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Natural Resource Stewardship and Science

National Park Service
Vegetation Mapping Inventory Program

Jean Lafitte National Historical Park and Preserve Vegetation Mapping Project

Natural Resource Report NPS/GULN/NRR—2017/1528





ON THIS PAGE
Photographs collected in Jean Lafitte National Historical Park and Preserve, Louisiana. From upper left clockwise to center: live oak (*Quercus virginiana*) forest canopy (CEGL004648), cottonwood borer (*Plectrodera scalator*), flowering bulltongue arrowhead (*Sagittaria lancifolia*) in the bulltongue sea (CEGL007889), cricket frog (*Acris* sp.), blooming American lotus (*Nelumbo lutea*) in CEGL004323, and a Carolina anole (*Anolis carolinensis*). Photographs by Andrew Strassman (U.S. Geological Survey).

ON THE COVER
A view of the open marsh of the Barataria Preserve at Jean Lafitte National Historical Park and Preserve in Louisiana. Photograph by Kevin Hop (U.S. Geological Survey).

National Park Service
Vegetation Mapping Inventory Program

Jean Lafitte National Historical Park and Preserve Vegetation Mapping Project

Natural Resource Report NPS/GULN/NRR—2017/1528

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Contents

Page

Figures vii
Tables ix
Lists xi
Appendixes xiii
Executive Summary xv
Acknowledgments xvii
Introduction and Project Overview 1
Jean Lafitte National Historical Park and Preserve 1
National Park Service Vegetation Mapping Inventory Program 2
Program Procedures and Standards 2
Jean Lafitte National Historical Park and Preserve Vegetation Mapping Project 5
Project Boundary 5
Study Plan 5
Classification of Vegetation 5
Project Orientation Meeting 8
Mapping of Vegetation 9
Accuracy Assessment Study 11
Product Development and Delivery 11
Digital Aerial Imagery 12
Orthorectified Mosaic 15
Stereo Models 16
Vegetation Classification 17
Methods 17
Preliminary Classification 17
Field Data Collection 2015 18
Data Entry and Quality Control 19
Results 21
Vegetation Classification Results 21

Contents (continued)

Page

Vegetation Descriptions 25
Vegetation Field Keys 26
Plant Species List 26
Vegetation Mapping 27
Methods 27
Preliminary Map Classification 27
Field Reconnaissance 27
Map Classification 29
Aerial Image Interpretation and Mapping 33
Database Development 34
Results 35
Map Classes 35
Summary Report of the Map Layer 45
Brief Analysis and Discussion 46
Forest and Woodland 47
Shrublands 47
Herbaceous Vegetation 47
Cultural Vegetation 48
Open Water 48
Map Layer Presentation 48
Accuracy Assessment 51
Methods 51
Sampling Design 51
Field Data Collection 54
Data Analyses 55
Results and Discussion 59
Users' Accuracy (Errors of Commission) 60
Producers' Accuracy (Errors of Omission) 61

Contents (continued)

Page

Literature Cited 63

Figures

Page

Figure 1. Jean Lafitte National Historical Park and Preserve, Louisiana (courtesy of National Park Service). 1

Figure 2. Project boundary extent for the Jean Lafitte National Historical Park and Preserve vegetation mapping project. 6

Figure 3. A field ecologist collecting a quick plot in support of vegetation classification for the Jean Lafitte National Historical Park and Preserve vegetation mapping project. 7

Figure 4. An orientation meeting at the Barataria Preserve Education Center in Jean Lafitte National Historical Park and Preserve, Louisiana, to discuss the vegetation mapping project for the Park. 9

Figure 5. A field visit of backslope forest vegetation during the orientation meeting for the Jean Lafitte National Historical Park and Preserve vegetation mapping project. 9

Figure 6. Vegetation ecologists providing classification guidance to mappers during field reconnaissance for the Jean Lafitte National Historical Park and Preserve vegetation mapping project. 10

Figure 7. The accuracy assessment analysis team reviewing accuracy results of the vegetation map for the Jean Lafitte National Historical Park and Preserve vegetation mapping project. 11

Figure 8. Flight line locations of digital aerial imagery collected for the Jean Lafitte National Historical Park and Preserve vegetation mapping project. 14

Figure 9. A mapper viewing aerial imagery on a computer to aid in fieldwork for vegetation mapping. 15

Figure 10. Quick plot data collection to support the vegetation classification for the Jean Lafitte National Historical Park and Preserve vegetation mapping project. 18

Figure 11. Locations of vegetation plots that supported the vegetation classification for the Jean Lafitte National Historical Park and Preserve vegetation mapping project. 20

Figure 12. Field reconnaissance to correlate aerial image signatures with ground vegetation for the Jean Lafitte National Historical Park and Preserve vegetation mapping project. 28

Figure 13. Locations of verification sites for the Jean Lafitte National Historical Park and Preserve vegetation mapping project. 30

Figure 14. Vegetation mapping decision tree for the Jean Lafitte National Historical Park and Preserve vegetation mapping project. 32

Figure 15. Vegetation map display from the Jean Lafitte National Historical Park and Preserve vegetation mapping project. 49

Figures (continued)

Page

Figure 16. An example of an accuracy assessment map to direct field crews to sites, with site and map information shown over a U.S. Geological Survey digital raster graphic backdrop.....53

Figure 17. Field classification of an accuracy assessment site for the Jean Lafitte National Historical Park and Preserve Vegetation mapping project.....55

Figure 18. Locations of accuracy assessment sites to assess the accuracy of the vegetation map layer for the Jean Lafitte National Historical Park and Preserve vegetation mapping project. 56

Tables

Page

Table 1. Hierarchy structure of the National Vegetation Classification Standard, Version 2 (Federal Geographic Data Committee 2008) for natural vegetation with example assignments from the U.S. National Vegetation Classification (USNVC Database 2017). 4

Table 2. Hierarchy structure of the National Vegetation Classification Standard, Version 2 (Federal Geographic Data Committee 2008) for cultural vegetation with example assignments from the U.S. National Vegetation Classification (USNVC Database 2017). 4

Table 3. Digital aerial imagery sets collected for the Jean Lafitte Historical Park and Preserve vegetation mapping project. 13

Table 4. Codes to cover-scale classes and vegetation strata used during vegetation plot sampling to develop the initial vegetation classification of Jean Lafitte National Historical Park and Preserve, Louisiana. 19

Table 5. Physiognomic cover-density modifiers for the Jean Lafitte National Historical Park and Preserve vegetation mapping project. 33

Table 6. Frequencies of polygons and areas for map classes represented in the vegetation map layer for the Jean Lafitte National Historical Park and Preserve vegetation mapping project. 45

Table 7. Values for calculating buffer distance from map polygon boundaries for the random selection of accuracy assessment sites. 52

Lists

Page

List 1. List of natural (including ruderal) vegetation types for the Jean Lafitte National Historical Park and Preserve vegetation mapping project, positioned hierarchically in the U.S. National Vegetation Classification (USNVC Database 2017). 21

List 2. List of map-class codes and names, with crosswalk to vegetation types in the U.S. National Vegetation Classification for the Jean Lafitte National Historical Park and Preserve vegetation mapping project. 36

List 3. List of map classes set into the hierarchy of the U.S. National Vegetation Classification for the Jean Lafitte National Historical Park and Preserve vegetation mapping project. 39

Appendixes

Page

Appendix A: Plot Sampling Form A-1

Appendix B: Descriptions of Vegetation Types B-1

Appendix C: Field Key to Vegetation Types C-1

Appendix D: List of Plant Species D-1

Appendix E: Descriptions of Map Classes E-1

Appendix F: Accuracy Assessment Form F-1

Appendix G: Accuracy Assessment Field Manual G-1

Appendix H: Accuracy Assessment Reconciliation H-1

Appendix I: Accuracy Assessment Contingency Table I-1

Executive Summary

The National Park Service (NPS) Vegetation Mapping Inventory (VMI) Program classifies, describes, and maps existing vegetation of national park units for the NPS Natural Resource Inventory and Monitoring (I&M) Program. The NPS VMI Program is managed by the NPS I&M Division and provides baseline vegetation information to the NPS Natural Resource I&M Program. The U.S. Geological Survey Upper Midwest Environmental Sciences Center, NatureServe, NPS Gulf Coast Network I&M Program, and NPS Jean Lafitte National Historical Park and Preserve (JELA, also referred to as the "Park") have completed vegetation classification and mapping of JELA for the NPS VMI Program.

Mappers, ecologists, and botanists collaborated to affirm vegetation types of JELA and to determine how best to map the vegetation types by using aerial imagery. Analyses of data from 159 legacy plots had been used to describe an initial 18 vegetation types in the Park; this classification work was completed prior to beginning this JELA vegetation mapping project. Data were collected during this project from another 87 quick plots to support vegetation types not previously identified at the Park. Data from 61 verification sites were collected to test the field key to vegetation types and the application of vegetation types to a sample set of map polygons. Furthermore, data from 594 accuracy assessment (AA) sites were collected (of which 587 were used to test accuracy of the vegetation map layer). The collective of these datasets resulted in affirming 41 natural (including ruderal) vegetation types at JELA consisting of 34 association types in the U.S. National Vegetation Classification (USNVC), 1 provisional type (potential for USNVC), 4 park-special types, 1 alliance type in the USNVC, and 1 group type in the USNVC.

To map the vegetation and land cover of JELA, 26 map classes were developed. Of these 26 map classes, 24 represent natural (including ruderal) vegetation types, most of which types are recognized in the USNVC. For the remaining 2 of the 26 map classes, 1 of the map classes represents a USNVC cultural subclass type for developed areas, and the other map class represents a non-USNVC type for nonvegetated open water. Features were interpreted from viewing 3-band digital aerial imagery using digital onscreen three-dimensional stereoscopic workflow systems in geographic information systems; digital aerial imagery was collected during July 25–26, 2014. The interpreted data were digitally and spatially referenced, thus making the spatial-database layers usable in a geographic information system. Polygon units were mapped to either a 0.5-hectare (ha) or 0.25-ha minimum mapping unit, depending on vegetation type.

A geodatabase containing various feature-class layers and tables presents the locations of USNVC vegetation types (vegetation map layer), vegetation plot samples, verification sites, AA sites, project boundary extent, and aerial image centers and flight lines. The feature-class layers and related tables for the vegetation map layer provide 2,463 polygons of detailed attribute data covering 11,058.5 ha, with an average polygon size of 4.5 ha when physiognomic cover-density modifiers are not considered; with modifiers, the vegetation map consists of 2,867 polygons, with an average polygon size of 3.9 ha. The vegetation map includes the administrative boundary for the Barataria Preserve within JELA and the Fleming Plantation area.

A summary report, generated from the vegetation map layer of JELA, concludes that the 24 map classes representing natural (including ruderal) vegetation types apply to 96.3% of polygons (2,372 polygons; average size of 4.4 ha) and cover 93.7% of the Park (10,357.1 ha). Further broken down, map classes representing vegetation types indicate that the Park is 27.0% forest and woodland (2,988.6 ha), 8.3% shrubland (912.9 ha), and 58.4% herbaceous cover (6,455.6 ha). A cultural map class representing developed areas applies to 2.9% of polygons (72 polygons; average size of 3.0 ha) and covers 1.9% of the Park (215.3 ha). A map class representing nonvegetation water (non-USNVC) applies to 0.8% of polygons (19 polygons; average size of 25.6 ha) and covers 4.4% of the Park (486.1 ha).

A thematic AA study was completed of map classes representing the natural (including ruderal) vegetation types of JELA. Initial AA results were discussed with NPS staff from the JELA and Gulf Coast Network I&M Program. Following input from NPS staff on how to handle map classes that fell below accuracy standards, adjustments were made to the vegetation map layer. Final results indicate an overall accuracy of 83.47% (kappa index of 82.54% for chance agreements) based on data from 587 of the 594 AA sites. Most individual map-class themes exceed the NPS VMI Program standard of 80% with a 90% confidence interval.

The JELA vegetation mapping project delivers many geospatial and vegetation data products, including an indepth project report discussing methods and results, which includes descriptions and a field key to vegetation types, map classification and map-class descriptions, and a contingency table listing AA results. The suite of products also includes a database of vegetation plots, verification sites, and AA sites; digital images of field sites; field data sheets; digital aerial imagery; hardcopy and digital maps; and a geodatabase of vegetation and land cover (map layer), field sites (vegetation plots, verification sites, and AA sites), aerial imagery index, project boundary, and metadata. Geospatial products are projected in the Universal Transverse Mercator, Zone 15 North, by using the North American Datum of 1983. Information on the NPS VMI Program and completed mapping projects are on the Internet at http://science.nature.nps.gov/im/inventory/veg.

Acknowledgments

The success of this vegetation mapping project was dependent on the collaborative efforts of several individuals from various organizations. The dedicated people who worked on this project collectively have a wide array of knowledge, skill, and expertise; these people were essential in moving the National Park Service (NPS) Jean Lafitte National Historical Park and Preserve (JELA, also referred to as the "Park") vegetation mapping project to its completion. The authors of this report wish to acknowledge those individuals who have been vital in making this vegetation mapping project a success.

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The authors also acknowledge our colleagues from within our own offices—the U.S. Geological Survey (USGS) Upper Midwest Environmental Sciences Center (UMESC) and NatureServe. Of UMESC, the authors acknowledge Erin Hoy for assisting in training the accuracy assessment (AA) crews, conducting AA analysis, and reviewing parts of this report; Larry Robinson for managing the collection of digital aerial imagery; JC Nelson for producing the cost-surface analysis and random-site selection for accuracy assessment; and Joe Jakusz (former Cartographic Technician) for his involvement at the beginning of this vegetation mapping project. The authors further acknowledge the assistance of Al Schotz of the Alabama Natural Heritage Program and Ellie Kravets of the University of North Carolina at Chapel Hill in the collection of the vegetation data for the AA and Mary Russo of NatureServe for careful data entry and management.

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All photograph images in this report are by authors of or contributors to this report unless otherwise specified.

Introduction and Project Overview

This report describes the Jean Lafitte National Historical Park and Preserve (JELA) vegetation mapping project for the National Park Service (NPS) Vegetation Mapping Inventory (VMI) Program. This "Introduction and Project Overview" section provides a general description of the vegetation mapping project without an indepth review of the methods and results. The report then begins an indepth description of the methods and results for the three main components of the project to provide the necessary detail to replicate this project. Appendixes are included and referenced in the report to provide further detail. Because of the length of this report, acronyms are reestablished for each main section and appendix. Throughout this report, JELA is also referred to as the "Park."

Jean Lafitte National Historical Park and Preserve[1]

Jean Lafitte National Historical Park and Preserve dates back to March 4, 1907, but was officially established as a National Park on August 10, 1939. The Park currently encapsulates six separate and unique sites that detail the history, culture, and natural environs of the Mississippi River delta in the area around New Orleans, Louisiana (Figure 1). Of these six sites, five are dedicated to the historical and cultural resources of the region, which include three unique cultural centers (the Acadian, Prairie Acadian, and Wetlands Acadian Cultural Centers), the French Quarter Visitor Center, and the Chalmette Battlefield and National Cemetery. The sixth site, the Barataria Preserve, is dedicated to the ecology of Mississippi River Delta and some additional history. The preserve is also one of the confirmed homes and bases of operation for the pirate Jean Lafitte, namesake of the Park. Today, the preserve is home to more than 200 species of birds; numerous amphibians and reptiles, which include the American alligator (*Alligator mississippiensis*); and hundreds of species of plants.



Figure 1. Jean Lafitte National Historical Park and Preserve, Louisiana (courtesy of National Park Service).

[1]Information within this section was partly compiled from the website for JELA at https://www.nps.gov/jela.

National Park Service Vegetation Mapping Inventory Program

The NPS VMI Program classifies, describes, and maps existing vegetation of national park units with a significant natural resource. Managed by the NPS Natural Resource Inventory and Monitoring (I&M) Program Division, the NPS VMI Program provides to the NPS I&M Program baseline vegetation information needed to manage ecosystem integrity for NPS units. Vegetation layers and associated information support a variety of resource assessment, park management, and planning needs. The layers and information also provide structure for framing and answering critical scientific questions about vegetation communities and their relation to environmental processes across the landscape.

Program Procedures and Standards

Program scientists developed procedures for classifying and mapping vegetation and for completing a mapping accuracy assessment (AA) (The Nature Conservancy and Environmental Systems Research Institute 1994a, 1994b; The Nature Conservancy et al. 1994; NatureServe 2004; Lea and Curtis 2010). Ecology and mapping teams collaborated to share knowledge and data and to resolve issues regarding classification and mapping procedures.

Products of the NPS VMI Program meet Federal Geographic Data Committee (FGDC) standards for vegetation classification and metadata and national standards for spatial accuracy and data transfer. These standards include the following:

- National Vegetation Classification Standard (NVCS) (Federal Geographic Data Committee 2008),
- Content Standard for Digital Geospatial Metadata (Federal Geographic Data Committee 1998a),
- United States National Map Accuracy Standards (U.S. Geological Survey 1999), and
- Spatial Data Transfer Standard (Federal Geographic Data Committee 1998b).

Mapping standards include a minimum mapping unit (MMU) of 0.5 hectares (ha) and a classification accuracy meeting or exceeding 80% (with a 90% confidence level) for map classes representing natural (including ruderal[2]) vegetation types in the U.S. National Vegetation Classification (USNVC). Geospatial products are projected in the Universal Transverse Mercator (UTM) and use the North American Datum of 1983 (NAD83). The NPS VMI Program provides an array of mapping and vegetation data products. Mapping products include aerial imagery, spatial map layers of vegetation, metadata, a map-classification description or key, and an AA of the vegetation map. Vegetation products include vegetation classification, field key to vegetation types, formal descriptions of vegetation types, and field data in database format. More information on the NPS VMI Program, including completed vegetation mapping projects, is on the Internet at

[2]Ruderal vegetation is defined as "vegetation found on human-disturbed sites, with no apparent recent historical natural analogs and whose current composition and structure is not a function of continuous cultivation by humans and includes a broadly distinctive characteristic species combination, whether tree, shrub, or herb dominated. The vegetation is often composed of invasive species, whether exotic or native, that have expanded in extent and abundance due to the human disturbances." (Faber-Langendoen et al. 2014).

http://science.nature.nps.gov/im/inventory/veg. Information on the NPS Natural Resource I&M Program is available on the Internet at http://science.nature.nps.gov/im/index.cfm.

Classification Standard

The NVCS (Federal Geographic Data Committee 2008) is a methodology to classify existing vegetation and is a framework to organize a vegetation classification within a hierarchical structure. The USNVC is a vegetation classification that follows the NVCS to define and organize existing vegetation in the United States. The NVCS is static in its methods and structure, whereas the USNVC is flexible with its vegetation classification concepts and assignments, yet remains within the static structural hierarchy of the NVCS. The NPS VMI Program uses the USNVC to classify and describe vegetation of national park units to provide a uniform approach in vegetation classification. The use of a national standard aids effective resource stewardship by augmenting compatibility and widespread use of the information throughout the NPS and other Federal and State agencies.

The NVCS separates vegetation into the following two overriding categories: natural vegetation (including ruderal) and cultural vegetation. Hierarchical levels for natural and cultural vegetation with examples of vegetation types from the USNVC are listed in Tables 1 and 2. Definitions of these various levels are detailed within section 2 of the NVCS (Federal Geographic Data Committee 2008); however, because of the emphasis given by the NPS VMI Program to vegetation types of the floristic levels (alliance and association) and the group level of the NVCS, the following brief definitions are provided.

- An association-level type is the finest level of the NVCS and is "defined on the basis of a characteristic range of species composition, diagnostic species occurrence, habitat conditions and physiognomy" (Jennings et al. 2006, as quoted in Federal Geographic Data Committee 2008:14). "Associations reflect topo-edaphic climate, substrates, hydrology, and disturbance regimes" (Federal Geographic Data Committee 2008:14).
- An alliance-level type is hierarchically one level above the association level and is "defined by a characteristic range of species composition, habitat conditions, physiognomy, and diagnostic species, typically at least one of which is found in the uppermost or dominant stratum of the vegetation" (Jennings et al. 2006, as quoted in Federal Geographic Data Committee 2008:14). "Alliances reflect regional to subregional climate, substrates, hydrology, moisture/nutrient factors, and disturbance regimes" (Federal Geographic Data Committee 2008:14).
- A group-level type is hierarchically one level above the alliance level (two levels above association level), yet is also the lowest level of the middle section of the NVCS hierarchy. The group level is defined in Table 2.4 of the NVCS as "combinations of relatively narrow sets of diagnostic plant species (including dominants and codominants), broadly similar composition, and diagnostic growth forms that reflect biogeographic differences in composition and sub-continental to regional differences in mesoclimate, geology, substrates, hydrology, and disturbance regimes" (Federal Geographic Data Committee 2008:17).

Table 1. Hierarchy structure of the National Vegetation Classification Standard, Version 2 (Federal Geographic Data Committee 2008) for natural vegetation with example assignments from the U.S. National Vegetation Classification (USNVC Database 2017).*

Classification Level	Example
Formation Class	Forest & Woodland (1; C01)
Formation Subclass	Temperate & Boreal Forest & Woodland (1.B; S15)
Formation	Temperate Flooded & Swamp Forest (1.B.3; F026)
Division	Southeastern North American Flooded & Swamp Forest (1.B.3.Nb; D062)
Macrogroup	Southern Coastal Plain Floodplain (1.B.3.Nb.4; M031)
Group	Bald-cypress - Tupelo Floodplain Forest (1.B.3.Nb.4.c; G033)
Alliance	*Taxodium distichum* - *Nyssa aquatica* - *Nyssa biflora* Floodplain Forest (A3594)
Association	*Taxodium distichum* - (*Nyssa aquatica*) / *Forestiera acuminata* - *Planera aquatica* Floodplain Forest (CEGL002421)

*The Bald-cypress - Water Tupelo Floodplain Forest—a vegetation type recognized by the Jean Lafitte National Historical Park and Preserve vegetation mapping project—is presented in its full hierarchical classification assignments by the U.S. National Vegetation Classification. The codes that follow classification names are code assignments.

Table 2. Hierarchy structure of the National Vegetation Classification Standard, Version 2 (Federal Geographic Data Committee 2008) for cultural vegetation with example assignments from the U.S. National Vegetation Classification (USNVC Database 2017).*

Classification Level	Example
Cultural Class	Agricultural & Developed Vegetation (7; CL01)
Cultural Subclass	Woody Agricultural Vegetation (7.A; CSC01)
Cultural Formation	Forest Plantation & Agroforestry (7.A.2; CFO02)
Cultural Subformation	Forest Plantation (7.A.2.1; CSF05)
Cultural Group [optional]	Temperate & Boreal Plantation (7.A.2.1.2; CGR007)
Cultural Subgroup	Eastern North American Temperate Forest Plantation (7.A.2.1.2.a; CSG005)
Cultural Type	Native Northern Pine Plantation (7.A.2.1.2.a.1; CTY009)
Cultural Subtype [optional]	*Pinus strobus* Planted Forest (CST007178)

*The White Pine Plantation Cultural Subtype—a vegetation type that is not recognized by the Jean Lafitte National Historical Park and Preserve vegetation mapping project—is presented in its full hierarchical classification assignments by the U.S. National Vegetation Classification. The codes that follow classification names are code assignments.

Jean Lafitte National Historical Park and Preserve Vegetation Mapping Project

The JELA vegetation mapping project was initiated by the NPS VMI Program to classify and map vegetation types of JELA, thereby providing NPS Natural Resource I&M Program, resource managers, and biological researchers with useful baseline vegetation information. The objective for the vegetation mapping project was to accurately identify and map existing vegetation types within the Park. To accomplish this objective, the following three main components were necessary: (1) vegetation classification, (2) vegetation mapping, and (3) AA. Each of these main components is discussed in greater detail in this report; however, as with any vegetation mapping project, several intermediate steps are inherent to the process. The remainder of this section provides an overview of events to complete the JELA vegetation mapping project, including the three main components and some of the more prevalent intermediate steps. This overview is presented in order of sequence; however, some overlap of events intrinsically exists.

Project Boundary

The project boundary extent for the JELA vegetation mapping project is shown in Figure 2. The project boundary includes the Barataria Preserve and Fleming Plantation area, and covers an area of 11,058 ha. A feature-class layer showing the extent of the project boundary was developed and incorporated into the geodatabase for the JELA vegetation mapping project.

Study Plan

A detailed study plan was submitted to the NPS VMI Program in June 2014. These plans focused on the second half of the "12-Step Guidance for NPS Vegetation Inventories" (version dated March 1, 2013[3]) because the development of the ecological classification (including vegetation plot collection, analyses, and drafting of the vegetation descriptions and key) had been completed for the NPS prior to the proposal to complete the vegetation mapping project.

Classification of Vegetation

Prior to the JELA vegetation mapping project, a vegetation classification of the Park had been developed in 2013–14 by NatureServe and the NPS Gulf Coast Network Natural Resource I&M Program. Although the vegetation classification effort was independent of this JELA vegetation mapping project, the 2013–14 classification served as a foundation supporting this project to map the vegetation communities of the Park. The vegetation classification was further developed during the JELA vegetation mapping project from the mapping and AA efforts. Additional vegetation types were identified during the mapping and AA efforts. These vegetation types were added to the vegetation classification for the Park. Where applicable, vegetation community concepts, names, and codes were updated to the current version of the USNVC.

The 2013–14 vegetation classification was derived from vegetation plots collected during 2001, and 2011–12; these vegetation plots are referred to as "legacy plots" throughout this report. Vegetation analyses provided detailed ecological information to affirm vegetation associations in the USNVC and to document the vegetation associations with local descriptors. A field key to vegetation types

[3]Version accessed at http://science.nature.nps.gov/im/inventory/veg/docs/Veg_Inv_12step_Guidance_v1.1.pdf.

complemented the 2013–14 vegetation classification. The vegetation classification and key were continually refined throughout the JELA vegetation mapping project with additional data from map reconnaissance, verification, and AA. Additional quick plots were collected in 2015 during the map reconnaissance effort (Figure 3). (A quick plot is a vegetation plot examining the major vegetative components without completing a botanical inventory.) These quick plots provided support for vegetation types discovered after the vegetation plot collection efforts.

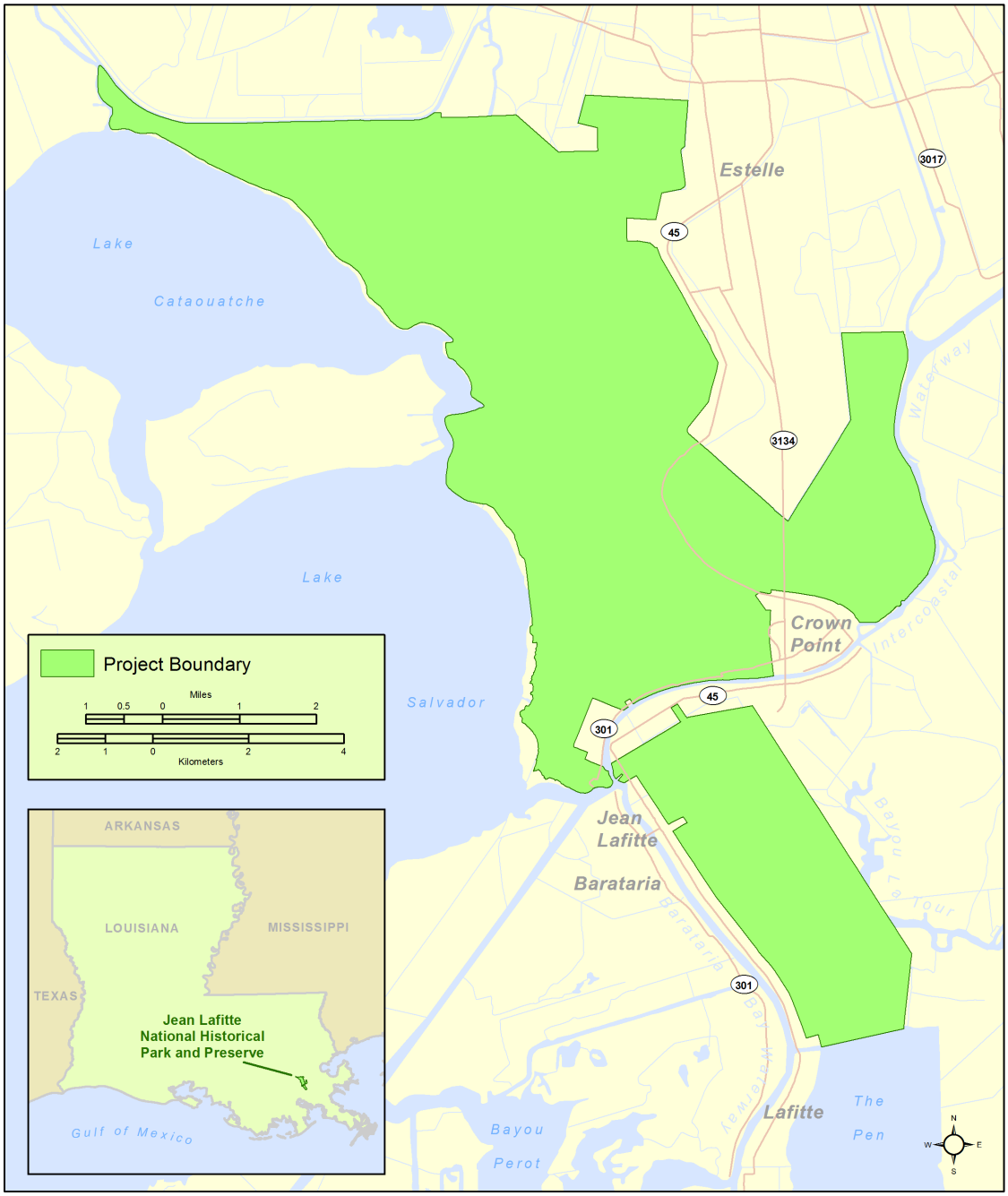


Figure 2. Project boundary extent for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.



Figure 3. A field ecologist collecting a quick plot in support of vegetation classification for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

In total, 246 vegetation plots consisting of 159 legacy plots and 87 quick plots are included in the database to support the vegetation classification for the JELA vegetation mapping project. The plot data were either converted (legacy plots) or entered (quick plots) into the PLOTS version 4.0 (National Park Service 2015) database for the project. The JELA vegetation mapping project identified 41 natural (including ruderal) vegetation types consisting of 34 association types in the USNVC, 1 "provisional[4]" type, 4 "park-special[5]" types, 1 alliance type in the USNVC (specific for mapping), and 1 group type in the USNVC (specific for mapping). Methods and results of vegetation classification are provided in the "Vegetation Classification" section of this report.

[4]A provisional vegetation type is one that has not been submitted for acceptance into the standard USNVC because the vegetation type has not yet been comprehensively reviewed for inclusion into the International Vegetation Classification and has not been peer reviewed for inclusion in the USNVC.

[5]A park-special vegetation type is one that lacks robust classification data for inclusion to the International Vegetation Classification and USNVC. However, the status of a park-special vegetation type could change if sufficient classification data were to warrant submission for peer review of potential status in the USNVC.

Classification Organization

Throughout this project report and the final products related to the JELA vegetation mapping project, vegetation associations types are from a 2017 version of the USNVC (USNVC Database 2017), which follows the methodology and organizational hierarchy of the NVCS, version 2 (Federal Geographic Data Committee 2008). The NVCS makes a distinction between natural (including ruderal) and cultural vegetation. Areas with at least 1% vegetation cover are classified and described with the USNVC with one exception—aquatic areas are only included when at least 10% vegetation cover (emergent or submergent) is present. Aquatic areas with less than 10% vegetation cover are categorized as open water; these areas are not described in the USNVC.

Although provisional and park-special vegetation types are technically not within the 2017 version of the USNVC database, presentation of these vegetation types are listed along with the USNVC associations in their likely locations as if part of the USNVC database, including hierarchical placement in the USNVC. This presentation provides contextual reference vegetation types each other.

The term "vegetation type" is used throughout this report to reference vegetation classification units in general, at any level of the classification hierarchy. For example, the *Taxodium distichum* - *Nyssa aquatica* / *Forestiera acuminata* - *Planera aquatica* Floodplain Forest Association, the Ruderal Mixed Spoil Bank Forest [Park Special] (a park-special type), the *Sesbania drummondii* Ruderal Shrubland (a provisional type), *Andropogon virginicus* - *Ambrosia artemisiifolia* - *Conyza canadensis* Eastern Ruderal Grassland Alliance, and the Eastern North American Ruderal Aquatic Vegetation Group are each treated as a vegetation type.

Project Orientation Meeting

An orientation meeting was held May 5–6, 2015, at the Barataria Preserve Education Center in JELA to discuss the mapping, AA, and end products for the JELA vegetation mapping project (Figure 4). Cooperators met to achieve the following objectives:

- provide an overview of the NPS VMI Program and data applications;
- become informed of the history, purpose, landscape, management, science, and specific interests of the Park;
- provide an overview of the vegetation sampling and classification work already completed;
- provide an overview of the digital aerial imagery already collected and processed;
- present the major steps remaining for the vegetation mapping project and view examples of final products;
- discuss an action plan for fieldwork and review the project schedule;
- review and become acquainted with the initial vegetation classification that had been developed for JELA; and
- visit various sites in the Park (Figure 5).



Figure 4. An orientation meeting at the Barataria Preserve Education Center in Jean Lafitte National Historical Park and Preserve, Louisiana, to discuss the vegetation mapping project for the Park.



Figure 5. A field visit of backslope forest vegetation during the orientation meeting for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

Mapping of Vegetation

The review of the initial vegetation classification during the project orientation meeting prepared the mappers for field reconnaissance, the purpose of which was to visit the vegetation types in the field, discern their appearances in the aerial images, and establish mapping protocols. The mappers completed two field trips, assisted intermittently by a vegetation ecologist for classification guidance (Figure 6). The first trip focused on collecting information on each individual vegetation type or map class. The second trip focused on the verification process, which tested a draft version of the vegetation field key and a sampling of preliminary map polygons. The map and vegetation field key were then adjusted based on the verification results.



Figure 6. Vegetation ecologists providing classification guidance to mappers during field reconnaissance for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

The mapping proceeded from fall 2015 to spring 2016. Mappers interpreted vegetation and land-cover types by viewing the digital aerial imagery collected for this project. The mappers viewed the aerial imagery stereoscopically by using computer workstations equipped with three-dimensional (3D) and geographic information system (GIS) software. Map conventions based on fieldwork and the vegetation classification helped maintain consistency in mapping. Draft versions of the vegetation map (a spatial database layer) were completed in spring 2016. This map layer was prepared for AA.

A total of 26 map classes represent JELA. Of these 26 map classes, 24 represent natural (including ruderal) vegetation types consisting of 34 USNVC association types, 1 provisional type (potential for USNVC), 4 park-special types, 1 USNVC alliance type, and 1 USNVC group type. For the remaining 2 of the overall 26 map classes, 1 represents a USNVC cultural subclass type for developed areas, and 1 represents nonvegetated open water (non-USNVC). The vegetation map layer provides 2,463 polygons of detailed attribute data covering 11,058.5 ha when physiognomic cover-density modifiers are not considered; with cover-density modifiers, the vegetation map consists of 2,867 polygons. Methods and results of vegetation mapping are provided in greater detail in the "Vegetation Mapping" section of this report.

Minimum Mapping Units

The standard MMU of 0.5 ha set by the NPS VMI Program was applied to mapping forest map classes. For woodland, shrubland, herbaceous vegetation, and nonvegetated open-water map classes, a MMU of 0.25 ha was applied. For cultural developed areas, no MMU was applied. More details on MMU conventions are provided in the "Vegetation Mapping" section of this report.

Accuracy Assessment Study

An AA was completed on the draft version of the vegetation map layer. During the 2016 field season, field crews collected data from 594 stratified-random sites to evaluate the accuracy of the vegetation map layer for those map classes representing natural (including ruderal) vegetation types. The AA field data were compared to the vegetation map data, with the initial results reviewed by the AA and mapping teams (Figure 7), and the map data were reconciled as necessary with agreement by NPS staff from JELA and the Gulf Coast Network I&M Program. Results from the AA study indicate an overall accuracy of 83.47% (kappa index of 82.54%, which accounts for chance agreements) based on an analysis of data from 587 of the 594 AA sites. The results were tabulated into a contingency matrix. Methods and results of the AA are provided in greater detail in the "Accuracy Assessment" section of this report.

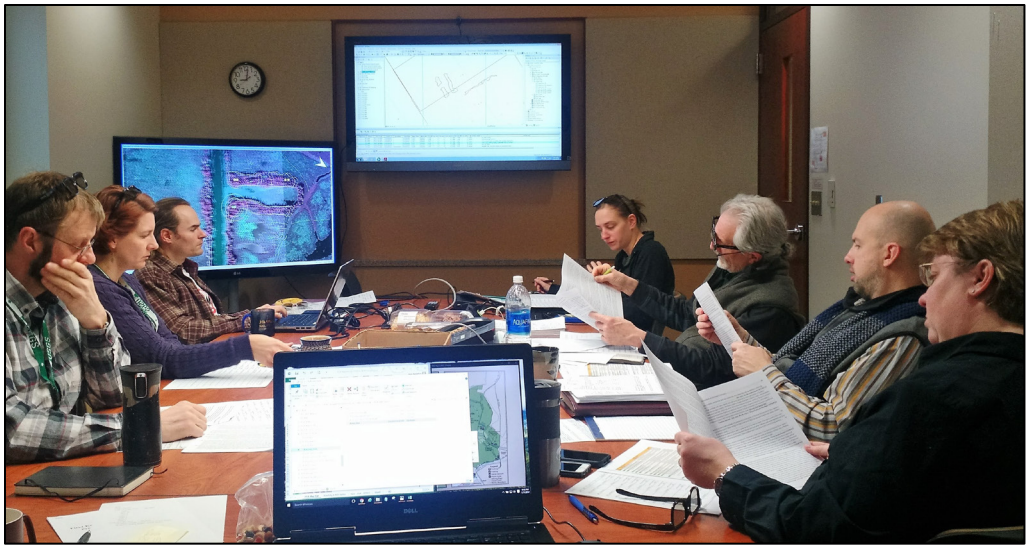


Figure 7. The accuracy assessment analysis team reviewing accuracy results of the vegetation map for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

Product Development and Delivery

The suite of end products developed and compiled for the JELA vegetation mapping project includes a project geodatabase; orthorectified mosaics of aerial imagery collected for the project; metadata documentation for geospatial datasets; a digital map book displaying the project aerial imagery; a vegetation database with the formal field data collected during this project (vegetation plots, verification sites, and AA sites); digital images of the formal field data, maps, and graphics showing a representation of each feature class within the project geodatabase; and this NPS Natural Resource Report summarizing the JELA vegetation mapping project. The set of products is delivered to NPS

staff of the VMI Program, Gulf Coast Network I&M Program, and JELA. The VMI Program posts the products to the Integrated Resource Management Applications Portal, providing easy access to these end products by NPS, partners, and the public.

The project geodatabase contains the following five feature classes: (1) polygon features showing the locations of vegetation types and general land-cover features; (2) point features showing the locations of vegetation plots, verification sites, and AA sites; (3) point features showing the locations of the digital aerial imagery set obtained for the vegetation mapping project; (4) line features showing the locations of flight lines to the aerial imagery obtained for the vegetation mapping project; and (5) polygon features showing the project boundary extent. Included in the geodatabase are tables that provide more information about the features, including links to classifications and detailed sampling data. Geospatial products were projected in the UTM, Zone 15 North, by using the NAD83.

Digital Aerial Imagery

Digital aerial imagery provides baseline data for mapping vegetation types and other land-cover features. Vertical imagery (images taken with the aerial camera pointed straight down at the ground) collected with proper overlap for each flight line allows an interpreter to study the images three dimensionally with a stereoscope (Avery 1978) or, as with the JELA vegetation mapping project, to view stereo models of digital aerial images in 3D using computers and specialized GIS software. Because ecological settings are taken into account when mapping vegetation types, viewing the aerial images in 3D helps the interpreter to recognize those ecological settings.

Sets of both true-color (TR) and color infrared (CIR) aerial imagery were acquired in July 2014 for the JELA vegetation mapping project using a plane-mounted digital camera. This imagery became the primary source for image interpretation and mapping. The aerial imagery was collected at a pixel resolution of 15.24 centimeters (centimeter measurement calculated from a standard 6-inch measurement). Park staff indicated that the best time to collect the imagery would be during June or July, with the goal of capturing peak vegetation growth.

Staff from the Upper Midwest Environmental Sciences Center (UMESC) of the U.S. Geological Survey (USGS) coordinated the collection of digital aerial imagery with the following requirements:

- a summer imagery set showing peak vegetation growth,
- a date to capture peak vegetation growth that was coordinated with JELA staff,
- a suitable pair of images for stereo viewing with 60% forward lap and 30% side lap,
- a collection time that would avoid long shadows and maintain proper color balance,
- a pixel resolution of 15.24 centimeters (equivalent to 6 inches), and
- a minimum of a 100-meter buffer beyond the JELA study area boundary.

The UMESC collaborated with the regional pilot from the Region 3 office of the U.S. Fish and Wildlife Service (St. Paul, Minnesota) to collect the aerial imagery. The imagery was collected using a gyroscopically-mounted, high resolution Applanix DSS 439 digital aerial camera system. DSS 439 images were collected with a 40-millimeter lens using either a CIR or TC filter. For JELA, separate flight missions collected imagery of the entire study area in CIR and TC. The camera system uses a

sophisticated inertial measurement unit (IMU) and a sensitive global positioning system (GPS) to track the precise location and position of the camera sensor at each instance of exposure. Image processing software uses these positional data to reference each image frame to the surface of the Earth within 1 meter (Ip et al. 2007).

The JELA flight plan consisted of 20 flight lines. To achieve a successful set of aerial imagery for vegetation mapping purposes, 3 flight missions were flown, collecting a total of 659 frames of imagery. The initial flight mission collected CIR imagery and was flown on July 25, 2014. Because of local weather patterns in the available collection window, some intermittent cloud coverage captured by the imagery was unavoidable. Efforts were made to ensure complete coverage by repeating the flight mission for a portion of the flight plan on July 26, 2014; this second flight mission repeated 10 flight lines. A total of 500 frames of CIR imagery were collected with the 2 CIR flight missions. The third flight mission collected TC imagery covering the entire study area on July 26, 2014.

Baseline information about the digital aerial imagery collected for the JELA vegetation mapping project is listed in Table 3. The first CIR aerial imagery mission captured the entire JELA study area with a minimum 100-meter buffer beyond the boundary. The second CIR mission captured duplicate flight lines over areas obscured by clouds in the first mission. The third mission captured TC imagery for the entire JELA study area, again with a minimum 100-meter buffer beyond the boundary. The flight line locations for the digital aerial imagery collected for the JELA vegetation mapping project are shown in Figure 8.

Table 3. Digital aerial imagery sets collected for the Jean Lafitte Historical Park and Preserve vegetation mapping project.

Imagery date	Imagery type	Pixel resolution	Footprint (pixels)	Footprint (m)	Area (ha)
7-25-2014	CIR imagery	15.24 cm (6 in)	7,212 by 5,408	1,099.1 by 824.2	90.6
7-26-2014	CIR imagery	15.24 cm (6 in)	7,212 by 5,408	1,099.1 by 824.2	90.6
7-26-2014	TC imagery	15.24 cm (6 in)	7,212 by 5,408	1,099.1 by 824.2	90.6

m, meter; ha, hectare; CIR, color infrared; cm, centimeter; in, inch; TC, true color

The digital aerial imagery was reviewed to assure that requirements for mapping purposes were met. Upon acceptance, exposures were adjusted for viewing and interpreting purposes. The aerial imagery was then processed for field and mapping purposes. Processing resulted in the creation of the following two products: (1) orthorectified mosaics of the CIR and TC imagery for background display in a GIS and (2) stereo models to view and map images in 3D using a GIS and specialized 3D computer hardware and software.

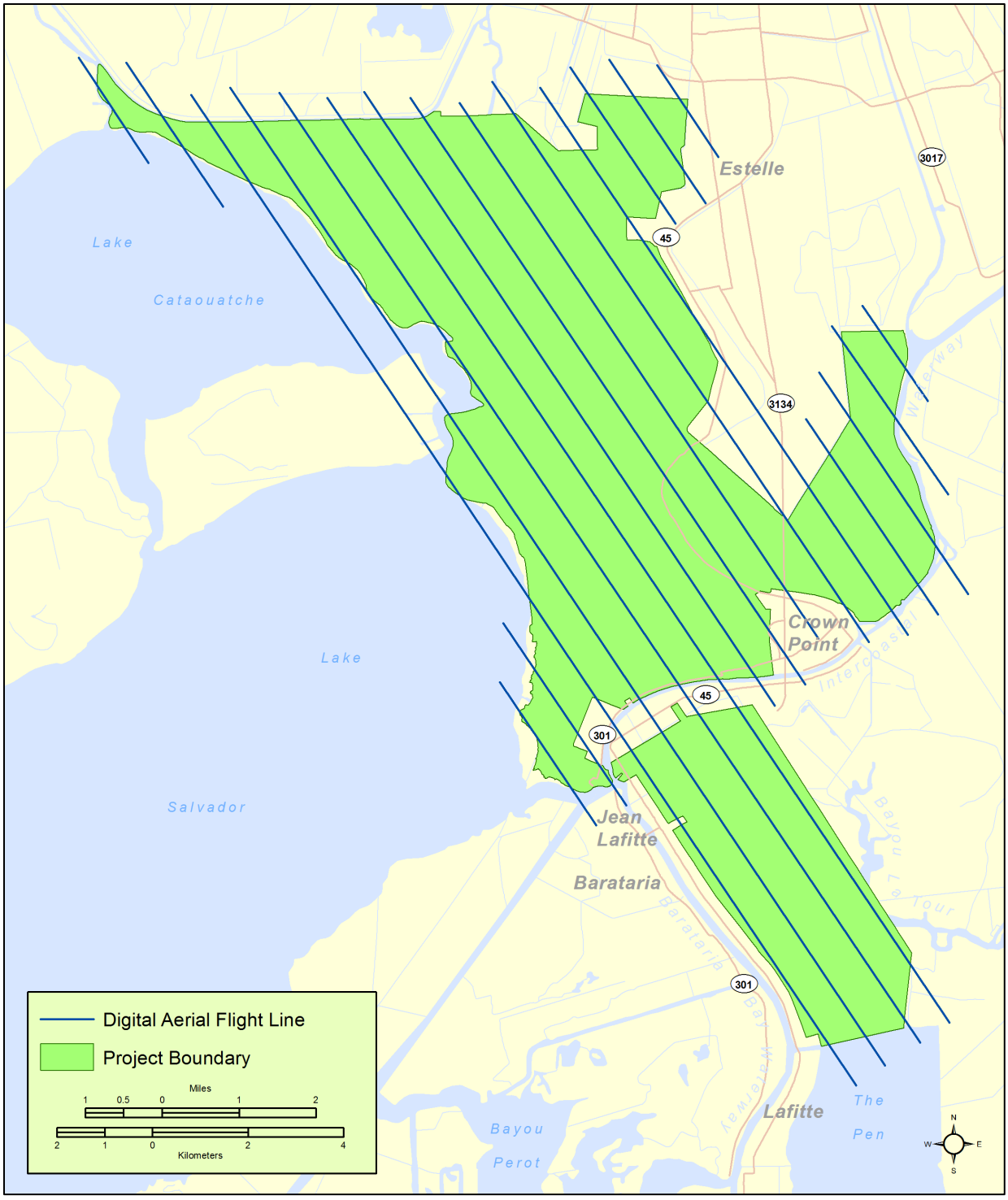


Figure 8. Flight line locations of digital aerial imagery collected for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

Orthorectified Mosaic

Individual image tiles from the digital aerial imagery collected for the JELA vegetation mapping project were converted to Tagged Image File Format and referenced to the Earth using the camera generated GPS and IMU records. Because the IMU records the rotation values from the camera sensor in three directions (roll, pitch, and yaw), and the GPS records the horizontal and vertical values from the sensor at the moment of exposure, specific software programs can reference each digital aerial image precisely to its ground position. To further increase the fit of the images to the Earth, software programs drape each aerial image over the landscape using digital elevation models.

Once referenced, or orthorectified, the individual digital aerial images were color balanced and "stitched" together to form two orthoimage mosaics; one mosaic of the best images from the two CIR imagery sets and one mosaic of the TC imagery set. Each mosaic was compressed into the JPEG 2000 file format to accommodate computer hardware systems and GIS software with manageable file sizes. Each orthoimage mosaic was projected in the UTM, Zone 15 North, by using the NAD83. Both the CIR and TC aerial imagery mosaics could then be viewed on computers to aid mappers during fieldwork and mapping (Figure 9).



Figure 9. A mapper viewing aerial imagery on a computer to aid in fieldwork for vegetation mapping.

Stereo Models

Digital aerial images were collected with a 60% overlap of each frame along a flight line. This overlapping coverage of the ground on the images is what allows for the creation of a 3D onscreen view in specialized computer software. Before the aerial imagery can be viewed in 3D, several processing steps must take place. For the JELA vegetation mapping project, stereo models were produced using IMAGINE Photogrammetry (ERDAS, Inc.). A stereo model is a flight line of imagery, along with a separate georeferencing file called a block file. The block file establishes the relation of each aerial image to the adjacent image in order to precisely align the image pair (also known as a stereo pair), so that the image pair is viewable in 3D and is displayed in the correct geospatial position. When the stereo model is imported into the software program called "Stereo Analyst for ArcGIS" (ERDAS, Inc.), the imagery can be viewed in 3D and the map can be interpreted. Because the block file associated with each stereo model contains georeferencing information, the delineations made on-screen by the interpreter are also georeferenced as they are drawn, creating the vegetation map. More information on the use of stereo models with specialized stereo viewing equipment for mapping is provided in the "Vegetation Mapping" section of this report.

In addition to mosaic orthoimages and stereo models, feature-class layers were produced to show in GIS the flight line locations and the center locations of individual aerial images. These feature classes are incorporated into the geodatabase product for the JELA vegetation mapping project. Aerial orthoimagery mosaics are included as products, along with a nonspatial digital map book of aerial images.

Vegetation Classification

A vegetation classification of the Jean Lafitte National Historical Park and Preserve (JELA, also referred to as the "Park") was developed under an independent effort prior to mapping and accuracy assessment (AA) for the JELA vegetation mapping project. This classification was completed in 2013–14 by NatureServe and the National Park Service (NPS) Gulf Coast Network Natural Resource Inventory and Monitoring (I&M) Program and served as a foundation to further classify and map the vegetation types of the Park. As the vegetation mapping project proceeded with mapping and AA, additional vegetation types were recognized in the Park and, thereby, were added to the vegetation classification for the JELA vegetation mapping project. Quick plots were collected to verify and characterize many of these additional vegetation types. Furthermore, at the close of the vegetation mapping project, classification concepts, names, and codes were updated to the current version of the U.S. National Vegetation Classification (USNVC) (USNVC Database 2017), including hierarchical placement. This report section discusses methods and results of vegetation classification for the JELA vegetation mapping project, including the methodology to develop the vegetation classification prior to the mapping and AA efforts.

Methods

The vegetation classification for the JELA vegetation mapping project was built from the preliminary classification that was developed of JELA prior to this project from legacy plots and data, and further developed from quick plot data collected with this project to document some classification gaps.

Preliminary Classification

The preliminary vegetation classification created by NatureServe and the NPS Gulf Coast Network I&M Program used existing data consisting of 159 legacy plots. Additional information used in the preliminary classification included publications of legacy data by Battaglia et al. (2007, 2009), Nolfo-Clements (2006), and Visser et al. (1998, 2000). In contrast to most other vegetation mapping projects for the NPS Vegetation Mapping Inventory (VMI) Program, no field visits or new sampling-plot data were collected for the preliminary classification.

Staff from the NPS Gulf Coast Network I&M Program provided initial classifications of the legacy plots using multivariate analyses (cluster analysis, Bray-Curtis [Sorensen], and flexible beta -0.25) PC-ORD v.5.32 (McCune and Mefford 2006). The analyses were reviewed and critiqued by NatureServe staff, and new iterations were run to inform the classification and to subset the data into finer groups. The dendrograms and ordinations were analyzed to determine which clusters of data points seemed to represent the existing associations of the USNVC at that time, and which clusters required the creation of new draft associations. Plot groups identified during the cluster analysis were analyzed using compositional statistics. Frequency, mean cover, relative cover, constancy, fidelity, and homoteneity were calculated for finer scale plot groups to determine the relation to existing or new USNVC associations. This analysis resulted in an initial draft classification of 17 USNVC associations and 1 park-special type. This initial draft classification was presented during the orientation meeting for the JELA vegetation mapping project in May 2015. This draft classification was subsequently tested in the field and refined based on the summer 2015 fieldwork.

Using existing datasets collected with different methods and by different researchers presented several challenges. The challenges included those associated with variability in methods (plot size, cover class scale, and plot placement); taxonomy, especially related to difficult genera (e.g., *Fraxinus*, *Eleocharis*, *Schoenoplectus*, and others); and phenology. In particular, plants visible in spring may not be visible in fall, and their relative biomass increases and decreases on a seasonal basis, changing perceptions of dominance among various species. Steps taken during the preliminary classification analysis to resolve some of these challenges included reviewing and standardizing the botanical nomenclature and cover values between datasets.

Field Data Collection 2015

The field sampling methodology applied in 2015 was adapted from field-method standards of the NPS VMI Program (NatureServe 2004). Details are provided therein, and a general summary is provided in this section.

Quick plots were collected in 2015 (Figure 10) primarily to document variation in marsh vegetation, to test the preliminary classification, and to acquire vegetation data on newly recognized vegetation types discovered during the mapping field reconnaissance. Data collection began during the first week of May after the orientation meeting for the vegetation mapping project and continued intermittently into October 2015. A total of 87 new quick plots were collected. For each quick plot, location, environmental, and vegetation data were collected. Environmental information about each plot included slope, aspect, soil texture, and evidence of disturbance. Within each plot, the vegetation was visually separated into strata (canopy, subcanopy, tall shrub, short shrub, and herbaceous). Visual estimates were collected for average height and total cover of each stratum and for total cover of the dominant and characteristic species in the entire plot and each stratum. Percent cover estimates were assigned using cover-scale classes (Table 4). Data from plots (marsh and forest) were taken from an estimated rectangular area of 20 by 20 meters (400 square meters).



Figure 10. Quick plot data collection to support the vegetation classification for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

Table 4. Codes to cover-scale classes and vegetation strata used during vegetation plot sampling to develop the initial vegetation classification of Jean Lafitte National Historical Park and Preserve, Louisiana.

Cover scales		Vegetation strata	
T	0–1%	T1	Emergent Canopy
P	>1–5%	T2	Main Canopy
1	>5–15%	T3	Subcanopy
2	>15–25%	S1	Tall Shrubs
3	>25–35%	S2	Short Shrubs
4	>35–45%	S3	Dwarf-shrubs
5	>45–55%	H	Herbaceous (field layer, including tree seedlings)
6	>55–65%	A1	Floating-leaved aquatics
7	>65–75%	A2	Submerged-leaved aquatics
8	>75–85%	–	
9	>85–95%	–	
10	>95%	–	

Digital picture images were also collected from the plot to provide additional information and assist in the vegetation classification. Picture images were taken in each cardinal direction from plot center and at least one other picture that best captured the character of the vegetation. For an example of the plot form, see "Appendix A: Plot Sampling Form."

These quick plots were identified in the field, or shortly thereafter, to a vegetation type. When a vegetation type was determined at a quick plot, an existing field key to vegetation types of JELA was used. Furthermore, as fieldwork progressed, vegetation types were identified that were not part of the initial classification, the field key was revised by NatureServe in consultation with the U.S. Geological Survey (USGS) Upper Midwest Environmental Sciences Center (UMESC), and new versions of the field key were used on subsequent visits.

Quick plot locations were recorded using a Wide Area Augmentation System (WAAS) enabled handheld Garmin GPSMAP 76 global positioning system (GPS) unit. Plant specimens were collected, in particular, to document the identities of members of the genus *Eleocharis* discovered at quick plots in the open marsh. These specimens have been provided to staff at Louisiana State University (http://www.herbarium.lsu.edu/lowellurbatsch.html) through an agreement with the NPS.

Locations of vegetation plots, including legacy plots and quick plots, that supported the vegetation classification of JELA are shown in Figure 11.

Data Entry and Quality Control

Quick plot data from the field forms were checked and then entered into the PLOTS version 4.0 (National Park Service 2015) database for the project. In cases where writing was unclear, fields were highlighted and checked again. Species and cover data entered into the database were subjected

to several quality control processes to ensure accuracy in the vegetation dataset. The quick plot data were provided to UMESC, but the data were not analyzed with multivariate analysis.

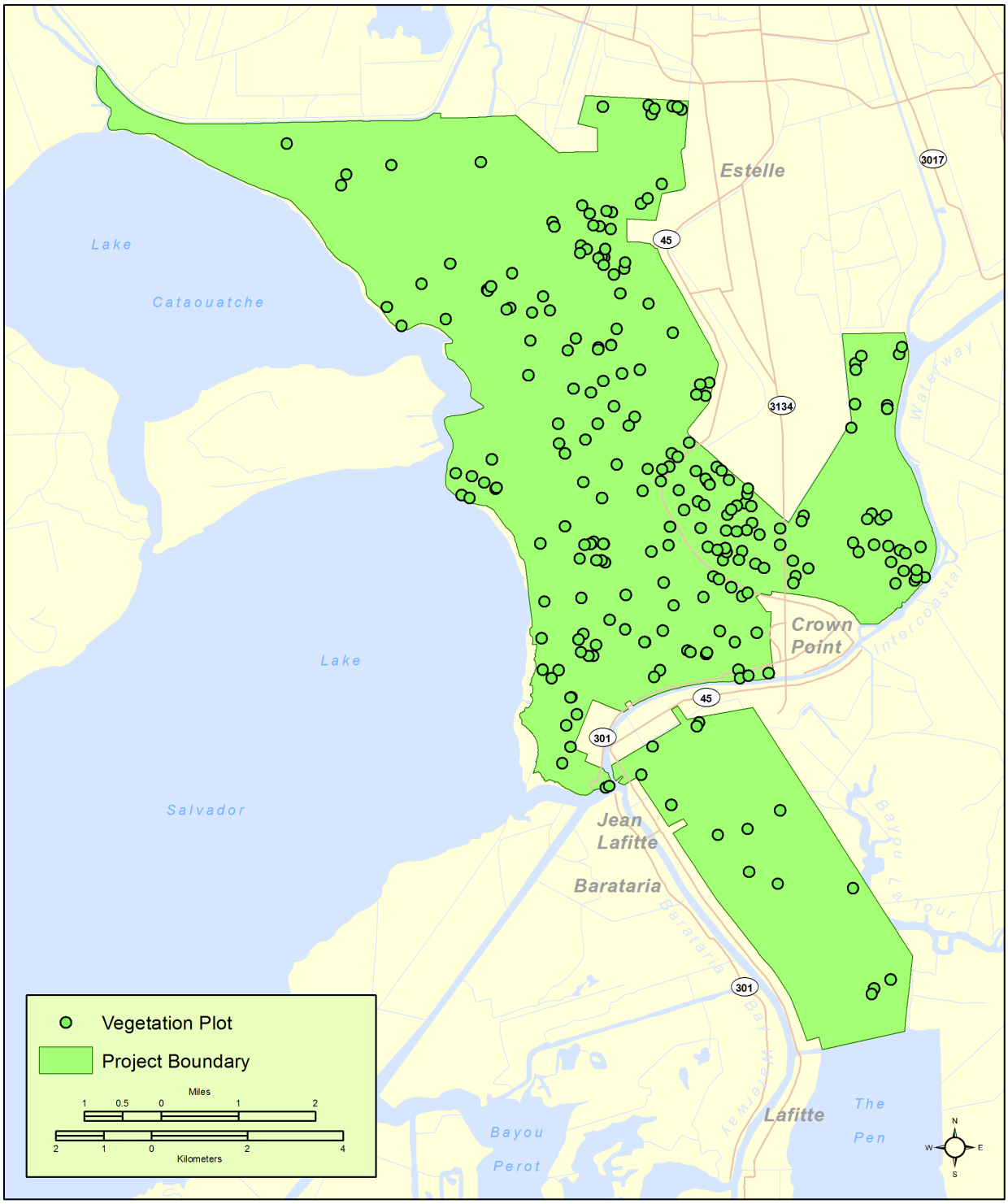


Figure 11. Locations of vegetation plots that supported the vegetation classification for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

Results

The final vegetation classification for the JELA vegetation mapping project is presented in this section. Vegetation descriptions, vegetation field keys, and plant species are each provided in different appendixes of this report; however, brief explanations to each of these appendixes are provided in this section.

Vegetation Classification Results

A listing of 39 vegetation types consisting of 34 association types in the USNVC, 1 provisional type (potential for USNVC), and 4 park-special types that are recognized for the JELA vegetation mapping project is provided in List 1, with the vegetation types positioned hierarchically in the USNVC (USNVC Database 2017). An additional USNVC alliance type is included in List 1 for a vegetation type that was needed to define a map class for mapping; no association, provisional, or park-special type was derived for the map class. This alliance type was supported with quick plots to provide definition to the map class, with no other associations under this alliance type recognized at JELA[6].

The listing of vegetation types in List 1 is the result of the combined efforts of vegetation classification, mapping, and AA. Of the 34 USNVC associations, 16 originated from legacy plots that supported the initial classification, 17 originated from quick plots that were collected during mapping, and 1 originated from AA field sites that were collected to assess the mapping. In addition, one park-special type originated from the initial suite of legacy plots, and three park-special types and the one provisional type originated from quick plots.

List 1. List of natural (including ruderal) vegetation types for the Jean Lafitte National Historical Park and Preserve vegetation mapping project, positioned hierarchically in the U.S. National Vegetation Classification (USNVC Database 2017).

1. Forest & Woodland Class
  1.B. Temperate & Boreal Forest & Woodland Subclass
    1.B.1. Warm Temperate Forest & Woodland Formation
      1.B.1.Na. Southeastern North American Forest & Woodland Division
        M305. Southeastern North American Ruderal Forest Macrogroup
          G029. Southeastern Exotic Ruderal Forest Group
            A3233 *Albizia julibrissin - Broussonetia papyrifera - Triadica sebifera* Ruderal Forest Alliance
              CEGL007037 *Triadica sebifera* Ruderal Forest Association

*Provisional vegetation type.

[6]In addition to using a USNVC alliance type to specifically define a map class, a USNVC group type was used to specifically define yet another map class for mapping. This group type, however, consists of three other USNVC associations of JELA that are part of another map class; therefore, the group-level type concept was already inherent to the classification.

List 1 (continued). List of natural (including ruderal) vegetation types for the Jean Lafitte National Historical Park and Preserve vegetation mapping project, positioned hierarchically in the U.S. National Vegetation Classification (USNVC Database 2017).

G031. Southeastern Native Ruderal Forest Group
A3232 *Liquidambar styraciflua* - *Celtis laevigata* - *Quercus nigra* Ruderal Forest Alliance
CEGL004854 *Celtis laevigata* Coastal Plain Ruderal Forest Association
CEGL004638 *Quercus nigra* Ruderal Forest Association
CEPS004809 Ruderal Mixed Deciduous Forest [Park Special]
CEPS009725 Ruderal Mixed Spoil Bank Forest [Park Special]
1.B.3. Temperate Flooded & Swamp Forest Formation
1.B.3.Nb. Southeastern North American Flooded & Swamp Forest Division
M310. Southeastern North American Ruderal Flooded & Swamp Forest Macrogroup
G762. Southeastern Exotic Ruderal Flooded & Swamp Forest Group
A3339 *Triadica sebifera* - *Melaleuca quinquenervia* - *Schinus terebinthifolius* Ruderal Flooded & Swamp Forest Alliance
CEGL007412 *Triadica sebifera* Ruderal Wet Forest Association
G553. Southeastern Native Ruderal Flooded & Swamp Forest Group
A3343 *Acer rubrum* - *Liriodendron tulipifera* Ruderal Flooded & Swamp Forest Alliance
CEGL007437 *Salix nigra* / *Morella cerifera* Ruderal Wet Forest Association
CEPS006671 Disturbed Woody Wetland [Park Special]
M031. Southern Coastal Plain Floodplain Forest Macrogroup
G033. Bald-cypress - Tupelo Floodplain Forest Group
A3592 *Acer rubrum* - *Gleditsia aquatica* - *Fraxinus profunda* Swamp Forest Alliance
CEGL007229 *Acer rubrum* - (*Fraxinus profunda*) / *Sabal minor* Swamp Forest Association
A3594 *Taxodium distichum* - *Nyssa aquatica* - *Nyssa biflora* Floodplain Forest Alliance
CEGL002421 *Taxodium distichum* - (*Nyssa aquatica*) / *Forestiera acuminata* - *Planera aquatica* Floodplain Forest Association
CEGL007422 *Taxodium distichum* - *Nyssa aquatica* - *Acer rubrum* / *Itea virginica* Floodplain Forest Association
A3595 *Taxodium distichum* - *Nyssa biflora* Tidal Swamp Forest Alliance
CEPS009724 *Taxodium distichum* - *Salix nigra* / *Morella cerifera* / *Thelypteris palustris* Woodland [Park Special]
CEGL007065 *Taxodium distichum* / *Morella cerifera* / *Thelypteris palustris* Tidal Woodland Association

*Provisional vegetation type.

List 1 (continued). List of natural (including ruderal) vegetation types for the Jean Lafitte National Historical Park and Preserve vegetation mapping project, positioned hierarchically in the U.S. National Vegetation Classification (USNVC Database 2017).

G034. Oak - Sweetgum Floodplain Forest Group
A3634 *Quercus virginiana* - *Quercus pagoda* - *Quercus nigra* Coastal Plain Swamp Forest Alliance
CEGL004648 *Quercus virginiana* - *Celtis laevigata* - *Quercus pagoda* / *Sabal minor* Swamp Forest Association
G759. Southern Ash - Elm - Willow Floodplain Forest Group
A3709 *Ulmus americana* - *Ulmus crassifolia* - *Celtis laevigata* West Gulf Coastal Plain Floodplain Forest Alliance
CEGL004619 *Quercus texana* - *Celtis laevigata* - *Ulmus* (*americana*, *crassifolia*) - (*Gleditsia triacanthos*) Floodplain Forest Association
2. Shrub & Herb Vegetation Class
2.B. Temperate & Boreal Grassland & Shrubland Subclass
2.B.2. Temperate Grassland & Shrubland Formation
2.B.2.Ne. Southeastern North American Grassland & Shrubland Division
M307. Southeastern Ruderal Grassland & Shrubland Macrogroup
G583. Southeastern Ruderal Grassland & Shrubland Group
A3321 *Andropogon virginicus* - *Ambrosia artemisiifolia* - *Conyza canadensis* Eastern Ruderal Grassland Alliance
A3322 *Rubus* spp. - *Prunus* spp. - *Cornus drummondii* Eastern Ruderal Shrubland Alliance
CEGL004657 *Baccharis halimifolia* Ruderal Shrubland Association
CEPP007085 *Sesbania drummondii* Ruderal Shrubland*
2.C. Shrub & Herb Wetland Subclass
2.C.4. Temperate to Polar Freshwater Marsh, Wet Meadow & Shrubland Formation
2.C.4.Ne. Atlantic & Gulf Coastal Marsh, Wet Meadow & Shrubland Division
M066. Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh Macrogroup
G110. Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh Group
A0806 *Morella cerifera* - *Rosa palustris* Tidal Freshwater Shrubland Alliance
CEGL007093 *Ilex cassine* - *Morella cerifera* / *Woodwardia areolata* - *Sphagnum* sp. Flotant Shrub Swamp Association
CEGL007241 *Morella cerifera* / *Typha domingensis* - *Sagittaria lancifolia* - *Eleocharis* spp. Tidal Marsh Association
A3578 *Panicum hemitomon* Floating Marsh Alliance
CEGL007834 *Morella cerifera* - *Panicum hemitomon* Floating Marsh Association
CEGL004665 *Panicum hemitomon* Marsh Association

*Provisional vegetation type.

List 1 (continued). List of natural (including ruderal) vegetation types for the Jean Lafitte National Historical Park and Preserve vegetation mapping project, positioned hierarchically in the U.S. National Vegetation Classification (USNVC Database 2017).

A1987 *Sagittaria lancifolia* Gulf Coast Tidal Freshwater Marsh Alliance
CEGL007886 *Eleocharis rostellata* - *Sagittaria lancifolia* Oligohaline Tidal Marsh Association
CEGL007891 *Phragmites australis* ssp. *berlandieri* - (*Sagittaria platyphylla*, *Vigna luteola*) Tidal Marsh Association
CEGL007889 *Sagittaria lancifolia* Mississippi River Deltaic Plain Tidal Marsh Association
A3580 *Schoenoplectus californicus* Gulf Coast Tidal Freshwater Marsh Alliance
CEGL003985 *Schoenoplectus californicus* Tidal Marsh Association
A3581 *Stuckenia pectinata* - *Zannichellia palustris* - *Ceratophyllum demersum* Freshwater Subtidal Marsh Alliance
CEGL007689 *Potamogeton perfoliatus* - (*Stuckenia pectinata*, *Zannichellia palustris*) Tidal Marsh Association
A4015 *Typha domingensis* - *Eleocharis rostellata* Gulf Coastal Plain Oligohaline Tidal Marsh Alliance
CEGL007888 *Spartina patens* - *Vigna luteola* Mississippi River Deltaic Plain Tidal Marsh Association
CEGL007235 *Typha domingensis* - *Sacciolepis striata* - *Sagittaria lancifolia* Marsh Association
CEGL008456 *Typha domingensis* Tidal Marsh Association
A4220 Gulf Coastal Plain Floating Marsh Alliance
CEGL007081 *Bacopa monnieri* - *Eleocharis* spp. Thin Floating Marsh Association
CEGL007076 *Bidens laevis* - *Hydrocotyle ranunculoides* Floating Marsh Association
M067. Atlantic & Gulf Coastal Plain Wet Prairie & Marsh Macrogroup
G188. Atlantic & Gulf Coastal Plain River & Basin Freshwater Marsh Group
A3404 *Zizaniopsis miliacea* - *Zizania aquatica* - *Pontederia cordata* Southeastern Floodplain Marsh Alliance
CEGL004139 *Zizaniopsis miliacea* Coastal Plain Slough Marsh Association
2.C.5. Salt Marsh Formation
2.C.5.Nb. North American Atlantic & Gulf Coastal Salt Marsh Division
M079. North American Atlantic & Gulf Coastal Salt Marsh Macrogroup
G120. Atlantic & Gulf Coastal Brackish Salt Marsh Group
A4013 *Spartina alterniflora* - *Spartina cynosuroides* Brackish Tidal Marsh Alliance
CEGL004178 *Cladium mariscus* ssp. *jamaicense* Tidal Salt Marsh Association
CEGL008476 *Schoenoplectus americanus* - (*Spartina patens*) - *Typha* spp. Salt Marsh Association

*Provisional vegetation type.

List 1 (continued). List of natural (including ruderal) vegetation types for the Jean Lafitte National Historical Park and Preserve vegetation mapping project, positioned hierarchically in the U.S. National Vegetation Classification (USNVC Database 2017).

5. Aquatic Vegetation Class
  5.B. Freshwater Aquatic Vegetation Subclass
    5.B.2. Temperate to Polar Freshwater Aquatic Vegetation Formation
      5.B.2.Na. North American Freshwater Aquatic Vegetation Division
        M108. Eastern North American Freshwater Aquatic Vegetation Macrogroup
          G114. Eastern North American Freshwater Aquatic Vegetation Group
            A4064 *Nymphaea odorata* - *Nuphar* spp. - *Brasenia schreberi* Aquatic Vegetation Alliance
              CEGL004323 *Nelumbo lutea* Aquatic Vegetation Association
              CEGL002386 *Nuphar advena* - *Nymphaea odorata* Aquatic Vegetation Association
        M401. North American Temperate Ruderal Aquatic Vegetation Macrogroup
          G595. Eastern North American Ruderal Aquatic Vegetation Group
            A4219 *Eichhornia crassipes* - *Alternanthera philoxeroides* Ruderal Aquatic Vegetation Alliance
              CEGL003858 *Alternanthera philoxeroides* Ruderal Aquatic Vegetation Association
              CEGL007671 *Eichhornia crassipes* Southeast Temperate Ruderal Aquatic Vegetation Association
              CEGL007075 *Oxycaryum cubense* - *Salvinia molesta* Exotic Floating Mat Association

*Provisional vegetation type.

Vegetation Descriptions

All natural (including ruderal) vegetation types identified with the JELA vegetation mapping project are described in "Appendix B: Descriptions of Vegetation Types." Updates were made to the plot-based descriptions with data collected during the map process. These descriptions list each vegetation type hierarchically in the USNVC, followed by concept summaries, environmental and vegetation information, characteristic species, classification development, and distributions. Most fields in the descriptions have separate sections with information on the global characteristics (prefaced by "Global" and referring to its range-wide characteristics) and on the local characteristics (prefaced by "Jean Lafitte National Historical Park and Preserve" and referring to its Park-specific characteristics).

The global information in a vegetation description applies to the entire range of the vegetation type; this information has been gathered from scientific literature and other field data and is stored in NatureServe's central database. For the descriptive text fields, global information (listed as "Global") can be thought of as an average or modal expression of a relatively natural stand throughout the range of the vegetation type. The local information (listed as "Jean Lafitte National Historical Park and Preserve") is derived from data from the classification phases of the JELA vegetation mapping project, which consisted mostly of data from the plots sampled before and during this project; however, some information from AA field data and less formal field observations are also included.

For each description of a vegetation type, "Local" and "Global" descriptions are given in the "Environment," "Vegetation," and "Range" sections. Additional fields in the database were updated as needed, including "Other Noteworthy Species" (such as rare or exotic taxa) and "Summary." For each vegetation type, the most abundant species were listed according to stratum (such as canopy and subcanopy) and lifeform (such as forb and graminoid).

Vegetation types without plot data—including those types discovered after the mapping was finished—do have descriptions, but any local information is based on general or cursory field observations or notes on abundant species. These data were drawn from quick plots taken during the 2015 map reconnaissance notes and from the 2016 AA field data; not from more comprehensive vegetation plot data. In Appendix B, the USNVC associations, provisional types, park-special types, alliance types, and group types are documented for JELA and are described with both the "Global" and the "Jean Lafitte National Historical Park and Preserve" information if there is supporting data.

Vegetation Field Keys

A field key to vegetation types of JELA is provided in "Appendix C: Field Key to Vegetation Types." The field key consists of dichotomous options that lead to natural (including ruderal) vegetation types. "Appendix B: Descriptions of Vegetation Associations Types" is recommended to complement the vegetation field key to determine a correct assessment of vegetation classification.

Plant Species List

A listing of plant species is provided in "Appendix D: List of Plant Species." This listing is an export of all plant taxa generated from the PLOTS database for the vegetation mapping project and includes plant species that were documented at vegetation plots (legacy plots and quick plots) and AA sites[7,8]. Although the primary purpose of vegetation plots (legacy plots and quick plots collectively) was to characterize USNVC types, the primary purpose of AA sites was to assess the vegetation map layer. The list of plant species is not intended to be a comprehensive list of every taxon within the Park; however, 347 plant species, subspecies, and genus are listed from the field data collection efforts.

Some tree and shrub seedlings and immature herbaceous plants only could be identified to the genus level and, therefore, are listed as such. The plant taxa list provides scientific and common names and is organized alphabetically by scientific name. Taxa names were standardized to the PLANTS Database (U.S. Department of Agriculture, Natural Resource Conservation Service 2016), which is in accordance with the NatureServe Ecology vascular plant taxonomic standard (Kartesz 1999).

[7]Plant taxa from legacy plots, along with other plot sample data, had been entered into a PLOTS v.3.2 (National Park Service 2011) database and later converted into a PLOTS version 4.0 (National Park Service 2015) database. Plant taxa from accuracy assessment sites, along with other site and environmental data, had been entered into a PLOTS version 4.0 (National Park Service 2015) database according to National Park Service specifications.

[8]There were four species observed in the Park but not documented on a data collection form. These species are listed in "Appendix D: List of Plant Species."

Vegetation Mapping

This report section discusses methods and results of vegetation mapping for the Jean Lafitte National Historical Park and Preserve (JELA, also referred to as the "Park") vegetation mapping project, and concludes with an analysis, discussion, and presentation of the map layer.

Methods

Mapping vegetation of the JELA involved the following five primary steps: (1) preliminary map classification with a vegetation primer, (2) field reconnaissance, (3) map classification, (4) aerial image interpretation and mapping, and (5) database development of the map layer. Although these steps proceeded sequentially, they overlap to some degree.

Preliminary Map Classification

Prior to field reconnaissance, mappers needed to become familiar with the vegetation types expected to exist in JELA. To accomplish this familiarity for the Park, the mappers met with vegetation classifiers, Park staff, and local experts and reviewed the vegetation classification and the field key to vegetation types that had been previously developed by NatureServe ecologists. During these meetings, each vegetation type was discussed. For each vegetation type, the discussion included what defines the type, where the type was known to exist within the Park, what other vegetation types are likely to be confused with the type, and any other aspects that could help define the type's location or aerial imagery signature on the landscape.

Using this information, the mappers formed an initial map classification. This preliminary map classification promoted continuity from the classifiers to the mappers at the onset of the vegetation mapping process. Additionally, this preliminary step put in the hands of the mappers the foundations of a working map classification to test, update, and refine during field reconnaissance.

Field Reconnaissance

Field reconnaissance efforts were initiated to prepare for mapping vegetation types in JELA. Mappers visited numerous locations within the Park, joined by a classifier and Park staff to assist in field classification of vegetation. The mappers compared, with the aid of weatherized field computers, the ground conditions to vegetation signatures (appearances) on the digital color infrared (CIR) aerial imagery set that was obtained for the JELA vegetation mapping project. Vegetation types were determined by a vegetation field key and the classifier. This process was necessary, as Hershey and Befort (1995) explain, because CIR photography (or imagery) is not consistent among image sets to allow a species to be depicted precisely. Sun angle, light intensity, shadow, exposure, and difference in digital postcapture processing can affect image appearance. Differences in site history, hydrologic regime, intraspecific variation, and seasonality can change the appearance of a single species across a single image. Hence, ground exploration of the imagery is a critical endeavor. The field reconnaissance effort at the Park helped correlate the aerial imagery signatures of the vegetation with the vegetation classification on the ground (Figure 12).

Field reconnaissance also allowed mappers to become familiar with the local ecology of vegetation types, which is important when applying ecologic concepts to mapping. Where mappers discovered

limitations to interpreting vegetation types using digital aerial imagery, environmental models were tested to determine if vegetation types could be consistently separated by environmental elements. In JELA, the complexity and small-scale variation in marsh vegetation coupled with the history of disturbance (man-made and natural) that pervades the Park has prevented geospatial-based models from being a reliable tool for aerial imagery interpretation.



Figure 12. Field reconnaissance to correlate aerial image signatures with ground vegetation for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

The mappers and classifier proceeded with field reconnaissance at JELA during 2015. The field efforts for mapping were completed during two trips in 2015. The first trip, in May, included the project orientation meeting. The second trip, in June, focused on the verification process, which tested a draft version of the vegetation field key and a sampling of preliminary map polygons. The second trip also included additional opportunities for note collection. The mappers and classifier worked as a team, rather than as individuals, to ensure correct assessment of vegetation types and, subsequently, to promote correct classification during mapping. The team became familiar with the vegetation and local ecology as they discussed the structural, floristic, and habitat characteristics of the vegetation present in the field and compared the vegetation types to the appearance of the vegetation in the imagery. Through this process, the team built an understanding of how to map the vegetation types, how to establish a working map classification with mapping protocols, and how to help the classifier to refine the vegetation classification and the field key to vegetation types.

During the field reconnaissance, the mappers studied a representative sample of the natural landscape of JELA and determined much variability in the vegetation type. In some cases, the classifier

determined that some vegetation types existed that had not been represented by the vegetation plots or that were not fully addressed in existing descriptions in the vegetation classification. These vegetation types were added accordingly to the vegetation and map classifications. During the two field reconnaissance efforts, the number of recognized vegetation types within the Park increased from 18 to 41 with significant refinement to the vegetation classification.

Project orthoimagery mosaic sets of the true-color (TC) and CIR digital aerial imagery allowed for easy infield use. The file sizes were much smaller, and most of the imagery signature was maintained. This imagery was accessed using ArcMap in ArcGIS (Version 10.3, Esri), which also allowed the mapping team to digitally collect notes on vegetation and imagery signatures in the field, such as recording the map-class assignment, if known. Notes to promote proper perspective of species composition, such as comments regarding significant species, also were recorded. An example of species composition is heterogeneous versus monotypic forest stand.

Verification

Between the first and second field reconnaissance efforts, areas of JELA with both familiar and novel signatures were mapped for field verification. The TC and CIR digital aerial imagery collected for the JELA vegetation mapping project was interpreted by the mappers, who applied the mapping conventions established from the earlier field reconnaissance effort. During the second field reconnaissance effort, the mappers and classifier visited sites to verify that the mapping was correct and that the field key to vegetation types functioned correctly.

A total of 61 verification sites were assessed within JELA. Specific map verification sites were selected in the field during the second field reconnaissance effort. Locations of verification sites (Figure 13) were chosen in an attempt to cover the suite of vegetation types present across the Park's extensive wetland complex. At each verification site, field data were collected, and the field key to vegetation types, map classification, and mapping conventions were assessed and adjusted as needed. The mappers and classifier collected coordinate location information using field computers equipped with global positioning system (GPS) in conjunction with the digital aerial imagery. A field key to vegetation types of JELA (a June 2015 draft) was used to determine the vegetation type of the area greater than a minimum mapping unit (MMU). The vegetation type was compared to the map class assigned by the mappers, and an electronic data sheet was completed for each verification site. These data were entered into a feature-class layer with relate tables and were incorporated into the geodatabase for the JELA vegetation mapping project. The field data also were imported into the PLOTS version 4.0 (National Park Service 2015) database for the project.

Map Classification

A map class represents a definable feature (e.g., a vegetation type, a nonvegetated feature, and an anthropogenic area) that can be consistently distinguished on aerial imagery or by use of an environmental model, or both. The set of map classes that represents all the mapped features defines the map classification. The map classification and protocols that define the mappable features are based on existing classification systems. For the JELA vegetation mapping project, all map classes representing vegetation were linked to the vegetation types in either the U.S. National Vegetation Classification (USNVC) or in NatureServe's internal databases (for provisional and park-special

types). For natural (including ruderal) vegetation, map classes were linked to natural types in the USNVC or NatureServe databases at the finest (lowest) level possible. For cultural vegetation, a map class was linked to a cultural type in the USNVC at the lowest applicable level.

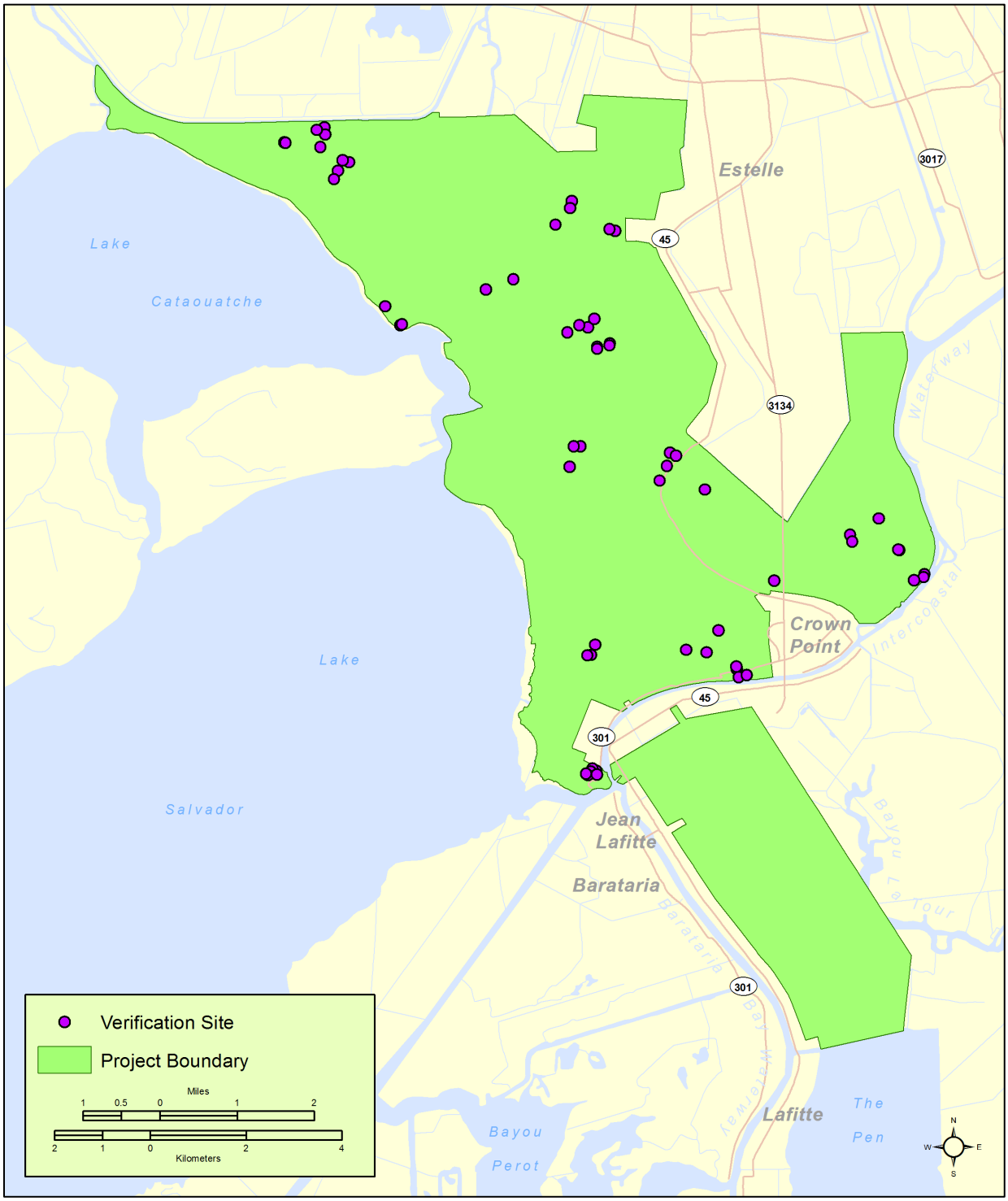


Figure 13. Locations of verification sites for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

After a draft of the map classification was developed, a "mapping tree" was created to facilitate the mapping process (Figure 14). A mapping tree is a diagram that divides the map classes into logical groups (e.g., Hardwood Forest, Herbaceous Wetland, and Shrub Wetland) and then further divides the groups into subgroups (e.g., Ruderal Monoculture, Rank Vegetation, and Evergreen Dominated), with a final selection of choices between the similar map classes in each subgroup. The choices in a mapping tree are meant to present the mappers with a limited and consistent set of options and to remind the mappers of possible alternative map classes.

To develop map-class names, for those map classes representing a single vegetation type in the USNVC, the type's common name was used (e.g., Southern Cattail Tidal Marsh for a single USNVC association, and Eastern North American Ruderal Aquatic Vegetation for a single USNVC group). For those map classes representing a single park-special vegetation type, a common name derived by NatureServe was used, but without the "[Park Special]" postfix (e.g., Ruderal Mixed Spoil Bank Forest). For those map classes representing more than one vegetation type, a comparable name (e.g., the Bald-cypress - Tupelo Flooded Forest map class for the collective USNVC associations of Bald-cypress - Water Tupelo Floodplain Forest and Southern Coastal Plain Bald-cypress - Tupelo Swamp Forest) was derived. For the one map class representing cultural vegetation, a generic name (i.e., Developed Area) was derived. For the one map class representing open-water features, a generic name (i.e., Open Water) was derived.

Throughout the project, the map classification remained fluid. Each field endeavor, including the accuracy assessment (AA) effort, revealed new information that prompted modifications to the map classes and their definitions. Revisions also were made to the map classification as the vegetation classification matured; as aerial images were interpreted, new problems forced redefinition, expansion, conjunction, or minor adjustment to map-class definitions. As individual map classes changed, these changes were consistently reapplied to areas that previously had been mapped to ensure consistent mapping across the Park.

A map-class code was derived for each map class for ease of assigning information to map polygons. Each map-class code was made using four alpha characters, and the code was to represent an independent map class; each code was to begin with one of the following first alpha characters to represent the major physiognomic characteristic:

- F—Forest (typically >60% tree cover),
- W—Woodland (>25% tree cover),
- S—Shrubland (>25% shrub cover and <25% tree cover),
- H—Herbaceous Vegetation (>10% herbaceous cover and <25% tree or shrub cover),
- C—Cultural (developed landscapes),
- N—Non-USNVC (open water with <10% vegetation cover).

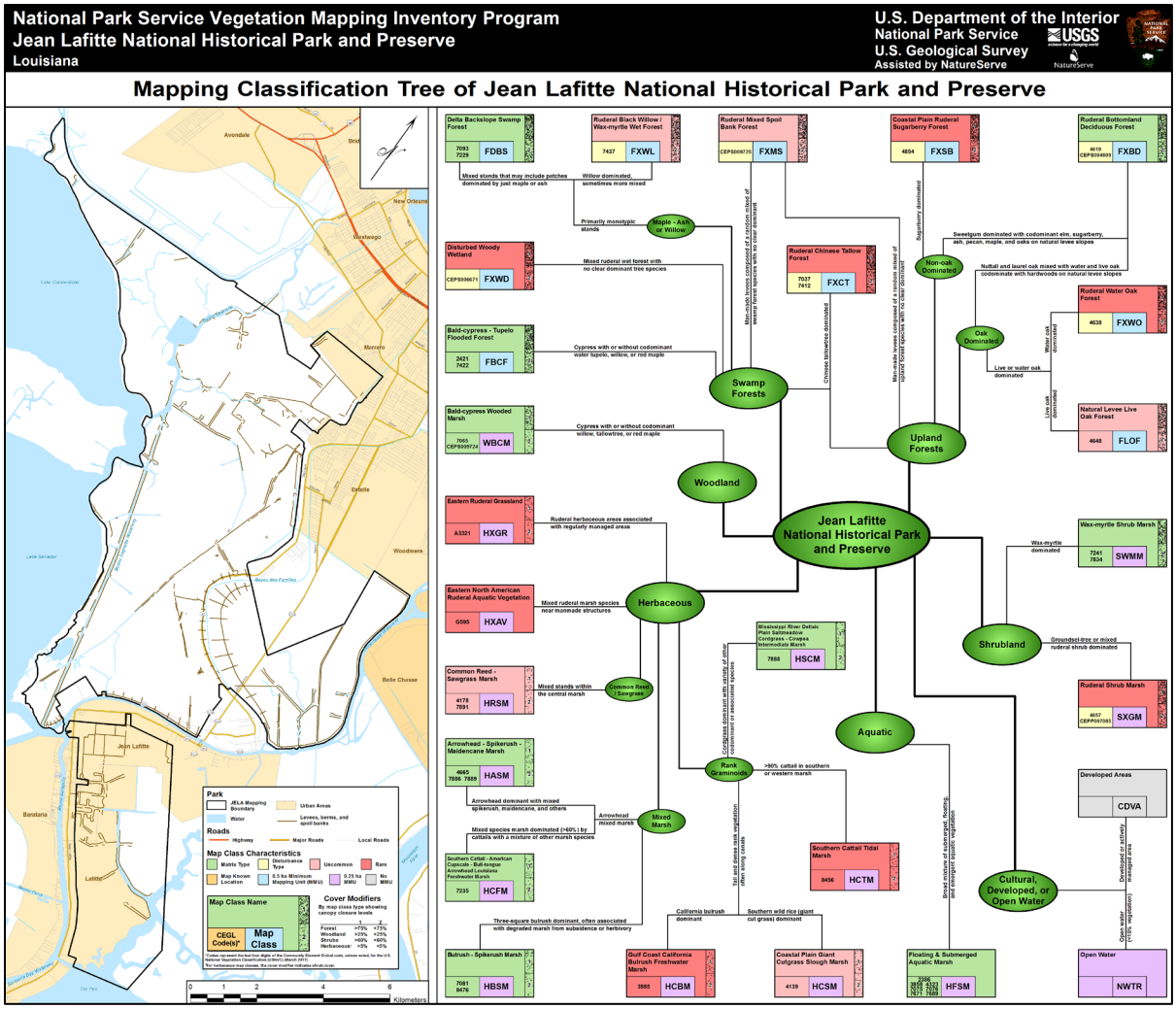


Figure 14. Vegetation mapping decision tree for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

The second character was to represent one of the following two possible scenarios: (1) to denote a ruderal map class with an "X" or (2) to denote the first significant term in the map-class name. The subsequent two characters were to loosely represent latter significant terms in the map-class name (e.g., FXBD for Ruderal Bottomland Deciduous Forest, HASM for Arrowhead - Spikerush - Maidencane Marsh, CDVA for Developed Area, and NWTR for Open Water).

Codes also were derived for physiognomic cover-density modifiers. These physiognomic modifiers provide additional information describing physiognomic characteristics of vegetation within mapped polygons. The physiognomic cover-density modifiers used for the JELA vegetation mapping project are described in Table 5.

An example of codes assigned to a particular mapped polygon might be "FLOF" (map class) and "1" (physiognomic cover-density modifier). The "FLOF" map-class code designates the polygon with the Natural Levee Live Oak Forest map class, which represents the *Quercus virginiana - Celtis laevigata*

- *Quercus pagoda* / *Sabal minor* Swamp Forest (CEGL004648) in the USNVC. The "1" modifier code indicates that the vegetation has a coverage density of 75–100%. This series of map classification and physiognomic information can enhance the interpretation of the map layer for managers and researchers, particularly when other geospatial datasets are introduced.

Table 5. Physiognomic cover-density modifiers for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

Major physiognomic characteristic	Modifier	Meaning
Forest	1	Closed canopy (75–100% cover)
	2	Open canopy* (25–75% cover)
Woodland	1	Closed canopy (25–60% cover)
	2	Open canopy (10–25% cover)
Shrubland	1	Closed canopy (60–100% cover)
	2	Open canopy (25–60% cover)
Herbaceous	1	Closed canopy (5–25% shrub cover)
	2	Open canopy (0–5% shrub cover)

*Some open-canopy versions of forest are still considered forests in the U. S. National Vegetation Classification because of their composition.

Aerial Image Interpretation and Mapping

The vegetation of JELA was mapped by a mapping team at the U.S. Geological Survey (USGS) Upper Midwest Environmental Sciences Center (UMESC) using digital-onscreen three-dimensional (3D) mapping systems running geographic information system (GIS) software. The mapping team performed onscreen interpretation of digital imagery that was spatially referenced in GIS. The mapping tree was used to further assist the mapping process and enforce consistent application of the map classification. A draft version of the vegetation map—a spatial-database layer—was then prepared for AA. The vegetation map was then adjusted according to the results from the analysis of the AA to meet accuracy criteria set by the National Park Service (NPS) Vegetation Mapping Inventory (VMI) Program.

The digital aerial imagery used for the onscreen mapping was collected during the summer of 2014 using a plane-mounted digital camera. (Refer to the "Introduction and Project Overview" section in this report for more information on the digital aerial imagery collected for the JELA vegetation mapping project.) The mappers used systems that incorporated passive stereo technology that uses polarized glasses to produce a 3D image on a liquid-crystal-display monitor for a computer. The stereo models were imported into the software program "Stereo Analyst for ArcGIS" (ERDAS, Inc.) for 3D viewing and editing.

Mapping proceeded from fall 2015 to spring 2016. A mapper would map a specified area and then give this draft work to a second mapper for quality assurance/quality control. The second mapper would then assess the draft work for errors in mapping and return the draft to the initial mapper for review and modification. Areas of high complexity could be revised more than once. This review process ensured that all portions of JELA were examined at least twice and by different individuals.

ArcGIS software was used as the GIS platform for the onscreen digital mapping. Because the 3D images were viewed directly in the GIS environment, vegetation could be mapped directly in ArcGIS. The polygon vector data were stored using an ArcGIS file geodatabase, which was projected in the Universal Transverse Mercator (UTM), Zone 15 North, by using the North American Datum of 1983 (NAD83).

Standard image signature characteristics were applied—including texture, color, pattern, and position in the landscape—to guide placement of polygons during mapping. In addition to image signature characteristics, mappers needed to understand the environmental distribution of the vegetation types across the landscape to help identify those vegetation types and to properly place polygon boundaries. For each polygon, the appropriate map-class code was applied.

Supplemental imagery and datasets were also used by the mappers to visualize and understand the landscape. These layers increased the mappers' ability to understand historical landscape change and use, determine wet and dry areas, and better visualize evergreen vegetation. The supplemental imagery and datasets included digital aerial imagery and field data from the field reconnaissance efforts and vegetation plot and verification site data.

The NPS VMI Program's standard MMU of 0.5 hectare (ha) was applied to mapping forest map classes. For woodland, shrubland, herbaceous vegetation, and nonvegetated open-water map classes, a MMU of 0.25 ha was applied. The smaller MMU was applied because of the consistent small patch presentation of vegetation types represented by the map classes. At the request of JELA staff, all instances of cultural developed areas, irrespective of size, were mapped to allow staff a better accounting of developed areas within the Park.

For polygons that represent vegetation crossing outside the boundary for the JELA vegetation mapping project, mappers allowed the polygons to be mapped less than the MMU if the vegetation that continued over the project boundary was contiguous and covered at least the standard MMU for that map class. In these instances, map classes with a 0.5-ha MMU were mapped down to 0.1 ha, and map classes with a 0.25-ha MMU were mapped down to 0.05 ha. For example, a 0.18-ha polygon of the Ruderal Chinese Tallow Forest (FXCT) map class would be mapped inside the boundary if at least 0.32 ha of contiguous connected FXCT was outside the boundary.

Database Development

At this stage, the map layer would have only map-attribute codes assigned to each polygon. To assign meaningful information to each polygon (e.g., map-class names and links to USNVC types), a feature-class table and other supportive tables were produced, and ArcGIS was used to relate the tables of polygon information within a geodatabase. A geodatabase provides access to a variety of

interrelated datasets. The geodatabase is expandable and can provide resource managers and researchers with a powerful GIS tool. The geodatabase developed for the JELA vegetation mapping project includes many feature-class layers produced from this project, including the map layer, vegetation plots, map verification sites, AA sites, aerial image locations, aerial flight line locations, and project boundary extent. Geospatial products for the JELA vegetation mapping project have been projected in the UTM, Zone 15 North, by using the NAD83.

Results

The final map classification for the JELA vegetation mapping project is presented in this section, along with a summary report of map-class distribution across the vegetation map.

Map Classes

After reconciling map classes from the AA analysis, 26 map classes represent JELA; 24 of the 26 map classes represent vegetation types. At the time of mapping, 30 map classes existed to map the Park, of which 28 map classes represented vegetation types. The AA study determined that confusion in mapping existed among some map classes; these map classes were listed with accuracy levels less than 80% (in the 90% confidence interval), as set by the NPS VMI Program. Map classes with low accuracy were examined for consistent sources of error and then NPS staff from JELA and the Gulf Coast Network Natural Resource Inventory and Monitoring (I&M) Program were consulted to determine if map classes should be merged to reduce error rates. The map classes with low accuracies were merged with the map classes that they were most often confused with during the mapping, unless the lower accuracy was accepted by NPS staff. Various reasons are recognized for where confusion in mapping existed among the map classes, including a breakdown of the mapping tree or ecological mapping conventions, inconsistent signatures on the aerial imagery across and among map classes, and disagreement in classification between field reconnaissance and AA. Further details regarding the mapping confusion are provided in the "Accuracy Assessment" section of this report and in individual map-class descriptions in "Appendix E: Descriptions of Map Classes." The descriptions in Appendix E also explain the link among map classes and the vegetation types they represent. Ground photograph images showing representations of the map classes are provided where possible.

Of the 26 map classes that represent JELA, 24 represent natural (including ruderal) vegetation types consisting of 34 USNVC association types, 1 represents provisional type (potential for USNVC), 4 represent park-special types, 1 represents USNVC alliance type, and 1 represents USNVC group type. For the remaining 2 of the overall 26 map classes, 1 represents a USNVC cultural subclass type for developed areas and 1 represents a non-USNVC type for nonvegetated open water. Of the 24 map classes representing natural (including ruderal) vegetation types, 13 represent a single vegetation type (when it exists above a MMU), 9 represent 2 vegetation types mapped together, 1 represents 3 vegetation types mapped together, and 1 represents 7 vegetation types mapped together.

The vegetation map layer provides 2,463 polygons of detailed attribute data covering 11,058.5 ha when physiognomic cover-density modifiers are not considered; with cover-density modifiers, the vegetation map consists of 2,867 polygons. Methods and results of vegetation mapping are provided in greater detail in the "Vegetation Mapping" section of this report.

The map classification for the JELA vegetation mapping project is listed in Lists 2 and 3. Map classifications from a map-class perspective and the vegetation types in the USNVC that are assigned to each map class are listed in List 2. Map classifications from a vegetation classification perspective and how the map classes relate to the USNVC in hierarchical order are listed in List 3. Note that map classes representing more than one vegetation type are listed multiple times in List 3 and are noted with an asterisk (*).

List 2. List of map-class codes and names, with crosswalk to vegetation types in the U.S. National Vegetation Classification for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.*

Live Oak Forest
- FLOF - Natural Levee Live Oak Forest
  - *Quercus virginiana* - *Celtis laevigata* - *Quercus pagoda* / *Sabal minor* Swamp Forest (CEGL004648)

Ruderal Water Oak Forest
- FXWO - Ruderal Water Oak Forest
  - *Quercus nigra* Ruderal Forest (CEGL004638)

Ruderal Bottomland Hardwood Forest
- FXBD - Ruderal Bottomland Deciduous Forest
  - Ruderal Mixed Deciduous Forest [Park Special] (CEPS004809)
  - *Quercus texana* - *Celtis laevigata* - *Ulmus* (*americana*, *crassifolia*) - (*Gleditsia triacanthos*) Floodplain Forest (CEGL004619)
- FXSB - Coastal Plain Ruderal Sugarberry Forest
  - *Celtis laevigata* Coastal Plain Ruderal Forest (CEGL004854)

Ruderal Chinese Tallow Forest
- FXCT - Ruderal Chinese Tallow Forest
  - *Triadica sebifera* Ruderal Forest (CEGL007037)
  - *Triadica sebifera* Ruderal Wet Forest (CEGL007412)

Ruderal Swamp & Spoil Forest
- FXMS - Ruderal Mixed Spoil Bank Forest
  - Ruderal Mixed Spoil Bank Forest [Park Special] (CEPS009725)
- FXWD - Disturbed Woody Wetland
  - Disturbed Woody Wetland [Park Special] (CEPS006671)
- FXWL - Ruderal Black Willow / Wax-myrtle Wet Forest
  - *Salix nigra* / *Morella cerifera* Ruderal Wet Forest (CEGL007437)

*The bold headings within the table (above the map classes) are map-class categories to organize the map classes. All USNVC names and codes (below the map classes) are association vegetation types unless otherwise noted.

**Provisional vegetation type.

List 2 (continued). List of map-class codes and names, with crosswalk to vegetation types in the U.S. National Vegetation Classification for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.*

Mixed Hardwood Swamp Forest
FDBS - Delta Backslope Swamp Forest
Acer rubrum - (*Fraxinus profunda*) / *Sabal minor* Swamp Forest (CEGL007229)
Ilex cassine - *Morella cerifera* / *Woodwardia areolata* - *Sphagnum* sp. Flotant Shrub Swamp (CEGL007093)
Bald-cypress Swamp Forest
FBCF - Bald-cypress - Tupelo Flooded Forest
Taxodium distichum - (*Nyssa aquatica*) / *Forestiera acuminata* - *Planera aquatic* Floodplain Forest (CEGL002421)
Taxodium distichum - *Nyssa aquatica* - *Acer rubrum* / *Itea virginica* Floodplain Forest CEGL007422)
Bald-cypress Marsh Woodland
WBCM - Bald-cypress Wooded Marsh
Taxodium distichum / *Morella cerifera* / *Thelypteris palustris* Tidal Woodland (CEGL007065)
Taxodium distichum - *Salix nigra* / *Morella cerifera* / *Thelypteris palustris* Woodland [Park Special] (CEPS009724)
Ruderal Shrub Marsh
SXSM - Ruderal Shrub Marsh
Baccharis halimifolia Ruderal Shrubland (CEGL004657)
Sesbania drummondii Ruderal Shrubland (CEPP007085)**
Wax-myrtle Shrub Marsh
SWMM - Wax-myrtle Shrub Marsh
Morella cerifera / *Typha domingensis* - *Sagittaria lancifolia* - *Eleocharis* spp. Tidal Marsh (CEGL007241)
Morella cerifera - *Panicum hemitomon* Floating Marsh (CEGL007834)
Cordgrass Marsh
HSCM - Mississippi River Deltaic Plain Saltmeadow Cordgrass - Cowpea Intermediate Marsh
Spartina patens - *Vigna luteola* Mississippi River Deltaic Plain Tidal Marsh (CEGL007888)
Arrowhead - Spikerush - Maidencane Marsh
HASM - Arrowhead - Spikerush - Maidencane Marsh
Panicum hemitomon Marsh (CEGL004665)
Eleocharis rostellata - *Sagittaria lancifolia* Oligohaline Tidal Marsh (CEGL007886)
Sagittaria lancifolia Mississippi River Deltaic Plain Tidal Marsh (CEGL007889)

*The bold headings within the table (above the map classes) are map-class categories to organize the map classes. All USNVC names and codes (below the map classes) are association vegetation types unless otherwise noted.

**Provisional vegetation type.

List 2 (continued). List of map-class codes and names, with crosswalk to vegetation types in the U.S. National Vegetation Classification for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.*

Bulrush - Spikerush Marsh
HBSM - Bulrush - Spikerush Marsh
Bacopa monnieri - *Eleocharis* spp. Thin Floating Marsh (CEGL007081)
Schoenoplectus americanus - (*Spartina patens*) - *Typha* spp. Salt Marsh (CEGL008476)
HCBM - Gulf Coast California Bulrush Freshwater Marsh
Schoenoplectus californicus Tidal Marsh (CEGL003985)
Common Reed - Sawgrass Marsh
HRSM - Common Reed - Sawgrass Marsh
Phragmites australis ssp. *berlandieri* - (*Sagittaria platyphylla*, *Vigna luteola*) Tidal Marsh (CEGL007891)
Cladium mariscus ssp. *jamaicense* Tidal Salt Marsh (CEGL004178)
Cattail Marsh
HCFM - Southern Cattail - American Cupscale - Bull-tongue Arrowhead Louisiana Freshwater Marsh
Typha domingensis - *Sacciolepis striata* - *Sagittaria lancifolia* Marsh (CEGL007235)
HCTM - Southern Cattail Tidal Marsh
Typha domingensis Tidal Marsh (CEGL008456)
Cutgrass Slough Marsh
HCSM - Coastal Plain Giant Cutgrass Slough Marsh
Zizaniopsis miliacea Coastal Plain Slough Marsh (CEGL004139)
Floating & Submerged Aquatic Marsh
HFSM - Floating & Submerged Aquatic Marsh
Bidens laevis - *Hydrocotyle ranunculoides* Floating Marsh (CEGL007076)
Potamogeton perfoliatus - (*Stuckenia pectinata*, *Zannichellia palustris*) Tidal Marsh (CEGL007689)
Nuphar advena - *Nymphaea odorata* Aquatic Vegetation (CEGL002386)
Nelumbo lutea Aquatic Vegetation (CEGL004323)
Alternanthera philoxeroides Ruderal Aquatic Vegetation (CEGL003858)
Oxycaryum cubense - *Salvinia molesta* Exotic Floating Mat (CEGL007075)
Eichhornia crassipes Southeast Temperate Ruderal Aquatic Vegetation (CEGL007671)

*The bold headings within the table (above the map classes) are map-class categories to organize the map classes. All USNVC names and codes (below the map classes) are association vegetation types unless otherwise noted.

**Provisional vegetation type.

List 2 (continued). List of map-class codes and names, with crosswalk to vegetation types in the U.S. National Vegetation Classification for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.*

Ruderal Herbaceous Vegetation
HXAV - Eastern North American Ruderal Aquatic Vegetation
Eastern North American Ruderal Aquatic Vegetation Group (G595)
HXGR - Eastern Ruderal Grassland
Andropogon virginicus - *Ambrosia artemisiifolia* - *Conyza canadensis* Eastern Ruderal Grassland Alliance (A3321)
Cultural Vegetation
CDVA - Developed Area
Herbaceous & Woody Developed Vegetation Cultural Subclass (CSC03)
Water
NWTR - Open Water
Open Water (non-USNVC)

*The bold headings within the table (above the map classes) are map-class categories to organize the map classes. All USNVC names and codes (below the map classes) are association vegetation types unless otherwise noted.

**Provisional vegetation type.

List 3. List of map classes set into the hierarchy of the U.S. National Vegetation Classification for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

1. Forest & Woodland Class
1.B. Temperate & Boreal Forest & Woodland Subclass
1.B.1. Warm Temperate Forest & Woodland Formation
1.B.1.Na. Southeastern North American Forest & Woodland Division
M305. Southeastern North American Ruderal Forest Macrogroup
G029. Southeastern Exotic Ruderal Forest Group
A3233 *Albizia julibrissin* - *Broussonetia papyrifera* - *Triadica sebifera* Ruderal Forest Alliance
CEGL007037 *Triadica sebifera* Ruderal Forest Association
FXCT - Ruderal Chinese Tallow Forest*

*Map class also represents other USNVC types.

**Provisional vegetation type.

List 3 (continued). List of map classes set into the hierarchy of the U.S. National Vegetation Classification for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

G031. Southeastern Native Ruderal Forest Group
A3232 *Liquidambar styraciflua* - *Celtis laevigata* - *Quercus nigra* Ruderal Forest Alliance
CEGL004854 *Celtis laevigata* Coastal Plain Ruderal Forest Association
FXSB - Coastal Plain Ruderal Sugarberry Forest
CEGL004638 *Quercus nigra* Ruderal Forest Association
FXWO - Ruderal Water Oak Forest
CEPS004809 Ruderal Mixed Deciduous Forest [Park Special]
FXBD - Ruderal Bottomland Deciduous Forest*
CEPS009725 Ruderal Mixed Spoil Bank Forest [Park Special]
FXMS - Ruderal Mixed Spoil Bank Forest
1.B.3. Temperate Flooded & Swamp Forest Formation
1.B.3.Nb. Southeastern North American Flooded & Swamp Forest Division
M310. Southeastern North American Ruderal Flooded & Swamp Forest Macrogroup
G762. Southeastern Exotic Ruderal Flooded & Swamp Forest Group
A3339 *Triadica sebifera* - *Melaleuca quinquenervia* - *Schinus terebinthifolius* Ruderal Flooded & Swamp Forest Alliance
CEGL007412 *Triadica sebifera* Ruderal Wet Forest Association
FXCT - Ruderal Chinese Tallow Forest*
G553. Southeastern Native Ruderal Flooded & Swamp Forest Group
A3343 *Acer rubrum* - *Liriodendron tulipifera* Ruderal Flooded & Swamp Forest Alliance
CEGL007437 *Salix nigra* / *Morella cerifera* Ruderal Wet Forest Association
FXWL - Ruderal Black Willow / Wax-myrtle Wet Forest
CEPS006671 Disturbed Woody Wetland [Park Special]
FXWD - Disturbed Woody Wetland
M031. Southern Coastal Plain Floodplain Forest Macrogroup
G033. Bald-cypress - Tupelo Floodplain Forest Group
A3592 *Acer rubrum* - *Gleditsia aquatica* - *Fraxinus profunda* Swamp Forest Alliance
CEGL007229 *Acer rubrum* - (*Fraxinus profunda*) / *Sabal minor* Swamp Forest Association
FDBS - Delta Backslope Swamp Forest*
A3594 *Taxodium distichum* - *Nyssa aquatica* - *Nyssa biflora* Floodplain Forest Alliance
CEGL002421 *Taxodium distichum* - (*Nyssa aquatica*) / *Forestiera acuminata* - *Planera aquatica* Floodplain Forest Association
FBCF - Bald-cypress - Tupelo Flooded Forest*

*Map class also represents other USNVC types.

**Provisional vegetation type.

List 3 (continued). List of map classes set into the hierarchy of the U.S. National Vegetation Classification for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

CEGL007422 *Taxodium distichum - Nyssa aquatica - Acer rubrum* / *Itea virginica* Floodplain Forest Association
FBCF - Bald-cypress - Tupelo Flooded Forest*
A3595 *Taxodium distichum - Nyssa biflora* Tidal Swamp Forest Alliance
CEPS009724 Taxodium distichum - Salix nigra / Morella cerifera / *Thelypteris palustris* Woodland [Park Special]
WBCM - Bald-cypress Wooded Marsh*
CEGL007065 *Taxodium distichum* / *Morella cerifera* / *Thelypteris palustris* Tidal Woodland Association
WBCM - Bald-cypress Wooded Marsh*
G034. Oak - Sweetgum Floodplain Forest Group
A3634 *Quercus virginiana - Quercus pagoda - Quercus nigra* Coastal Plain Swamp Forest Alliance
CEGL004648 *Quercus virginiana - Celtis laevigata - Quercus pagoda* / *Sabal minor* Swamp Forest Association
FLOF - Natural Levee Live Oak Forest
G759. Southern Ash - Elm - Willow Floodplain Forest Group
A3709 *Ulmus americana - Ulmus crassifolia - Celtis laevigata* West Gulf Coastal Plain Floodplain Forest Alliance
CEGL004619 *Quercus texana - Celtis laevigata - Ulmus* (*americana*, *crassifolia*) - (Gleditsia triacanthos) Floodplain Forest Association
FXBD - Ruderal Bottomland Deciduous Forest*
2. Shrub & Herb Vegetation Class
2.B. Temperate & Boreal Grassland & Shrubland Subclass
2.B.2. Temperate Grassland & Shrubland Formation
2.B.2.Ne. Southeastern North American Grassland & Shrubland Division
M307. Southeastern Ruderal Grassland & Shrubland Macrogroup
G583. Southeastern Ruderal Grassland & Shrubland Group
A3321 *Andropogon virginicus - Ambrosia artemisiifolia - Conyza canadensis* Eastern Ruderal Grassland Alliance
HXGR - Eastern Ruderal Grassland
A3322 Rubus spp. - *Prunus* spp. - *Cornus drummondii* Eastern Ruderal Shrubland Alliance
CEGL004657 *Baccharis halimifolia* Ruderal Shrubland Association
SXSM - Ruderal Shrub Marsh*
CEPP007085 *Sesbania drummondii* Ruderal Shrubland**
SXSM - Ruderal Shrub Marsh*

*Map class also represents other USNVC types.

**Provisional vegetation type.

List 3 (continued). List of map classes set into the hierarchy of the U.S. National Vegetation Classification for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

2.C. Shrub & Herb Wetland Subclass
2.C.4. Temperate to Polar Freshwater Marsh, Wet Meadow & Shrubland Formation
2.C.4.Ne. Atlantic & Gulf Coastal Marsh, Wet Meadow & Shrubland Division
M066. Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh Macrogroup
G110. Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh Group
A0806 *Morella cerifera - Rosa palustris* Tidal Freshwater Shrubland Alliance
CEGL007093 *Ilex cassine - Morella cerifera* / *Woodwardia areolata - Sphagnum* sp. Flotant Shrub Swamp Association
FDBS - Delta Backslope Swamp Forest*
CEGL007241 *Morella cerifera* / *Typha domingensis - Sagittaria lancifolia* - Eleocharis spp. Tidal Marsh Association
SWMM - Wax-myrtle Shrub Marsh*
A3578 *Panicum hemitomon* Floating Marsh Alliance
CEGL007834 *Morella cerifera - Panicum hemitomon* Floating Marsh Association
SWMM - Wax-myrtle Shrub Marsh*
CEGL004665 *Panicum hemitomon* Marsh Association
HASM - Arrowhead - Spikerush - Maidencane Marsh*
A1987 *Sagittaria lancifolia* Gulf Coast Tidal Freshwater Marsh Alliance
CEGL007886 *Eleocharis rostellata - Sagittaria lancifolia* Oligohaline Tidal Marsh Association
HASM - Arrowhead - Spikerush - Maidencane Marsh*
CEGL007891 *Phragmites australis* ssp. *berlandieri* - (*Sagittaria platyphylla*, *Vigna luteola*) Tidal Marsh Association
HRSM - Common Reed - Sawgrass Marsh*
CEGL007889 *Sagittaria lancifolia* Mississippi River Deltaic Plain Tidal Marsh Association
HASM - Arrowhead - Spikerush - Maidencane Marsh*
A3580 *Schoenoplectus californicus* Gulf Coast Tidal Freshwater Marsh Alliance
CEGL003985 *Schoenoplectus californicus* Tidal Marsh Association
HCBM - Gulf Coast California Bulrush Freshwater Marsh
A3581 *Stuckenia pectinata - Zannichellia palustris - Ceratophyllum demersum* Freshwater Subtidal Marsh Alliance
CEGL007689 *Potamogeton perfoliatus* - (*Stuckenia pectinata*, *Zannichellia palustris*) Tidal Marsh Association
HFSM - Floating & Submerged Aquatic Marsh*

*Map class also represents other USNVC types.

**Provisional vegetation type.

List 3 (continued). List of map classes set into the hierarchy of the U.S. National Vegetation Classification for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

A4015 *Typha domingensis* - *Eleocharis rostellata* Gulf Coastal Plain Oligohaline Tidal Marsh Alliance
CEGL007888 *Spartina patens* - *Vigna luteola* Mississippi River Deltaic Plain Tidal Marsh Association
HSCM - Mississippi River Deltaic Plain Saltmeadow Cordgrass - Cowpea Intermediate Marsh
CEGL007235 *Typha domingensis* - *Sacciolepis striata* - *Sagittaria lancifolia* Marsh Association
HCFM - Southern Cattail - American Cupscale - Bull-tongue Arrowhead Louisiana Freshwater Marsh
CEGL008456 *Typha domingensis* Tidal Marsh Association
HCTM - Southern Cattail Tidal Marsh
A4220 Gulf Coastal Plain Floating Marsh Alliance
CEGL007081 *Bacopa monnieri* - *Eleocharis* spp. Thin Floating Marsh Association
HBSM - Bulrush - Spikerush Marsh*
CEGL007076 *Bidens laevis* - *Hydrocotyle ranunculoides* Floating Marsh Association
HFSM - Floating & Submerged Aquatic Marsh*
M067. Atlantic & Gulf Coastal Plain Wet Prairie & Marsh Macrogroup
G188. Atlantic & Gulf Coastal Plain River & Basin Freshwater Marsh Group
A3404 *Zizaniopsis miliacea* - *Zizania aquatica* - *Pontederia cordata* Southeastern Floodplain Marsh Alliance
CEGL004139 *Zizaniopsis miliacea* Coastal Plain Slough Marsh Association
HCSM - Coastal Plain Giant Cutgrass Slough Marsh
2.C.5. Salt Marsh Formation
2.C.5.Nb. North American Atlantic & Gulf Coastal Salt Marsh Division
M079. North American Atlantic & Gulf Coastal Salt Marsh Macrogroup
G120. Atlantic & Gulf Coastal Brackish Salt Marsh Group
A4013 *Spartina alterniflora* - *Spartina cynosuroides* Brackish Tidal Marsh Alliance
CEGL004178 *Cladium mariscus* ssp. jamaicense Tidal Salt Marsh Association
HRSM - Common Reed - Sawgrass Marsh*
CEGL008476 *Schoenoplectus americanus* - (*Spartina patens*) - *Typha* spp. Salt Marsh Association
HBSM - Bulrush - Spikerush Marsh*

*Map class also represents other USNVC types.

**Provisional vegetation type.

List 3 (continued). List of map classes set into the hierarchy of the U.S. National Vegetation Classification for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

5. Aquatic Vegetation Class
5.B. Freshwater Aquatic Vegetation Subclass
5.B.2. Temperate to Polar Freshwater Aquatic Vegetation Formation
5.B.2.Na. North American Freshwater Aquatic Vegetation Division
M108. Eastern North American Freshwater Aquatic Vegetation Macrogroup
G114. Eastern North American Freshwater Aquatic Vegetation Group
A4064 *Nymphaea odorata* - *Nuphar* spp. - *Brasenia schreberi* Aquatic Vegetation Alliance
CEGL004323 *Nelumbo lutea* Aquatic Vegetation Association
HFSM - Floating & Submerged Aquatic Marsh*
CEGL002386 *Nuphar advena* - *Nymphaea odorata* Aquatic Vegetation Association
HFSM - Floating & Submerged Aquatic Marsh*
M401. North American Temperate Ruderal Aquatic Vegetation Macrogroup
G595. Eastern North American Ruderal Aquatic Vegetation Group
HXAV - Eastern North American Ruderal Aquatic Vegetation
A4219 *Eichhornia crassipes* - *Alternanthera philoxeroides* Ruderal Aquatic Vegetation Alliance
CEGL003858 *Alternanthera philoxeroides* Ruderal Aquatic Vegetation Association
HFSM - Floating & Submerged Aquatic Marsh*
CEGL007671 *Eichhornia crassipes* Southeast Temperate Ruderal Aquatic Vegetation Association
HFSM - Floating & Submerged Aquatic Marsh*
CEGL007075 *Oxycaryum cubense* - *Salvinia molesta* Exotic Floating Mat Association
HFSM - Floating & Submerged Aquatic Marsh*
7. Agricultural & Developed Vegetation Cultural Class
7.C. Herbaceous & Woody Developed Vegetation Cultural Subclass
CDVA - Developed Area - Open Space
Non-USNVC
Open Water (<1% vegetation)
NWTR - Open Water

*Map class also represents other USNVC types.

**Provisional vegetation type.

Summary Report of the Map Layer

A summary report is provided in Table 6 of the spatial-data layer (vegetation map) by individual map class at the most detailed level of polygon attribution (map class). The frequency of polygons, area, average polygon size, and percent map coverages for each map class are summarized in Table 6.

Table 6. Frequencies of polygons and areas for map classes represented in the vegetation map layer for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.*

Map-class category	Map-class code - name	Poly freq	Area (ha)	Ave (ha)	Prct cover
Live Oak Forest	FLOF - Natural Levee Live Oak Forest	50	147	2.9	1.3
Ruderal Water Oak Forest	FXWO - Ruderal Water Oak Forest	22	51.5	2.3	0.5
Ruderal Bottomland Hardwood Forest	FXBD - Ruderal Bottomland Deciduous Forest	40	225.9	5.7	2.0
	FXSB - Coastal Plain Ruderal Sugarberry Forest	1	1.8	1.8	0.02
Ruderal Chinese Tallow Forest	FXCT - Ruderal Chinese Tallow Forest	104	126.7	1.2	1.1
Ruderal Swamp & Spoil Forest	FXMS - Ruderal Mixed Spoil Bank Forest	79	111.4	1.4	1.0
	FXWD - Disturbed Woody Wetland	27	34.8	1.3	0.3
	FXWL - Ruderal Black Willow / Wax-myrtle Wet Forest	100	167.8	1.7	1.5
Mixed Hardwood Swamp Forest	FDBS - Delta Backslope Swamp Forest	39	306.4	7.9	2.8
Bald-cypress Swamp Forest	FBCF - Bald-cypress - Tupelo Flooded Forest	88	888.5	10.1	8.0
Bald-cypress Marsh Woodland	WBCM - Bald-cypress Wooded Marsh	153	926.8	6.1	8.4
Ruderal Shrub Marsh	SXSM - Ruderal Shrub Marsh	41	31.6	0.8	0.3
Wax-myrtle Shrub Marsh	SWMM - Wax-myrtle Shrub Marsh	320	881.3	2.8	8.0
Cordgrass Marsh	HSCM - Mississippi River Deltaic Plain Saltmeadow Cordgrass - Cowpea Intermediate Marsh	276	463.2	1.7	4.2
Arrowhead - Spikerush - Maidencane Marsh	HASM - Arrowhead - Spikerush - Maidencane Marsh	310	4,622.4	14.9	41.8

*Tally results represent the vegetation map layer at the map-class attribution level, without physiognomic cover-density modifiers. The bold headings within the table (above the map classes) are categories to organize the map classes. All map classes except for those under the Open Water category represent vegetation types within the U.S. National Vegetation Classification. Poly, polygon; Freq, frequency; ha, hectare; Ave, average; Prct, percent; ~, approximately

Table 6 (continued). Frequencies of polygons and areas for map classes represented in the vegetation map layer for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.*

Map-class category	Map-class code - name	Poly freq	Area (ha)	Ave (ha)	Prct cover
Bulrush - Spikerush Marsh	HBSM - Bulrush - Spikerush Marsh	206	210.4	1.0	1.9
	HCBM - Gulf Coast California Bulrush Freshwater Marsh	11	5.6	0.5	0.05
Common Reed - Sawgrass Marsh	HRSM - common Reed - Sawgrass Marsh	44	30.2	0.7	0.3
Cattail Marsh	HCFM - Southern Cattail - American Cupscale - Bull-tongue Arrowhead Louisiana Freshwater Marsh	275	188.7	0.7	1.7
	HCTM - Southern Cattail Tidal Marsh	2	14.1	7.1	0.1
Cutgrass Slough Marsh	HCSM - Coastal Plain Giant Cutgrass Slough Marsh	33	29.1	0.9	0.3
Floating & Submerged Aquatic Marsh	HFSM - Floating & Submerged Aquatic Marsh	134	872.1	6.5	7.9
Eastern North American Ruderal Aquatic Vegetation	HXAV - Eastern North American Ruderal Aquatic Vegetation	10	12.4	1.2	0.1
	HXGR - Eastern Ruderal Grassland	7	7.4	1.1	0.07
Developed Area	CDVA - Developed Area	72	215.3	3.0	1.9
Open Water	NWTR	19	486.1	25.6	4.4
Totals		2,463	11,058.50	4.5	~100.0

*Tally results represent the vegetation map layer at the map-class attribution level, without physiognomic cover-density modifiers. The bold headings within the table (above the map classes) are categories to organize the map classes. All map classes except for those under the Open Water category represent vegetation types within the U.S. National Vegetation Classification. Poly, polygon; Freq, frequency; ha, hectare; Ave, average; Prct, percent; ~, approximately

Brief Analysis and Discussion

Collectively, the spatial-database layer (vegetation map) produced for the JELA vegetation mapping project consists of 2,463 polygons and covers 11,058.5 ha, with an average polygon size of 4.5 ha when physiognomic cover-density modifiers are not considered; with modifiers, the vegetation map consists of 2,867 polygons, with an average polygon size of 3.9 ha. The 24 map classes representing natural (including ruderal) vegetation in the USNVC apply to 96.3% of polygons (2,372 polygons; average size of 4.4 ha) and cover 93.7% of the Park (10,357.1 ha). Further broken down, map classes representing natural vegetation in the USNVC indicate that the Park is 27.0% forest and woodland (2,988.6 ha), 8.3% shrubland (912.9 ha), and 58.4% herbaceous cover (6,455.6 ha). Map classes representing cultural vegetation in the USNVC apply to 2.9% of polygons (72 polygons; average size

of 3.0 ha) and cover 1.9% of the Park (215.3 ha). Map classes representing nonvegetation open and flowing water (non-USNVC) apply to 0.8% of polygons (19 polygons; average size of 25.6 ha) and cover 4.4% of the Park (486.1 ha).

Forest and Woodland

Overall, map classes representing ruderal forest vegetation types account for 15.1% (373 polygons) of the mapped polygons and 6.5% (719.9 ha) of JELA, whereas map classes representing nonruderal forest and woodland vegetation types account for 13.4% (330 polygons) of the polygons but 20.5% (2,268.7 ha) of the Park. This difference indicates that nonruderal forest and woodland types are generally in larger, more homogenous and contiguous blocks, and the average area of a ruderal forest block is 1.9 ha compared to 6.9 ha for nonruderal forest and woodland map classes. These nonruderal forest and woodland coverage figures also discount the value of large blocks of contiguous forest that consist of numerous different nonruderal map classes.

The major component of the nonruderal forest and woodland map classes in JELA are the Bald-cypress - Tupelo Flooded Forest (FBCF) and the Bald-cypress Wooded Marsh (WBCM). These forests are very common in the marsh and around drier edges. Together, the FBCF and WBCM map classes cover 16.4% of the Park. In addition to covering a large area, these map classes consist of only four vegetation types, all dominated by bald cypress (*Taxodium distichum*).

The ruderal forest types of JELA are spread broadly across map classes with no clear dominant map class. However, the Ruderal Bottomland Deciduous Forest (FXBD) and Ruderal Black Willow / Wax-myrtle Wet Forest (FXWL) map classes are the most common ruderal forest map classes in the Park. Together these two map classed cover 3.5% (393.7 ha) of JELA. The FXWL map class generally represents a monoculture of young black willow (*Salix nigra*), whereas the FXBD map class represented a broad group of tree species adapted to saturated soils.

Shrublands

The Ruderal Shrub Marsh (SXSM) and the nonruderal Wax-myrtle Shrub Marsh (SWMM) are the only two shrub map classes in the Park. These two very different map class are possible throughout the marsh habitat with the ruderal SXSM only accounting for 1.7% (41 polygons) of the mapped polygons and 0.3% (31.6 ha) of the Park area, whereas SWMM accounts for 15.8% (320 polygons) of the polygons and 8.0% (881.3 ha) of the Park area.

Herbaceous Vegetation

Overall, map classes representing ruderal herbaceous vegetation types account for 0.7% (17 polygons) of the mapped polygons and 0.2% (19.8 ha) of the JELA area, whereas map classes representing nonruderal herbaceous vegetation types (all being USNVC associations) account for 52.4% (1,291 polygons) of the polygons and 58.2% (6,435.8 ha) of the Park area.

Ruderal herbaceous vegetation plays a very minor role in the Park and is constrained to powerline and pipeline rights-of-way with active management and remnant borrow pits from historic levee construction.

More than one-half of the Park consists of nonruderal herbaceous vegetation, with more than 70% of that represented by the Arrowhead - Spikerush - Maidencane Marsh (HASM) map class. This massive map class covers 41.8% (4,622.4 ha) of the Park with several very large polygons that presents many signatures on the aerial imagery across the Park. A distant second is the Floating & Submerged Aquatic Marsh (HFSM) map class which covers 7.9% (872.1 ha) of the Park. This highly dynamic map class consists of seven vegetation types (each a USNVC association) that were determined to change rapidly across the season, and even across the day, because of winds and tides that pushed floating vegetation mats around.

Cultural Vegetation

An aspect of JELA that cannot be ignored is the cultural landscape. Massive actively maintained levees form much of the northern border of the Park with a myriad of hunting camps discovered in portions of the Park. The cultural landscape covers 1.9% of the Park (215.3 ha) spread among 72 polygons. As a note, all hunting camps detected during mapping were added to the map irrespective of size or apparent upkeep in order to provide the Park with a better inventory of these locations.

Open Water

Open water in JELA is common covering 4.4% (486.1 ha) of the Park. Much of this area is dedicated to the shore lines of Lake Salvador and Lake Cataouatche that form the Park's western border.

Map Layer Presentation

A presentation example of the map layer produced for the JELA vegetation mapping project is shown in Figure 15. The finest (most detail) level of the map (polygons consisting of map classes and the physiognomic cover-density modifier) is too detailed to present at a Park-wide scale; therefore, generalized map classes that were aggregated to provide a meaningful and displayable map are shown in Figure 15. These categories are the same as the bolded categories provided in List 2 and Table 6.

Detailed map polygons and their classification to the USNVC are provided in the project geodatabase and can be accessed using GIS software.

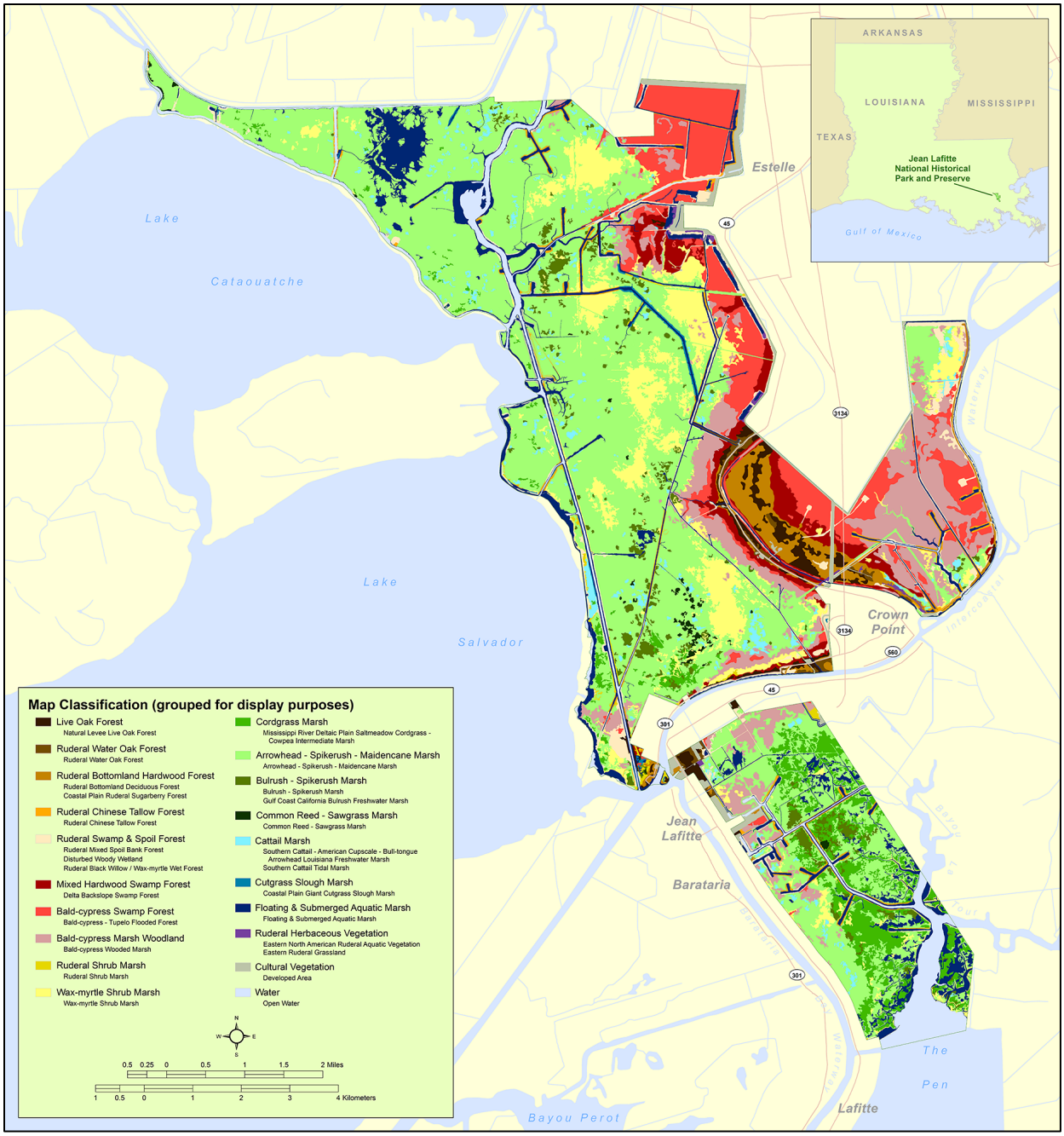


Figure 15. Vegetation map display from the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

Accuracy Assessment

The objective of an accuracy assessment (AA) is to measure the probability that a particular location has been assigned the correct vegetation class in the vegetation map layer. The process of an AA is based on field observations, and the process of mapping is based on aerial image interpretation; each process has different perspectives of scale and observation. An AA estimates thematic accuracy by map class in the map layer, giving users the information needed to determine suitability of the map layer for a particular application. At the same time, map layer producers are able to learn more about the nature of accuracy, including error, in the map layer. Thus, the two attributes of an AA are "users' accuracy," which is the probability that the map actually represents what was classified on the ground, and "producers' accuracy," which is the probability that an AA site has been mapped correctly. An error in mapping from the users' perspective is one of commission where a map class was mapped as a vegetation type that did not exist at the assessment site. An error in mapping from the producers' perspective is one of omission where a map class was not mapped as the vegetation type that existed at the assessment site. Both users' and producers' accuracies can be obtained from the same set of data by using different analyses. Errors exist when map classes are not the same as the classes observed in the field. A major assumption of an AA is that the application of the classification system is identical between mapping and field assessment. When the application of classification is not applied consistently with the field assessment, a "false error" could result. A "false error" requires additional review of field data and classification decision.

This report section describes the AA methods that were applied to the vegetation map for the Jean Lafitte National Historical Park and Preserve (JELA, also referred to as the "Park") vegetation mapping project, and concludes by discussing the users' and producers' accuracy results, giving additional detail to map classes with lower accuracy.

Methods

An AA sampling design was developed for the JELA vegetation mapping project. Field data were collected at AA sites that were randomly selected by the sampling design. The field data were then used to analyze the classification accuracy of the vegetation map layer.

Sampling Design

A stratified random sampling approach was used to select AA sites for the JELA vegetation mapping project. Site locations were selected within the Barataria Preserve and the Fleming Plantation area. Map classes representing natural (including ruderal) vegetation types in either the U.S. National Vegetation Classification (USNVC) or NatureServe's internal database (for provisional and park-special types) were included as the individual themes to randomly selected sites.

The number of samples needed for each map class (theme) was determined by using National Park Service (NPS) Vegetation Mapping Inventory (VMI) Program recommendations (Lea and Curtis 2010) as suggested in the following scenarios.

- Scenario A—The class is abundant, covering more than 50 hectares (ha) in total area. The map class receives the maximum sample size of 30.

- Scenario B—The class is relatively abundant, covering at least 8.33 ha but no more than 50 ha in total area. The map class receives a sample size of six-tenths of the observations per hectare of the map class (equal to one observation for every 1.67 ha of map-class area). (This ratio allocates observations at a density rate equal to 30 observations per 50 ha).
- Scenario C—The class is relatively rare, covering less than 8.33 ha in total area. The map class receives five observations; the recommended minimum sample size.

For Scenario C, a class could receive less than five observations if the area was on private land or if the total area was extremely low.

Random selection of AA site locations was buffered from the polygon boundaries in the vegetation map layer to ensure that field classification of the observed area (a circular area approximately the size of the minimum mapping unit [MMU]) for each AA site would not overlap with vegetation types represented in adjacent polygons.

The required buffer distance was calculated with the following formula:

$$\text{Buffer Distance} = \sqrt{R^2 + F^2 + M^2}$$

where R is the radius distance of the observation area,

F is the expected (e.g., 90th percentile) global positioning system (GPS) error distance, and

M is the standard requirement (maximum positional error distance in the map) for positional accuracy.

The MMUs that were used to map JELA were 0.5 and 0.25 ha, depending on the map class; map-class MMUs are described in the "Vegetation Mapping" section of this report. Depending on the MMU size, values for R, F, and M and the polygon buffer distance vary; these values are given in Table 7. The value of R is 40 meters for 0.5 ha and 28 meters for 0.25 ha. The values of F and M are generalized to 15 and 12 meters, respectively. Therefore, a buffer distance of either 44 meters for a 0.5 ha MMU map class or 34 meters for a 0.25 ha MMU map class was applied to the interior side of polygon boundaries.

Table 7. Values for calculating buffer distance from map polygon boundaries for the random selection of accuracy assessment sites.

MMU (ha)	R (m)	F (m)	M (m)	Buffer (m)
0.5	40	15	12	44
0.25	28	15	12	34

MMU, minimum mapping unit; ha, hectare; R, radius; m, meter; F, global positioning system error; M, map positional accuracy

For some map-class themes that were characteristically shaped as narrow and linear in the mapping, the buffer distance needed to be reduced because the target number of AA sites could not otherwise be attained. The buffer distance was reduced on a case by case basis and was reduced incrementally until the target number of sites could be selected for a particular theme; this process promoted the maximum distance in buffer while still attaining the targeted number of sites. Multiple AA sites in a polygon were allowed provided that the site extents did not overlap in area, with a maximum of three sites allowed in any single mapped polygon.

Once the number of AA sites was determined and buffers were applied, random sites with associated geographic coordinates were generated for each map class using the Geospatial Modelling Environment suite of tools (Spatial Ecology LLC). The site coordinates were projected in the Universal Transverse Mercator, Zone 15 North, by using the North American Datum of 1983. The site coordinates then were provided to the field crews to upload into GPS receivers. Staff from the Upper Midwest Environmental Sciences Center (UMESC) provided the field crews with two sets of 1:16,000-scale hard-copy maps that display the locations of the AA sites; one map set displayed AA sites on digital raster graphics (DRG, from the U.S. Geological Survey [USGS] National Map) and the other map set displayed AA sites on true-color (TC) aerial imagery (from Esri). The AA site locations shown on the hard-copy maps were color coded, based on the MMU of the map class that was assigned to the polygon, to instruct the field crews on the area to classify for the AA site. When map polygons were shaped as narrow and linear, the hard-copy maps for the field crews included polygon lines to denote the interpreted boundaries between two map classes. Likewise, track files for use with handheld GPS units were provided to the field crews to show these same boundary lines. An example of an AA field-crew map displaying AA site and map information over a USGS DRG backdrop is shown in Figure 16.

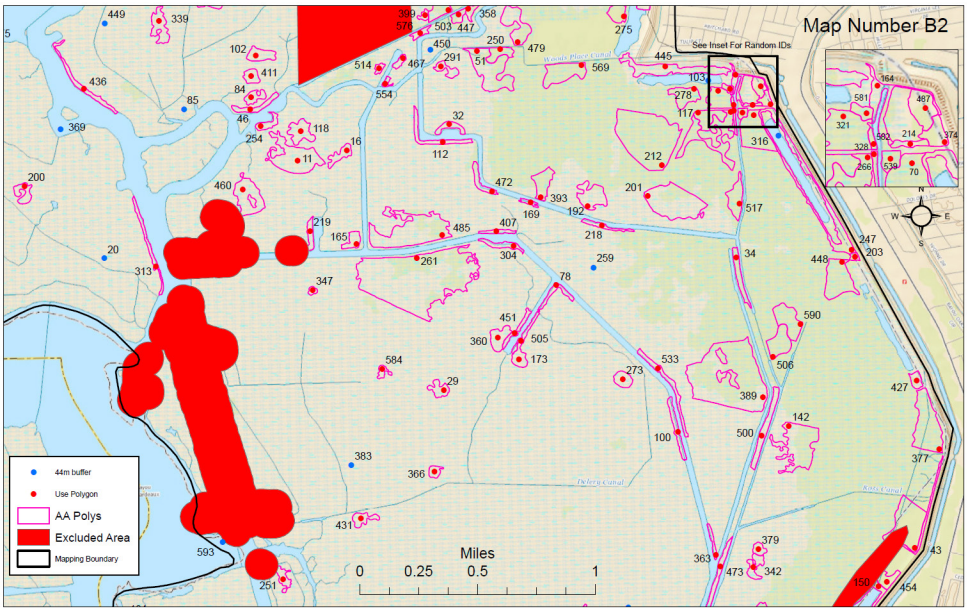


Figure 16. An example of an accuracy assessment map to direct field crews to sites, with site and map information shown over a U.S. Geological Survey digital raster graphic backdrop.

Field Data Collection

Without knowing the map classifications of AA site locations, field observation data were collected by AA field teams (field crews) that consisted of different individuals; each field crew consisted of a lead botanist and a field assistant who were trained in AA procedures by ecologists from NatureServe and UMESC. Each field crew navigated to the preselected AA sites using GPS and hard-copy maps.

Field crews assessed an area approximately the size of the MMU defined for each AA site. The size of the MMU defined for each AA site either is a circle with a 40-meter radius for a MMU of 0.5 ha; a circle with a 28-meter radius for a MMU of 0.25 ha; or if the mapped polygon boundaries could not support a circular MMU, an area specified by polygon boundaries that was provided on the hard-copy maps and GPS track files. At each AA site, field crews determined the assessment area size (0.5 or 0.25 ha) by looking at the colored dot for each AA site location shown on the hard-copy field maps. A blue-dot AA site indicated 40-meter analysis radius (0.5-ha analysis area), a red-dot AA site indicated 28-meter analysis radius (0.25-ha analysis area), and any blue or red dot with corresponding polygon boundary lines indicated the analysis area and boundary location. In these very narrow polygons (as indicated on the DRG and aerial imagery maps with boundary lines), the field crews considered the AA site coordinate location in relation to polygon boundaries and gave more attention to vegetation along the axis of the polygon.

Within the targeted assessment area, the field crew recorded data on a field form. The data included the GPS coordinate location, dominant and indicator species, environmental data, and pertinent comments. For an example of a field form, see “Appendix F: Accuracy Assessment Form.” A field key to vegetation types of JELA (draft version from 2016) guided field crews to the vegetation type that best classifies the AA site (Figure 17). When the vegetation type was uncertain (e.g., a type that expressed a variation not supported by the vegetation field key or an ecotone between two vegetation types), the crew still made a single “best call” but took extra notes on the circumstance. In numerous instances, an “alternate field call” was recorded and, therefore, provided a second vegetation type to classify a specific site. When two vegetation types were recognized, the crew was instructed to note the vegetation type that contained the most area within the radius of a MMU. For additional field collection details and procedures, see “Appendix G: Accuracy Assessment Field Manual.”



Figure 17. Field classification of an accuracy assessment site for the Jean Lafitte National Historical Park and Preserve Vegetation mapping project.

Data Analyses

Field data for 594 AA sites were collected and then entered into the PLOTS version 4.0 (National Park Service 2015) database for the project, with subsequent review of data entry. Data were collected at two sites twice, but the earlier data sheet was used in the analysis. Locations of these 594 AA sites are shown in Figure 18. Of the 594 AA collection sites, 7 sites were excluded from the analysis because of unresolvable issues with the field data. Thus, 587 AA sites were used in the analysis of vegetation map layer accuracy. The analysis included the following steps:

- initial comparative analysis of the field-site and map-polygon data,
- review of all disagreements and correction of false errors as necessary,
- analysis of individual map classes,
- final output of results into a contingency (matrix) table, and
- final output of the analyses and results into a spatial database for use in a GIS.

Initial Comparative Analysis

The AA field-site data and map-polygon data were spatially joined using ArcGIS (Version 10.4, Esri). Each AA field-site classification call (to a vegetation type) was compared to the corresponding map-polygon classification call (to a map class representing one or more vegetation types). Results from this initial comparison were tabulated either as a “match” (agreement) or a “mismatch” (disagreement). Matches were determined when either the primary or the secondary field-site calls were in agreement with the map-polygon call. Mismatches were determined when the criteria for a match was not met. The initial comparison revealed that 76.66% of the AA sites matched the corresponding mapped polygons.

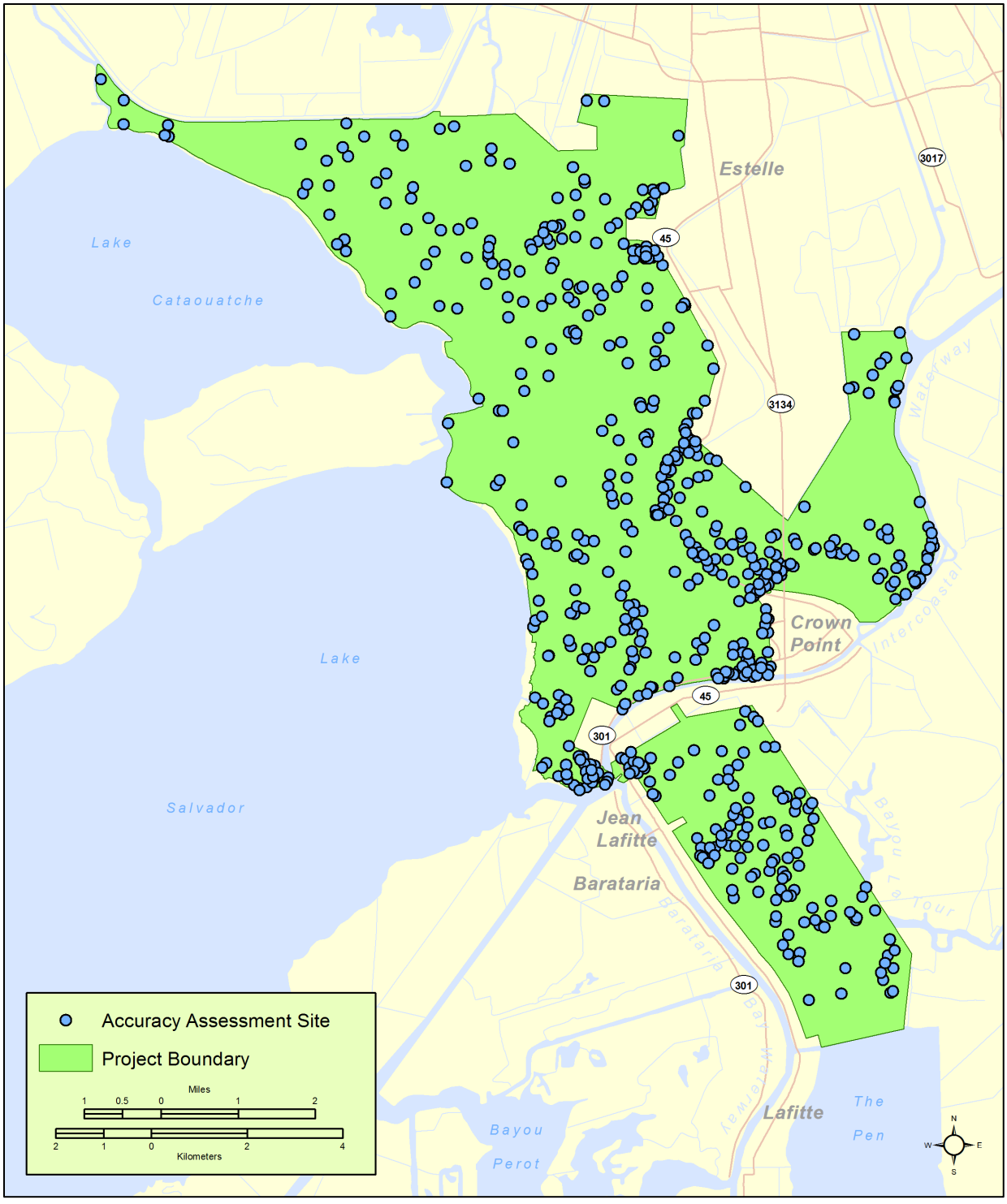


Figure 18. Locations of accuracy assessment sites to assess the accuracy of the vegetation map layer for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

Review of Disagreements

Each set of mismatched classification calls were reviewed to ascertain as being a "false error" or a "true error." A false error is defined as a mismatch that was caused by one of the following: (1) spatial accuracy error in the field-site coordinates or map layer, (2) a missing or misapplied field-site classification call, (3) a field-site assessment of an area smaller than a MMU for the map class being assessed (an inclusion), or (4) a significant change in vegetation with time. In contrast, a true error is defined as a mismatch that was caused by the mapping, determined after exploring causes for a false error. This review process involved using ArcGIS to locate and view the AA field-site locations and their corresponding polygons on a computer screen by using digital aerial imagery and the software program called "Stereo Analyst for ArcGIS" (ERDAS, Inc.). The field data sheets also were reviewed to gain a fuller sense of the context of the ground data. A classification determined to be a false error was reclassified as a match pending a secondary review during a series of AA reconciliation meetings.

Spatial Accuracy

A spatial error might exist when (1) the GPS device acquired inaccurate field coordinates or (2) a geospatial error existed within the vegetation map layer (called a "map-layer shift"). These spatial errors could displace the newly acquired field coordinate to an adjacent polygon on the map layer. Spatial errors in GPS coordinates were minimized during the random site selection process by selecting AA site coordinates more than 34 meters (for 0.25-ha MMU map classes) or 44 meters (for 0.5-ha MMU map classes) from map polygon edges; however, field-acquired GPS coordinates collected with a poor GPS accuracy could position the coordinates into an adjacent map polygon. Furthermore, during AA site selection, the buffer distance from polygon edges was reduced when the target number of AA sites for a map class could not otherwise be attained and, therefore, increased the likelihood that the field-acquired GPS position was not in the correct map polygon, even with acceptable GPS accuracy.

Questionable Field-Site Classification Call

A field-site classification call might be questioned during the analysis. A likely reason for questioning a field-site call was if the perspective from the ground was limited by impenetrable vegetation or if wet soils prevented the field crew from accessing the entire AA site; i.e., the area of a MMU for the map class being assessed. Another reason for questioning a field-site call was if the AA site was diverse and other vegetation types were omitted or not recognized by the field crew. Questionable field-site calls were reviewed by checking the aerial imagery at the AA site and by inspecting the field data sheets for misapplications. Questionable field-site calls required further joint analysis by UMESC and NatureServe staff during the AA reconciliation meeting.

Inclusion

The actual area assessed in the field might have been below an area of a MMU for the map class being assessed; therefore, the assessed area was termed an inclusion. The AA site in question may have contained vegetation that was merely an inclusion (smaller than a MMU for the map class being assessed) to the entire AA site area. Certain vegetation features are quite distinct from each other when the aerial imagery was viewed three-dimensionally (e.g., open woodland or dense forest), which makes for easy determination of site inclusion. An inclusion might also exist when the field

assessment was indeed of a proper area (of a MMU for the map class being assessed), but the field-assessed area overlapped into an adjacent map polygon. Determining if the assessed area actually falls within the intended polygon can sometimes be difficult, particularly in the case of smaller map polygons. Along with the questionable field-site classification calls, inclusion errors required further joint analysis by UMESC and NatureServe staff during the AA reconciliation meeting.

Vegetation Change With Time

The vegetation map layer represents the ground conditions as presented in the aerial imagery that was acquired for the JELA vegetation mapping project. Sometimes the vegetation landscape changed between the date of imagery and the date of AA field assessment, which was 2 years. Landscape changes included mechanical removal of woody vegetation and degradation of vegetation canopy because of subsidence. Intraseasonal change, such as the movement of floating aquatic vegetation, also was considered and addressed during the analysis. When intraseasonal change happened, the assessed area was termed as a change in vegetation with time. Determinations of vegetation change were easily made by a comparison between the aerial imagery and AA field-site pictures. Determinations were confirmed during the AA reconciliation meeting.

Individual Map-Class Analysis

A contingency table was generated to compare the results of the initial analysis of the AA data with the vegetation map layer. This contingency table provided important information including users' and producers' accuracies of individual map classes and agreements and disagreements of map classes. Individual map-class accuracies that fell below the NPS VMI Program standard were reviewed to determine which map classes were in confusion with each other. If repeated confusion was evident, a decision was made either to merge the map classes to gain higher accuracy or to leave the map classes separate and accept lower accuracy. When a lower accuracy was accepted, the benefits of having that particular class mapped separately outweighed the benefits of a merge with other classes to produce a higher accuracy. These decisions were made with staff input from UMESC, JELA, and the Gulf Coast Network Natural Resource Inventory and Monitoring (I&M) Program.

To avoid underestimating the role that the NPS, NatureServe, and UMESC staff had in the reconciliation of AA results and the impact that these results had on the final map classification for JELA, further understanding of the processes and steps that ultimately produced the final AA results and map classification is needed. The following is an outline of the discussions among JELA, NatureServe, and UMESC staff regarding AA issues, AA results, and eventual merging of map classes.

Review and Reconciliation of Site Specific AA Data

NatureServe and UMESC staff met to review and reconcile site specific AA field data. This meeting took place at UMESC on January 31 and February 1, 2017. Site-specific AA field-site data were reviewed for potential changes to classification assignments and for inclusions or vegetation change with time. Adjustments to the vegetation classification also were addressed. Of the 594 analyzed AA sites, 134 were included in the review and reconciliation of AA field data.

Postreconciliation AA Contingency Table

The AA contingency table was updated to reflect adjustments from the review and reconciliation meeting. Individual map classes that fell below the 80% accuracy standard of the NPS VMI Program were studied for where confusion was present in the mapping. Detailed proposals were drafted, and the proposals listed the potential merges of map classes that had consistent confusion in mapping. These proposals were sent to NPS staff from JELA and the Gulf Coast Network I&M Program for their input and decision. Each proposed resolution explained the pros and cons regarding the effect the resolution had on the vegetation map layer. This information helped JELA staff to realize the cost-benefit ratio of accepting a map class with lower than standard accuracy to retain map detail or of accepting a merging of map classes to gain higher accuracy yet lose some map detail. These proposals and the associated NPS decisions are outlined in "Appendix H: Accuracy Assessment Reconciliation."

Final AA Contingency Table

The results from the complete analyses, including the reconciliations of AA site data and the consolidation of map classes, were updated into the contingency table. The frequency of agreement and the placement of disagreements are listed in the contingency table. The percentages of users' and producers' accuracies were recalculated for each map class.

AA Spatial Database

For use in a GIS, a feature-class layer was produced of the AA site locations, as well as supporting tables; the layer and tables were incorporated into the geodatabase for the JELA vegetation mapping project. The field data for AA also are included in the PLOTS version 4.0 (National Park Service 2015) database for the project.

Results and Discussion

Of the 587 sites used in the analysis, the initial comparison determined that 76.66% of the AA sites matched the corresponding polygons that represented natural (including ruderal) vegetation types. Through the review process of correcting false errors and combining map classes because of low accuracies, the overall accuracy was increased to 83.47 %. A kappa adjustment for chance agreements resulted in an overall accuracy of 82.54%.

The contingency matrix for the AA results is provided in "Appendix I: Accuracy Assessment Contingency Table." The matrix table lists the accuracy of each map class (along with 90% confidence intervals); with the users' accuracy reflecting errors of inclusion (commission errors) and the producers' accuracy reflecting errors of exclusion (omission errors). The width of each confidence interval was affected by the sample size used to derive the point estimate.

The overall AA met the accuracy requirement of 80% established by the NPS VMI Program. The most important factors that remain affecting accuracy are (1) difficulties distinguishing ruderal upland forest from nonruderal upland forest; (2) consistent overestimation of Chinese tallowtree cover on man-made levees; (3) consistent overestimation of black willow cover; and (4) consistent, but minor, confusion among the Park's most common (by area) herbaceous marsh map classes.

With the analysis complete, some individual map class accuracies did not meet the 80% requirement (taking into account 90% confidence intervals). The following are map classes for which the mapping project did not meet the required rates of accuracy in terms of either the actual percentage or the confidence intervals.

Users' Accuracy (Errors of Commission)

For each map class that has a users' accuracy (errors of commission) below NPS VMI Program standards, the individual errors of commission are reviewed and reported. This section reports on individual map classes with users' accuracy below program standards and the associated map classes with which the errors of commission occur. A low users' accuracy indicates that a map class was mapped too aggressively, which refers to an overapplication of the map class within the Park. At the individual AA site level, the low users' accuracy indicates that the AA site was mapped as the map class being tested, but AA determined that the vegetation at the AA site is represented by a different map class (e.g., the mappers called the polygon the FXWL map class, but the AA recognized a vegetation type at the AA site that is represented by the FXWD map class).

For simplification, the following explanations of map classes with low-users' accuracy provide vegetation classification of AA sites using map classes that represent the classified vegetation types. Some map classes represent multiple vegetation types. For the purpose of these explanations, the level of detail by vegetation type is not necessarily needed.

Ruderal Black Willow / Wax-myrtle Wet Forest (FXWL) Map Class

The users' accuracy for the Ruderal Black Willow / Wax-myrtle Wet Forest (FXWL) map class was 55%, with a 90% confidence interval of 38–72%. Of the 29 AA sites tested for FXWL, 13 sites contained vegetation types other than FXWL. The following are the attributed errors.

- Three Ruderal Bottomland Deciduous Forest (FXBD) sites, three Ruderal Chinese Tallow Forest (FXCT) sites, three Ruderal Mixed Spoil Bank Forest (FXMS) sites, two Disturbed Woody Wetland (FXWD) sites, one Bald-cypress - Tupelo Flooded Forest (FBCF) site, and one Bald-cypress Wooded Marsh (WBCM) site were mapped as FXWL because of a combination of overestimation of black willow cover and the potential of signature confusion between the signature of black willow and other wet, ruderal tree species.

Disturbed Woody Wetland (FXWD) Map Class

The users' accuracy for the Disturbed Woody Wetland (FXWD) map class was 56%, with a 90% confidence interval of 34–78%. Of the 18 AA sites tested for FXWD, 8 sites contained vegetation types other than FXWD. The following is a list of attributed errors.

- Three FXBD sites were mapped as FXWD because of an underestimation of the hydrologic influence at the sites.
- One FXCT site was mapped as FXWD because of an underestimation of Chinese tallow cover.
- One FXWL site was mapped as FXWD because of an underestimation of black willow cover.

- One Delta Backslope Swamp Forest (FDBS) site was mapped as FXWD because of an overestimation of disturbance at the site.
- One Wax-myrtle Shrub Marsh (SWMM) site was mapped as FXWD because of a misinterpretation of canopy height.
- One Floating & Submerged Aquatic Marsh (HFSM) site was mapped as FXWD because of an overestimation of canopy cover along a linear canal.

Producers' Accuracy (Errors of Omission)

For map classes that have a producers' accuracy (errors of omission) below programmatic standards, each map class and the individual errors of omission are reviewed. A low producers' accuracy indicates that a map class was mapped too conservatively, which refers to an underapplication of the map class within the Park. This section reports on the individual map classes with low producers' accuracy and the associated map classes with which the errors of omission occur. At the individual AA site level, therefore, the AA determined that the vegetation at the AA site was the map class being reviewed, but that the mappers called the polygon in which the AA site is located within as a different map class (e.g. the AA recognized a vegetation type at the AA site that is represented by FXWD, but the mappers called the polygon FXBD).

For the same reasons given for the explanations of map classes with low users' accuracy, the following explanations of map classes with low-producers' accuracy provide vegetation classification of AA sites by using the map classes that represent the classified vegetation types.

Disturbed Woody Wetland (FXWD) Map Class

The producers' accuracy for the Disturbed Woody Wetland (FXWD) map class was 53%, with a 90% confidence interval of 31–74%. Of the 19 AA sites classified in the field as FXWD, 9 sites fell within polygons that were mapped as other vegetation types. The following is a list of attributed errors.

- Three sites assessed in polygons mapped as FXBD were determined to be FXWD. Mappers overestimated the hydrologic influence at these disturbed forest sites.
- Two sites assessed in polygons mapped as FXWL were determined to be FXWD. Mappers overestimated black willow cover at these sites.
- One site assessed in a polygon mapped as Ruderal Water Oak (FXWO) was determined to be FXWD. Mappers overestimated water oak cover and underestimated hydrologic influence at this site.
- One site assessed in a polygon mapped as FXCT was determined to be FXWD. Mappers overestimated Chinese tallowtree cover at this site.
- One site assessed in a polygon mapped as FXMS was determined to be FXWD. Mappers misinterpreted the history of the levee and determined that the levee was man-made rather than natural.
- One site assessed in a polygon mapped as FDBS was determined to be FXWD. Mappers underestimated the degree of disturbance in this swamp forest.

Literature Cited

Avery, T. E. 1978. Forester's guide to aerial photo interpretation. Agriculture Handbook 308. U.S. Forest Service, Washington, D.C., USA. (Revised and enlarged version of Occasional Paper 156, Southern Forest Experiment Station, New Orleans, January 1957.)

Battaglia, L. L., J. S. Denslow, J. R. Inczauskis, and S. G. Baer. 2009. Effects of native vegetation on invasion success of Chinese tallow in a floating marsh ecosystem. Journal of Ecology (97), 239–246.

Battaglia, L. L., J. S. Denslow, and T. G., Hargis. 2007. Does woody species establishment alter herbaceous community composition of freshwater floating marshes? Journal of Coastal Research, 23(6), 1580–1587.

Brady, N. C. and R. R. Weil. 2002. The Nature and Properties of Soils, 13th Edition. Prentice Hall, New Jersey, USA.

Daubenmire, R. F. 1968. Plant communities: a textbook of plant synecology. Harper & Row. New York, USA. 300 pp.

Faber-Langendoen D., T. Keeler-Wolf, D. Meidinger, D. Tart, B. Hoagland, C. Josse, G. Navarro, S. Ponomarenko, J. Saucier, A. Weakley, and P. Comer. 2014. EcoVeg: a new approach to vegetation description and classification. Ecological Monographs 84:533–561.

Federal Geographic Data Committee. 1998a. Content standard for digital geospatial metadata, FGDC-STD-001-1998. Available at http://www.fgdc.gov/standards/projects/FGDC-standards-projects/metadata/base-metadata/v2_0698.pdf (accessed 27 March 2015).

Federal Geographic Data Committee. 1998b. Spatial data transfer standard, FGDC-STD-002 (modified version ANSI NCITS 20:1998). Available from http://www.fgdc.gov/standards/standards_publications/index_html (accessed 27 March 2015).

Federal Geographic Data Committee. 2008. National vegetation classification standard, Version 2, FGDC-STD-005-2008 (Version 2). Available at http://www.fgdc.gov/standards/projects/FGDC-standards-projects/vegetation/NVCS_V2_FINAL_2008-02.pdf (accessed 27 March 2015).

Fosberg, F.R. 1961. A classification of vegetation for general purposes. Tropical Ecology 2:1–28.

Hershey, R. R., and W. A. Befort. 1995. Aerial photo guide to New England forest cover types. General Technical Report NE-195. U.S. Forest Service, Radnor, Pennsylvania, USA.

Ip, A. W. L., M. M. R. Mostafa, E. Liberty, and J. Hutton, 2007. An End-to-End Airborne Digital Mapping Solution, for Rapid Directly Georeferenced Orthophoto Production. RSPSoc 2007, Newcastle upon Tyne, UK, Sept 11–14, 2007.

Jennings, M. D., D. Faber-Langendoen, R. K. Peet, O. L. Loucks, D. C. Glenn-Lewin, A. Damman, M. G. Barbour, R. Pfister, D. H. Grossman, D. Roberts, D. Tart, M. Walker, S. S. Talbot, J. Walker, G. S. Hartshorn, G. Waggoner, M. D. Abrams, A. Hill, and M. Rejmanek. 2006. Description, documentation, and evaluation of associations and alliances within the U.S. National Vegetation Classification, Version 4.5. Ecological Society of America, Vegetation Classification Panel. Washington, D.C., USA.

Kartesz, J. T. 1999. A synonymized checklist and atlas with biological attributes for the vascular flora of the United States, Canada, and Greenland. First edition. In: J. T. Kartesz and C. A. Meacham. Synthesis of the North American Flora, Version 1.0. North Carolina Botanical Garden, Chapel Hill, North Carolina, USA.

Lea, C. and A. C. Curtis. 2010. Thematic accuracy assessment procedures: National Park Service Vegetation Inventory, version 2.0. Natural Resource Report NPS/2010/NRR—2010/204. National Park Service, Fort Collins, Colorado, USA.

McCune, B. and M. J. Mefford. 2006. PC-ORD, Multivariate analysis and ecological data, Version 5.32. MjM Software Design, Gleneden Beach, Oregon, USA.

Mueller-Dombois, D. and H. Ellenberg. 1974. Aims and Methods of Vegetation Ecology. John Wiley & Sons. New York, USA. 547 pp.

National Park Service. 2011. PLOTS v.3.2 (AC07). Version Date: 03/2011. Created for the National Park Service by Colorado Natural Heritage Program, Colorado State University, Fort Collins, Colorado, USA.

National Park Service. 2015. PLOTS version 4.0 "PLOTSv4.0". Colorado Natural Heritage Program. Available at http://science.nature.nps.gov/im/inventory/veg/plots.cfm. (accessed 7 March 2016).

NatureServe. 2004. Field methods for vegetation mapping. Prepared for the U.S. Geological Survey and National Park Service. Washington, D.C., USA.

NatureServe. 2017. International Ecological Classification Standard: Terrestrial Ecological Classifications. U.S. National Vegetation Classification. Associations and Alliances of Jean Lafitte National Historical Park and Preserve. NatureServe Central Databases. Arlington, Virginia, USA. Data current as of 8 March 2017.

Nolfo-Clements, L. E. 2006. Vegetative survey of wetland habitats at Jean Lafitte National Historical Park and Preserve in southeastern Louisiana. Southeastern Naturalist 5(3):499–514.

The Nature Conservancy and Environmental Systems Research Institute. 1994a. NBS/NPS vegetation mapping program: Standardized national vegetation classification system. Prepared for the National Biological Survey and National Park Service. Washington, D.C., USA.

The Nature Conservancy and Environmental Systems Research Institute. 1994b. NBS/NPS vegetation mapping program: Field methods for vegetation mapping. Prepared for the National Biological Survey and National Park Service. Washington, D.C., USA.

The Nature Conservancy, Environmental Systems Research Institute, and National Center of Geographic Information and Analysis. 1994. NBS/NPS vegetation mapping program: accuracy assessment procedures. Prepared for the U.S. Department of the Interior, National Biological Survey and National Park Service. Washington, D.C., USA.

U.S. Department of Agriculture, Natural Resource Conservation Service. 2016. The PLANTS Database. National Plant Data Team, Greensboro, North Carolina, USA. Available at http://plants.usda.gov (accessed 9 March 2017).

U.S. Geological Survey. 1999. Map accuracy standards. U.S. Geological Survey. Fact sheet 171–99. Available at http://pubs.er.usgs.gov/publication/fs17199 (accessed 27 March 2015).

USNVC [United States National Vegetation Classification] Database. 2017. United States National Vegetation Classification Database Ver 2.0. Federal Geographic Data Committee, Vegetation Subcommittee, Washington D.C., USA. [usnvc.org] (accessed 8 March 2017).

Visser, J. M., C. E. Sasser, R. H. Chabreck, and R. G. Linscombe. 1998. Marsh vegetation types of the Mississippi River Deltaic Plain. Estuaries 21(48):818–828.

Visser, J. M., C. E. Sasser, R. H. Chabreck, and R. G. Linscombe. 2000. Marsh vegetation types of the Chenier Plain, Louisiana, USA. Estuaries 23(3):318–327.

Appendix A: Plot Sampling Form

LOCATION:__ Jean Lafitte (JELA) ___ DATE (y/m/d): 2015/_____/_____ POINT CODE:_____

VEGETATION MAPPING OBSERVATION PLOT FIELD FORM

I. IDENTIFIERS AND LOCATION DATA

Observers (First and last names):_____

Observation plot size: _____m^2 Observation plot shape: rectangular____ circular____ linear____

1. Time (EDT)_____AM / PM 2. GPS unit (*circle*): **Garmin MAP76** or other_____

3. Lat _____ Long _____ (decimal degrees - report maximum number of significant digits)

5. Datum: NAD83 (note all data must be recorded in NAD 83 Lat/Long) 6. Target GPS file name (as recorded in GPS): _____

7. Estimated accuracy (EPE) _____ m 8. # of satellites fixed _____ 9. # points averaged _____

10. Receiver status (*circle*): 2D / 3D / 2D WAAS / 3D WAAS / NO SIGNAL (*estimated location marked on map*)

II. ENVIRONMENTAL DESCRIPTION

1. Unvegetated Surface Substrate
(*estimate percentage of applicable covers;* ***should total 100%***):
____ bedrock
____ loose boulders and stones
____ leaf litter / organic matter
____ decaying wood
____ water
____ mineral soil / sand
____ other (*specify*)

2. Slope _____
A – 0-3% (0-2^0) (level or nearly level)
B – 3-9% (2-5^0) (gentle)

3. Aspect _____
F (flat)
V (variable)
N 338-22^0 NE 23-67^0
E 68-112^0 SE 113-157^0
S 158-202^0 SW 203-247^0
W 248-292^0 NW 293-337^0

4. Flotant (floating marsh)? YES / NO

4. Environmental Comments (*Note environmental characteristics that affect vegetation –e.g., hydrology, exposure, etc., as well as natural or unnatural disturbances*)

III. SKETCH OF OBSERVATION AREA (aerial view or transect view or both): indicate north arrow, where GPS positions were collected, locations and bearings of photopoints, plot orientation, roads, trails, as well as distinctive features of the vegetation, or landscape, etc. Use the symbols in the key below for GPS points and photos.

⊗	GPS position
○→	Photo # and direction

***Note: If camera tracks numbers reliably, enter number of photo in box to the left. If not, just take a picture of the first page of the plot sheet, then take your plot photo to ensure that we can track which photo goes with which plot.

IV. COMMENTS

_____
_____
_____
_____

Observation Plot Form 1

LOCATION:__ Jean Lafitte (JELA) ___ DATE (y/m/d): 2015/_____/_____ POINT CODE:_____

V. VEGETATION DESCRIPTION

Leaf phenology (of dominant stratum)	**Leaf Type (of dominant stratum)**	**Physiognomic class**
Trees (canopy only) and Shrubs	___Broad-leaved	___Forest (canopy + subcanopy)
___Evergreen (> ~75%)	___Needle-leaved	___Woodland (canopy + subcanopy)
___Cold-deciduous (> ~75%)	___Mixed broad-leaved/needle-leaved	___Shrubland
___Mixed evergreen - cold-deciduous (~ 25-75%)	___Graminoid	___Herbaceous
Herbs: ____Annual ___Perennial	___Forb	___Nonvascular

VI. VEGETATION STRUCTURE (*record maximum absolute cover class in each stratum*):

Stratum	**Strata max. height** (select one from right)	**Cover values by strata;** (upper value of range = 5, 10, 20, 30, 40, 50, 60, 70, 80, 90, or 100%)	**Strata Heights (max. defaults)**	
Canopy			20 m, 35 m, or > 35 m	
Subcanopy			10 m, 20m	
Shrub			2 m, or 5 m	
Herbaceous/Field			0.5 m, 1 m, or 2 m	
Aquatic				
Nonvascular				

VIII. VEGETATION COMPOSITION (*list all dominant and diagnostic species for each stratum (one row per species); record total cover, then check box for stratum in which that species has the most coverage).* ***1 = rare, 2 = <1%, common, 3 = <1%, few individuals 4= 1- 5%; 5= 5-10%, 6= 10-25%, 7= 26-50%, 8= 51-75%, 9= 76-100%***

SPECIES	**Diag species?**	**Spec coll?**	**Total cover**	**Canopy layer**	**Sub-canopy layer**	**Shrub layer**	**Field layer**
INVASIVE SPECIES (within 25m radius)	**Rare**	**1-20%**	**>20%**				

Provisional NVC Code: CEGL00_____ Provisional NVC Name: _____

Fit: High / Medium / Low Confidence: High / Medium / Low

Appendix B: Descriptions of Vegetation Types

U.S. National Vegetation Classification

Associations and Alliances of Jean Lafitte National Historical Park and Preserve

8 March 2017

by

NatureServe

4600 North Fairfax Drive, 7th Floor
Arlington, VA 22203

601A Foster Street
Durham, NC 27701-2108

This subset of the International Ecological Classification Standard covers associations and alliances attributed to Jean Lafitte National Historical Park and Preserve. 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 Milo Pyne, Senior Regional Ecologist, Durham, NC <milo_pyne@natureserve.org>.

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[1] NatureServe is an international organization including NatureServe regional offices, a NatureServe central office, U.S. State Natural Heritage Programs, and Conservation Data Centres (CDC) in Canada and Latin America and the Caribbean. Ecologists from the following organizations have contributed the development of the ecological systems classification:

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Central NatureServe Office, Arlington, VA; Eastern Regional Office, Boston, MA; Midwestern Regional Office, Minneapolis, MN; Southeastern Regional Office, Durham, NC; Western Regional Office, Boulder, CO; Alabama Natural Heritage Program, Montgomery AL; Alaska Natural Heritage Program, Anchorage, AK; Arizona Heritage Data Management Center, Phoenix AZ; Arkansas Natural Heritage Commission Little Rock, AR; Blue Ridge Parkway, Asheville, NC; California Natural Heritage Program, Sacramento, CA; Colorado Natural Heritage Program, Fort Collins, CO; Connecticut Natural Diversity Database, Hartford, CT; Delaware Natural Heritage Program, Smyrna, DE; District of Columbia Natural Heritage Program/National Capital Region Conservation Data Center, Washington DC; Florida Natural Areas Inventory, Tallahassee, FL; Georgia Natural Heritage Program, Social Circle, GA; Great Smoky Mountains National Park, Gatlinburg, TN; Gulf Islands National Seashore, Gulf Breeze, FL; Hawaii Natural Heritage Program, Honolulu, Hawaii; Idaho Conservation Data Center, Boise, ID; Illinois Natural Heritage Division/Illinois Natural Heritage Database Program, Springfield, IL; Indiana Natural Heritage Data Center, Indianapolis, IN; Iowa Natural Areas Inventory, Des Moines, IA; Kansas Natural Heritage Inventory, Lawrence, KS; Kentucky Natural Heritage Program, Frankfort, KY; Louisiana Natural Heritage Program, Baton Rouge, LA; Maine Natural Areas Program, Augusta, ME; Mammoth Cave National Park, Mammoth Cave, KY; Maryland Wildlife & Heritage Division, Annapolis, MD; Massachusetts Natural Heritage & Endangered Species Program, Westborough, MA; Michigan Natural Features Inventory, Lansing, MI; Minnesota Natural Heritage & Nongame Research and Minnesota County Biological Survey, St. Paul, MN; Mississippi Natural Heritage Program, Jackson, MI; Missouri Natural Heritage Database, Jefferson City, MO; Montana Natural Heritage Program, Helena, MT; National Forest in North Carolina, Asheville, NC; National Forests in Florida, Tallahassee, FL; National Park Service, Southeastern Regional Office, Atlanta, GA; Navajo Natural Heritage Program, Window Rock, AZ; Nebraska Natural Heritage Program, Lincoln, NE; Nevada Natural Heritage Program, Carson City, NV; New Hampshire Natural Heritage Inventory, Concord, NH; New Jersey Natural Heritage Program, Trenton, NJ; New Mexico Natural Heritage Program, Albuquerque , NM; New York Natural Heritage Program, Latham, NY; North Carolina Natural Heritage Program, Raleigh, NC; North Dakota Natural Heritage Inventory, Bismarck, ND; Ohio Natural Heritage Database, Columbus, OH; Oklahoma Natural Heritage Inventory, Norman, OK; Oregon Natural Heritage Program, Portland, OR; Pennsylvania Natural Diversity Inventory, PA; Rhode Island Natural Heritage Program, Providence, RI; South Carolina Heritage Trust, Columbia, SC; South Dakota Natural Heritage Data Base, Pierre, SD; Tennessee Division of Natural Heritage, Nashville, TN; Tennessee Valley Authority Heritage Program, Norris, TN; Texas Conservation Data Center, San Antonio, TX; Utah Natural Heritage Program, Salt Lake City, UT; Vermont Nongame & Natural Heritage Program, Waterbury, VT; Virginia Division of Natural Heritage, Richmond, VA; Washington Natural Heritage Program, Olympia, WA; West Virginia Natural Heritage Program, Elkins, WV; Wisconsin Natural Heritage Program, Madison, WI; Wyoming Natural Diversity Database, Laramie, WY

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Alberta Natural Heritage Information Centre, Edmonton, AB, Canada; Atlantic Canada Conservation Data Centre, Sackville, New Brunswick, Canada; British Columbia Conservation Data Centre, Victoria, BC, Canada; Manitoba Conservation Data Centre. Winnipeg, MB, Canada; Ontario Natural Heritage Information Centre, Peterborough, ON, Canada; Quebec Conservation Data Centre, Quebec, QC, Canada; Saskatchewan Conservation Data Centre, Regina, SK, Canada; Yukon Conservation Data Centre, Yukon, Canada

Latin American and Caribbean
Centro de Datos para la Conservacion de Bolivia, La Paz , Bolivia; Centro de Datos para la Conservacion de Colombia, Cali,Valle, Columbia; Centro de Datos para la Conservacion de Ecuador, Quito, Ecuador; Centro de Datos para la Conservacion de Guatemala, Ciudad de Guatemala , Guatemala; Centro de Datos para la Conservacion de Panama, Querry Heights , Panama; Centro de Datos para la Conservacion de Paraguay, San Lorenzo , Paraguay; Centro de Datos para la Conservacion de Peru, Lima, Peru; Centro de Datos para la Conservacion de Sonora, Hermosillo, Sonora , Mexico; Netherlands Antilles Natural Heritage Program, Curacao , Netherlands Antilles; Puerto Rico-Departmento De Recursos Naturales Y Ambientales, Puerto Rico; Virgin Islands Conservation Data Center, St. Thomas, Virgin Islands.

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Table of Contents

Page

1. Forest & Woodland B-9
1.B.1. Warm Temperate Forest & Woodland B-9
1.B.1.NA. Southeastern North American Forest & Woodland B-9
M305. Southeastern North American Ruderal Forest B-9
G029. Southeastern Exotic Ruderal Forest B-9
A3233 *Albizia julibrissin - Broussonetia papyrifera - Triadica sebifera* Ruderal Forest Alliance B-9
[CEGL007037] *Triadica sebifera* Ruderal Forest B-11
G031. Southeastern Native Ruderal Forest B-13
A3232 *Liquidambar styraciflua - Celtis laevigata - Quercus nigra* Ruderal Forest Alliance B-13
[CEGL004854] *Celtis laevigata* Coastal Plain Ruderal Forest B-14
[CEGL004638] *Quercus nigra* Ruderal Forest B-16
[CEPS004809] Ruderal Mixed Deciduous Forest [Park Special] B-18
[CEPS009725] Ruderal Mixed Spoil Bank Forest [Park Special] B-20
1.B.3. Temperate Flooded & Swamp Forest B-22
1.B.3.NB. Southeastern North American Flooded & Swamp Forest B-22
M310. Southeastern North American Ruderal Flooded & Swamp Forest B-22
G762. Southeastern Exotic Ruderal Flooded & Swamp Forest B-22
A3339 *Triadica sebifera - Melaleuca quinquenervia - Schinus terebinthifolius* Ruderal Flooded & Swamp Forest Alliance B-22
[CEGL007412] *Triadica sebifera* Ruderal Wet Forest B-24
G553. Southeastern Native Ruderal Flooded & Swamp Forest B-26
A3343 *Acer rubrum - Liriodendron tulipifera* Ruderal Flooded & Swamp Forest Alliance B-26
[CEGL007437] *Salix nigra / Morella cerifera* Ruderal Wet Forest B-28
[CEPS006671] Disturbed Woody Wetland [Park Special] B-30
M031. Southern Coastal Plain Floodplain Forest B-31
G033. Bald-cypress - Tupelo Floodplain Forest B-31
A3592 *Acer rubrum - Gleditsia aquatica - Fraxinus profunda* Swamp Forest Alliance B-31
[CEGL007229] *Acer rubrum* - (*Fraxinus profunda*) / Sabal minor Swamp Forest B-33
A3594 *Taxodium distichum - Nyssa aquatica - Nyssa biflora* Floodplain Forest Alliance B-37
[CEGL002421] *Taxodium distichum - (Nyssa aquatica) / Forestiera acuminata - Planera aquatica* Floodplain Forest B-39
[CEGL007422] *Taxodium distichum - Nyssa aquatica - Acer rubrum / Itea virginica* Floodplain Forest B-43
A3595 *Taxodium distichum - Nyssa biflora* Tidal Swamp Forest Alliance B-47
[CEPS009724] *Taxodium distichum - Salix nigra / Morella cerifera / Thelypteris palustris* Woodland [Park Special] B-49
[CEGL007065] *Taxodium distichum / Morella cerifera / Thelypteris palustris* Tidal Woodland B-51
G034. Oak - Sweetgum Floodplain Forest B-54
A3634 *Quercus virginiana - Quercus pagoda - Quercus nigra* Coastal Plain Swamp Forest Alliance B-55
[CEGL004648] *Quercus virginiana - Celtis laevigata - Quercus pagoda / Sabal minor* Swamp Forest B-56
G759. Southern Ash - Elm - Willow Floodplain Forest B-59

Table of Contents (continued)

Page

A3709 *Ulmus americana - Ulmus crassifolia - Celtis laevigata* West Gulf Coastal Plain Floodplain Forest Alliance B-59
[CEGL004619] *Quercus texana - Celtis laevigata - Ulmus (americana, crassifolia) - (Gleditsia triacanthos)* Floodplain Forest B-62
2. Shrub & Herb Vegetation B-64
2.B.2. Temperate Grassland & Shrubland B-64
2.B.2.NE. Southeastern North American Grassland & Shrubland B-64
M307. Southeastern Ruderal Grassland & Shrubland B-64
G583. Southeastern Ruderal Grassland & Shrubland B-64
A3321 *Andropogon virginicus - Ambrosia artemisiifolia - Conyza canadensis* Eastern Ruderal Grassland Alliance B-64
A3322 *Rubus* spp. - *Prunus* spp. - *Cornus drummondii* Eastern Ruderal Shrubland Alliance B-66
[CEGL004657] *Baccharis halimifolia* Ruderal Shrubland B-67
[CEPP007085] *Sesbania drummondii* Ruderal Shrubland B-69
2.C.4. Temperate to Polar Freshwater Marsh, Wet Meadow & Shrubland B-71
2.C.4.Ne. Atlantic & Gulf Coastal Marsh, Wet Meadow & Shrubland B-71
M066. Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh B-71
G110. Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh B-71
A0806 *Morella cerifera - Rosa palustris* Tidal Freshwater Shrubland Alliance B-71
[CEGL007093] *Ilex cassine - Morella cerifera / Woodwardia areolata - Sphagnum* sp. Flotant Shrub Swamp B-73
[CEGL007241] *Morella cerifera / Typha domingensis - Sagittaria lancifolia - Eleocharis* spp. Tidal Marsh B-77
A3578 *Panicum hemitomon* Floating Marsh Alliance B-82
[CEGL007834] *Morella cerifera - Panicum hemitomon* Floating Marsh B-83
[CEGL004665] *Panicum hemitomon* Marsh B-87
A1987 *Sagittaria lancifolia* Gulf Coast Tidal Freshwater Marsh Alliance B-91
[CEGL007886] *Eleocharis rostellata - Sagittaria lancifolia Oligohaline* Tidal Marsh B-92
[CEGL007891] *Phragmites australis* ssp. *berlandieri - (Sagittaria platyphylla, Vigna luteola)* Tidal Marsh B-95
[CEGL007889] *Sagittaria lancifolia* Mississippi River Deltaic Plain Tidal Marsh B-98
A3580 *Schoenoplectus californicus* Gulf Coast Tidal Freshwater Marsh Alliance B-101
[CEGL003985] *Schoenoplectus californicus* Tidal Marsh B-102
A3581 *Stuckenia pectinata - Zannichellia palustris - Ceratophyllum demersum* Freshwater Subtidal Marsh Alliance B-104
[CEGL007689] *Potamogeton perfoliatus - (Stuckenia pectinata, Zannichellia palustris)* Tidal Marsh B-105
A4015 *Typha domingensis - Eleocharis rostellata* Gulf Coastal Plain Oligohaline Tidal Marsh Alliance B-107
[CEGL007888] *Spartina patens - Vigna luteola* Mississippi River Deltaic Plain Tidal Marsh B-109
[CEGL007235] *Typha domingensis - Sacciolepis striata - Sagittaria lancifolia* Marsh B-112
[CEGL008456] *Typha domingensis* Tidal Marsh B-115
A4220 Gulf Coastal Plain Floating Marsh Alliance B-117
[CEGL007081] *Bacopa monnieri - Eleocharis* spp. Thin Floating Marsh B-118

Table of Contents (continued)

Page

[CEGL007076] *Bidens laevis* - *Hydrocotyle ranunculoides* Floating Marsh....B-121
M067. Atlantic & Gulf Coastal Plain Wet Prairie & Marsh....B-123
G188. Atlantic & Gulf Coastal Plain River & Basin Freshwater Marsh....B-123
A3404 *Zizaniopsis miliacea - Zizania aquatica - Pontederia cordata* Southeastern Floodplain Marsh Alliance....B-123
[CEGL004139] *Zizaniopsis miliacea* Coastal Plain Slough Marsh....B-124
2.C.5. Salt Marsh....B-126
2.C.5.Nb. North American Atlantic & Gulf Coastal Salt Marsh....B-126
M079. North American Atlantic & Gulf Coastal Salt Marsh....B-126
G120. Atlantic & Gulf Coastal Brackish Salt Marsh....B-126
A4013 *Spartina alterniflora - Spartina cynosuroides* Brackish Tidal Marsh Alliance....B-127
[CEGL004178] *Cladium mariscus* ssp. *jamaicense* Tidal Salt Marsh....B-128
[CEGL008476] *Schoenoplectus americanus* - *(Spartina patens)* - *Typha* spp. Salt Marsh....B-130
5. Aquatic Vegetation....B-132
5.B.2. Temperate to Polar Freshwater Aquatic Vegetation....B-132
5.B.2.Na. North American Freshwater Aquatic Vegetation....B-132
M108. Eastern North American Freshwater Aquatic Vegetation....B-132
G114. Eastern North American Freshwater Aquatic Vegetation....B-132
A4064 *Nymphaea odorata - Nuphar* spp. - *Brasenia schreberi* Aquatic Vegetation Alliance....B-133
[CEGL004323] *Nelumbo lutea* Aquatic Vegetation....B-134
[CEGL002386] *Nuphar advena* - *Nymphaea odorata* Aquatic Vegetation....B-136
M401. North American Temperate Ruderal Aquatic Vegetation....B-139
G595. Eastern North American Ruderal Aquatic Vegetation....B-139
A4219 *Eichhornia crassipes - Alternanthera philoxeroides* Ruderal Aquatic Vegetation Alliance....B-139
[CEGL003858] *Alternanthera philoxeroides* Ruderal Aquatic Vegetation....B-140
[CEGL007671] *Eichhornia crassipes* Southeast Temperate Ruderal Aquatic Vegetation....B-142
[CEGL007075] *Oxycaryum cubense* - *Salvinia molesta* Exotic Floating Mat....B-144

1. Forest & Woodland

1.B.1. Warm Temperate Forest & Woodland

1.B.1.Na. SOUTHEASTERN NORTH AMERICAN FOREST & WOODLAND

M305. Southeastern North American Ruderal Forest

G029. SOUTHEASTERN EXOTIC RUDERAL FOREST

Group Summary Description: The vegetation of this group shows evidence of former and heavy human disturbance, particularly to the soils, such as through plowing, grading, skidding, etc., but has otherwise been allowed to succeed more-or-less spontaneously. The vegetation is a disparate mix of exotic species, and the ecological and floristic organization of the vegetation is not clear. The tree layer is dominated (>80% cover) by exotic tree species. Understory shrub and herb species may be a mix of exotic and native generalists. Dominant exotic tree species include *Albizia julibrissin, Broussonetia papyrifera, Triadica sebifera (= Sapium sebiferum*, and *Maclura pomifera*. *Maclura pomifera* is a native species in a narrow region of the eastern U.S., but is so widely planted outside of its range that it is effectively exotic. Minor native associates include conifer *Pinus taeda*, and hardwoods *Catalpa bignonioides, Catalpa speciosa, Liquidambar styraciflua, Liriodendron tulipifera, Maclura pomifera*, and *Quercus nigra*. Some plantation stands are planted for restoration purposes (e.g., to provide cover on abandoned farmland or land prone to erosion), and these may be allowed to mature and die, with native trees invading into the understory and eventually into the canopy.

A3233 *Albizia julibrissin - Broussonetia papyrifera - Triadica sebifera* Ruderal Forest Alliance
Silktree - Paper-mulberry - Chinese Tallow Ruderal Forest Alliance
Southeastern Exotic Ruderal Forest

ALLIANCE CONCEPT

Summary: This alliance contains naturalized exotic forests on old fields and waste areas colonized by *Albizia julibrissin, Broussonetia papyrifera, Triadica sebifera (= Sapium sebiferum)*, or *Maclura pomifera*. *Maclura pomifera* is a native species in a narrow region of the eastern U.S., but is so widely planted outside of its range that it is effectively exotic. Dominance-based suballiances may be described. *Albizia julibrissin* stands have dense to rather sparse cover. Stands are mostly 3-7 m tall. These forests occur on the upper slopes of loess bluffs of the Mississippi River and are probably more widespread in the warmer areas of the southeastern U.S. *Broussonetia papyrifera* forests are dominated by the non-native tree *Broussonetia papyrifera* in all strata. Native canopy or subcanopy trees occur at low cover values. *Triadica sebifera*-dominated upland forests are often found on old fields, dredge spoil, or other disturbed sites. Understory and herb layers are often poorly developed. Finally, *Maclura pomifera* occurs in pure stands or makes up the majority of the canopy. These are forests that typically result from the spread of plantings of *Maclura pomifera* or its invasion following land abandonment and/or fire, or from other severe disturbance. Stands are usually small (10-15 ha [30-40 acres]), with associated species varying widely depending on geography and habitat. *Maclura pomifera* produces no sawtimber, pulpwood, or utility poles, but it has been planted in greater numbers than almost any other tree species in North America, having become naturalized throughout the United States and southern Canada.

Classification Comments: *Albizia* stands are limited northward by the relative lack of cold-hardiness of the above-ground stems of this species. The natural range of *Maclura pomifera* is in the Red River drainage of Oklahoma, Texas, and Arkansas; and in the Blackland Prairies of Arkansas, the Post Oak Savannas, and the Chisos Mountains of Texas. According to some authors the original range included most of eastern Oklahoma, portions of Missouri, and perhaps northwestern Louisiana. The forests in this alliance are found locally throughout the eastern United

States and in southern Canada on a wide range of sites, but are best developed on moist, rich loamy soils or those of limestone origin. The northern limits of this alliance compared to alliances in Eastern North American Native Ruderal Forest Group (G030) needs review. *Maclura pomifera* stands in the northern and central United States may need to be placed in *Acer platanoides* - *Ailanthus altissima* - *Pinus* spp. Exotic Ruderal Forest Alliance (A3230).

Similar Alliances:

- *Acer platanoides* - *Ailanthus altissima* - *Pinus* spp. Exotic Ruderal Forest Alliance (A3230)

Diagnostic Characteristics: This alliance contains naturalized exotic forests on old fields and waste areas colonized by *Albizia julibrissin, Broussonetia papyrifera, Triadica sebifera (= Sapium sebiferum)*, or *Maclura pomifera*. *Maclura pomifera* is a native species in a narrow region of the eastern U.S., but is so widely planted outside of its range that it is effectively exotic.

ALLIANCE DESCRIPTION

Environment: *Maclura pomifera* stands are best developed on moist, rich loamy soils or those of limestone origin, but can establish on a variety of soils, including acidic sands. Other stands are typically found on old fields, dredge spoil, or other disturbed sites.

Vegetation: *Maclura pomifera* occurs in pure stands or makes up the majority of the canopy. In Nebraska and Kansas, it invades overgrazed pastures, accompanied by *Gleditsia triacanthos* and is succeeded by *Carya* spp., *Celtis* spp., *Juglans nigra, Quercus* spp., and *Ulmus* spp. Among the most common associates on limestone-derived soils in middle Tennessee and neighboring portions of Kentucky and Alabama are *Juniperus virginiana, Juglans nigra, Carya* spp., and *Ulmus* spp. Old fields and waste areas colonized by *Albizia julibrissin, Broussonetia papyrifera*, and *Triadica sebifera* stands range from dense to rather sparse cover, and understory and herb layers are often poorly developed. But in general the floristics of these stands is poorly described.

Physiognomy and Structure: Stands are dominated by broad-leaved deciduous trees, ranging from 5 to 15 m tall.

Floristics: *Maclura pomifera* occurs in pure stands or makes up the majority of the canopy. In Nebraska and Kansas, it invades overgrazed pastures, accompanied by *Gleditsia triacanthos* and is succeeded by *Carya* spp., *Celtis* spp., *Juglans nigra, Quercus* spp., and *Ulmus* spp. Among the most common associates on limestone-derived soils in middle Tennessee and neighboring portions of Kentucky and Alabama are *Juniperus virginiana, Juglans nigra, Carya* spp., and *Ulmus* spp. Old fields and waste areas colonized by *Albizia julibrissin, Broussonetia papyrifera*, and *Triadica sebifera* stands range from dense to rather sparse cover, and understory and herb layers are often poorly developed. But in general the floristics of these stands is poorly described.

Dynamics: *Maclura pomifera* stands are short-lived, typically resulting from planting or invasion of *Maclura pomifera* following land abandonment or fire, or from other severe disturbance. *Maclura pomifera* readily escapes from cultivation and invades exposed, eroding soil, particularly in overgrazed pastures. Thickets are characteristically found along fencerows, ditch banks, ravines, and around abandoned farmsteads.

ALLIANCE DISTRIBUTION

Range: The range of this alliance includes scattered localities throughout the southeastern United States, from Texas east to Florida, and northward to the Carolinas. *Maclura pomifera* has been planted in greater numbers than almost any other tree species in North America (Burton 1990), having become naturalized throughout the United States and southern Canada. Its distribution has been greatly expanded beyond the natural range of osage-orange in the Red River drainage of Oklahoma, Texas, and Arkansas; and in the Blackland Prairies, Post Oak Savannas, and Chisos Mountains of Texas. According to some authors the original range included most of eastern Oklahoma, portions of Missouri, and perhaps northwestern Louisiana (Burton 1990). The commercial range of the species includes most of the United States east of the Rocky Mountains, south of the Platte River, and the Great Lakes, excluding the Appalachian Mountains. *Albizia julibrissin* is found in the southeastern United States. It is limited northward by the relative lack of cold-hardiness of the above-ground stems of *Albizia*. *Triadica sebifera* is so far restricted to Texas, Louisiana, and Alabama, but it could possibly be found in other parts of the southeastern United States, including Florida, Georgia, Mississippi, and South Carolina. *Broussonetia papyrifera* is naturalized in 29 states in the U.S., and is an aggressive invasive in Florida (Kershner et al. 2008).

Nations: US
Subnations: AL, AR, FL, GA, KY, LA, MS, OK, SC?, TN, TX

ALLIANCE SOURCES

References: Burns and Honkala 1990b, Burton 1990, Faber-Langendoen et al. 2017b*, Kershner et al. 2008
Author of Concept: Faber-Langendoen et al. 2017b
Author of Description: D. Faber-Langendoen, in Faber-Langendoen et al. (2013)

[CEGL007037] *Triadica sebifera* Ruderal Forest

Translated Name: **Chinese Tallow Ruderal Forest**
Common Name: **Ruderal Upland Chinese Tallow Forest**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	Southeastern North American Forest & Woodland (1.B.1.Na)
Macrogroup	Southeastern North American Ruderal Forest (M305)
Group	Southeastern Exotic Ruderal Forest (G029)
Alliance	*Albizia julibrissin - Broussonetia papyrifera - Triadica sebifera* Ruderal Forest Alliance (A3233)

ELEMENT CONCEPT

Global Summary: *Triadica sebifera (= Sapium sebiferum)*-dominated upland forests, often developed on old fields, dredge spoil, shell middens, or other disturbed sites. The understory and herb layers are often poorly developed. This association is defined broadly until further information is available to refine its description and classification.

ENVIRONMENTAL DESCRIPTION

Jean Lafitte National Historical Park and Preserve Environment: This community occurs on higher and drier spoil banks, shell middens, and other disturbed sites.
Global Environment: This community may develop on old fields, dredge spoil, shell middens, or other disturbed sites.

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: This vegetation is dominated or codominated by *Triadica sebifera*. Other trees and shrubs include *Celtis laevigata, Baccharis halimifolia, Acer rubrum*, and *Quercus virginiana*. Common woody vines include *Rubus trivialis, Ampelopsis arborea*, and the non-native *Lonicera japonica*. In the field layer, *Solidago sempervirens* is the most frequently encountered herb. The epiphyte *Tillandsia usneoides* is also frequently found in this community.

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Celtis laevigata*, *Triadica sebifera*
Tree canopy	Epiphyte	*Tillandsia usneoides*
Herb (field)	Liana	*Rubus trivialis*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Triadica sebifera*

CHARACTERISTIC SPECIES

Jean Lafitte National Historical Park and Preserve: *Celtis laevigata, Rubus trivialis, Solidago sempervirens, Triadica sebifera*
Global: *Triadica sebifera*

OTHER NOTEWORTHY SPECIES

Jean Lafitte National Historical Park and Preserve: Invasive/Exotic Plants: *Lonicera japonica* (High/Medium), *Triadica sebifera* (High)
Global: Invasive/Exotic Plants: *Triadica sebifera* (High)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (invasive) (1-Dec-1997).

RELATED CONCEPTS

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Jean Lafitte National Historical Park and Preserve Classification Comments: This vegetation was identified during a cluster analysis of 159 plots from Jean Lafitte National Historical Park and Preserve, Louisiana. This vegetation is described from 5 plots that formed a fairly distinctive group in cluster analysis. Homoteneity (0.675) and Bray-Curtis Similarity (0.400) were moderate within the group of plots.

ELEMENT DISTRIBUTION

Jean Lafitte National Historical Park and Preserve Range: This community occurs on higher and drier spoil banks.
Global Range: The range of this association includes Texas, Louisiana, Alabama, and Georgia, but it could possibly be found in other parts of the southeastern United States, including Florida, Mississippi and South Carolina.
Nations: US
States/Provinces: AL, FL?, GA, LA, MS, SC?, TX
TNC Ecoregions: 31:C, 40:C, 41:C, 43:C, 53:C, 55:P
USFS Ecoregions (1994/95): 231Bi:CCC, 231E:C?, 231Fa:CCP, 231Fb:CCC, 232Bs:CCC, 232Ce:CCC, 232Dc:CCC, 232Dd:CCC, 232E:CP, 232F:CP, 255Da:CCC, 255Db:CCP, 255Dc:CCC
Federal Lands: NPS (Fort Pulaski, Jean Lafitte, Natchez Trace); USFWS (Anahuac, Brazoria)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Inventory Notes: Plot data were collected by a number of different observers. Data for this analysis and analytical assistance were provided by NPS.
Jean Lafitte National Historical Park and Preserve Plots: LE5a, Lev1a, Lev2a, Levee12a, Levee8a, JELA_AA_0092.
Jean Lafitte National Historical Park and Preserve Description Author(s): J. Teague and M. Pyne
Global Description Author(s): A.S. Weakley, L.M. Smith, M. Pyne
References: Nordman et al. 2011, Southeastern Ecology Working Group n.d.*

G031. SOUTHEASTERN NATIVE RUDERAL FOREST

Group Summary Description: This ruderal native forest group occurs in old-field and other human-disturbed sites across the southeastern United States. The vegetation shows evidence of former and heavy human use, such as formerly cleared and/or planted sites, but which has been allowed to succeed more-or-less spontaneously, as determined by the vegetation being dominated (>80% cover) by ruderal native tree species. Understory shrub and herb species may be a mix of exotic species and native generalists. Some typical native ruderal species include conifer *Pinus taeda*, and hardwoods *Catalpa bignonioides, Catalpa speciosa, Liquidambar styraciflua, Liriodendron tulipifera, Maclura pomifera*, and *Quercus nigra*. Exotic associates may include *Albizia julibrissin, Broussonetia papyrifera, Triadica sebifera (= Sapium sebiferum*, and *Maclura pomifera*. *Maclura pomifera* is a native species in a narrow region of the eastern U.S., but is so widely planted outside of its range that it is effectively exotic. Where both the ground layer and tree layer are native ruderals, the stand may overlap with degraded phases of other native forest types.

A3232 *Liquidambar styraciflua - Celtis laevigata - Quercus nigra* Ruderal Forest Alliance

Sweetgum - Sugarberry - Water Oak Ruderal Forest Alliance
Ruderal Sweetgum - Sugarberry - Water Oak Forest

ALLIANCE CONCEPT

Summary: This alliance includes a variety of semi-natural disturbance-related upland forests dominated by *Liquidambar styraciflua, Quercus nigra, Celtis laevigata*, and other hardwoods. These forests tend to develop after logging or agricultural cropping. Some associations may have *Carya alba, Liriodendron tulipifera, Quercus alba, Quercus falcata, Quercus nigra, Quercus phellos*, and *Quercus velutina*. In addition, *Pinus taeda* may be present and abundant. *Celtis laevigata* semi-natural stands occur in highly disturbed soils in coastal areas of Georgia and possibly adjacent states. *Celtis laevigata* is the strong canopy dominant in this community. However, exotic tree species such as *Melia azedarach, Triadica sebifera*, and *Morus alba* may be scattered throughout. Ground cover species are variable but may include *Rubus trivialis* and *Ampelopsis arborea*.
Classification Comments: *Quercus laevis* and *Crataegus flava* stands formerly included here have been removed. They are strongly dominated by *Quercus laevis* and are mostly (or possibly entirely) the result of the removal and reproductive failure of *Pinus palustris*. This includes modified and/or fire-suppressed examples of *Pinus palustris - Quercus* spp.-dominated vegetation, where *Pinus palustris* has been removed and/or failed to regenerate due to fire suppression or other environmental modifications, including turpentining and logging. Canopy closure of fire-suppressed examples may exceed 60%. The relative density and diversity of the shrub and herb layers will vary with degree of fire suppression; the local expression will vary with latitude and the distributions of various shrub and herbaceous components, as well as with soil texture. It may be that these sites are better treated (at least from a conservation or restoration perspective) as lower quality (but often highly restorable) examples of various communities in the former *Pinus palustris / Quercus* spp. Woodland Alliance (A.499).
Diagnostic Characteristics: Stands are found in the uplands and dominated by *Liquidambar styraciflua, Quercus nigra, Celtis laevigata* (>50%) or, if >25%, with a mix of other generalist tree species, including other hardwoods, such as *Carya alba, Liriodendron tulipifera, Quercus alba, Quercus falcata, Quercus nigra, Quercus phellos*, and *Quercus velutina*, or the conifer *Pinus taeda*.

ALLIANCE DESCRIPTION

Environment: These forests tend to develop after logging or agricultural cropping.
Vegetation: This alliance includes a variety of semi-natural disturbance-related upland forests dominated by *Liquidambar styraciflua, Quercus nigra, Celtis laevigata*, and other hardwoods. Some associations may have *Carya alba, Liriodendron tulipifera, Quercus alba, Quercus falcata, Quercus nigra, Quercus phellos*, and *Quercus velutina*. In addition, *Pinus taeda* may be present and abundant. *Celtis laevigata* semi-natural stands occur in highly disturbed soils in coastal areas of Georgia and possibly adjacent states. *Celtis laevigata* is the strong canopy dominant in this community. However, exotic tree species such as *Melia azedarach, Triadica sebifera*, and *Morus alba* may be scattered throughout. Ground cover species are variable but may include *Rubus trivialis* and *Ampelopsis arborea*.
Physiognomy and Structure: Stands are primarily dominated by broad-leaved deciduous hardwood trees.
Floristics: This alliance includes a variety of semi-natural disturbance-related upland forests dominated by *Liquidambar styraciflua, Quercus nigra, Celtis laevigata*, and other hardwoods. Some associations may have *Carya alba, Liriodendron tulipifera, Quercus alba, Quercus falcata, Quercus nigra, Quercus phellos*, and *Quercus velutina*. In addition, *Pinus taeda* may be present and abundant. *Celtis laevigata* semi-natural stands occur in highly disturbed soils in coastal areas of Georgia and possibly adjacent states. *Celtis laevigata* is the strong canopy dominant in this community. However, exotic tree species such as *Melia azedarach, Triadica sebifera*, and *Morus alba* may be scattered throughout. Ground cover species are variable but may include *Rubus trivialis* and *Ampelopsis arborea*.
Dynamics: These forests tend to develop after logging or agricultural cropping.

ALLIANCE DISTRIBUTION

Range: This alliance is distributed throughout the southeastern United States in most physiographic provinces, ranging from Maryland to Florida and west to Arkansas and possibly Texas.
Nations: US
Subnations: AL, AR, DC?, DE, FL?, GA, KY, LA, MD, MS, NC, NJ, OK, SC, TN, TX?, VA

ALLIANCE SOURCES

References: Faber-Langendoen et al. 2017b*
Author of Concept: Faber-Langendoen et al. 2017b
Author of Description: D. Faber-Langendoen, in Faber-Langendoen et al. (2013)

[CEGL004854] *Celtis laevigata* Coastal Plain Ruderal Forest

Translated Name: **Sugarberry Coastal Plain Ruderal Forest**
Common Name: **Coastal Plain Ruderal Sugarberry Forest**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	Southeastern North American Forest & Woodland (1.B.1.Na)
Macrogroup	Southeastern North American Ruderal Forest (M305)
Group	Southeastern Native Ruderal Forest (G031)
Alliance	*Liquidambar styraciflua - Celtis laevigata - Quercus nigra* Ruderal Forest Alliance (A3232)

ELEMENT CONCEPT

Global Summary: This ruderal forest occurs on highly disturbed soils in coastal areas of Georgia, Louisiana, and possibly additional states of the southeastern coastal plains. *Celtis laevigata* is the strong canopy dominant in this

community. However, exotic tree species such as *Melia azedarach, Triadica sebifera*, and *Morus alba* may be scattered throughout. Ground cover species are variable but may include *Rubus trivialis* and *Ampelopsis arborea*. Examples occur near the ports of Savannah (Chatham County, Georgia), and at Jean Lafitte National Park (Jefferson Parish, Louisiana).

ENVIRONMENTAL DESCRIPTION

Jean Lafitte National Historical Park and Preserve Environment: This community occurs on highly disturbed upland sites.

Global Environment: This community occurs on highly disturbed sites on the southern Atlantic and Gulf coastal plains.

VEGETATION DESCRIPTION

Global Vegetation: *Celtis laevigata* dominates the forest canopy. Non-native trees, including *Melia azedarach, Triadica sebifera*, and *Morus alba*, may be scattered throughout the community. Ground cover species are variable but may include *Rubus trivialis* and *Ampelopsis arborea*.

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Celtis laevigata*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Celtis laevigata*

CHARACTERISTIC SPECIES

Jean Lafitte National Historical Park and Preserve: *Celtis laevigata*

Global: *Celtis laevigata*

OTHER NOTEWORTHY SPECIES

Global: Invasive/Exotic Plants: *Melia azedarach* (Medium/Low), *Morus alba* (High/Medium), *Triadica sebifera* (High)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (22-Nov-2010). This vegetation is presumed to be a result of disturbance of more diverse-canopied hardwood forests.

RELATED CONCEPTS

CLASSIFICATION

Status: Standard

Classification Confidence: 3 - Weak

Global Classification Comments: Examples occur near the ports of Savannah (Chatham County, GA).

ELEMENT DISTRIBUTION

Global Range: This community is described from coastal Georgia, and documented from southern Louisiana. It may be more widespread, but it is conceptually restricted to the southern coastal plains.

Nations: US

States/Provinces: FL?, GA, LA, SC?

TNC Ecoregions: 31:C, 53:?, 56:C, 57:C
USFS Ecoregions (1994/95): 232Ca:CC?, 232Cb:CCC, 232Ce:CCC, 232Eb:CPP
Federal Lands: NPS (Jean Lafitte)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Plots: None.
Jean Lafitte National Historical Park and Preserve Description Author(s): J. Teague and M. Pyne
Global Description Author(s): J. Thompson and E. Leonard
References: Southeastern Ecology Working Group n.d.*

[CEGL004638] *Quercus nigra* Ruderal Forest

Translated Name: **Water Oak Ruderal Forest**
Common Name: **Ruderal Water Oak Forest**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	Southeastern North American Forest & Woodland (1.B.1.Na)
Macrogroup	Southeastern North American Ruderal Forest (M305)
Group	Southeastern Native Ruderal Forest (G031)
Alliance	*Liquidambar styraciflua - Celtis laevigata - Quercus nigra* Ruderal Forest Alliance (A3232)

ELEMENT CONCEPT

Global Summary: This community is a result of soil disturbance and/or fire suppression of upland pinelands of the Southeastern Coastal Plain and of pinelands and subsequent old fields in the adjacent Piedmont areas. South of the range of southern yellow pines, this community is found on spoil banks, artificial levees, and other anthropogenic landforms in a marsh and swamp landscape context. This association occurs on mesic or dry-mesic sites, especially on loamy or other fine-textured soils (in contrast to *Quercus hemisphaerica - Quercus nigra* Forest Alliance (A0053), which occurs primarily on coarse-textured sands in drier situations). *Quercus nigra* dominates the tree canopy. Other oaks (e.g., *Quercus falcata, Quercus phellos, Quercus hemisphaerica*) may be intermixed, as well as *Liquidambar styraciflua*, remnant *Pinus palustris*, weedy *Pinus elliottii var. elliottii, Carya* spp., or *Pinus taeda*. In the Upper Gulf Coastal Plain of Georgia, some examples may contain *Fagus grandifolia, Liriodendron tulipifera, Carya alba*, and *Cornus florida* in the subcanopy.

ENVIRONMENTAL DESCRIPTION

Jean Lafitte National Historical Park and Preserve Environment: This community is found on highly disturbed upland sites, spoil banks, artificial levees, and other anthropogenic landforms.
Global Environment: This community is a result of disturbance and/or fire suppression of upland pinelands of the southeastern Coastal Plain and adjacent Piedmont. South of the range of southern yellow pines, this community is found on highly disturbed upland sites, spoil banks, artificial levees, and other anthropogenic landforms in a marsh and swamp landscape context. It occurs on mesic or dry-mesic sites, especially on loamy or other fine-textured soils. In the Piedmont transition of South Carolina, it may have grown out of areas that were heavily farmed or cut over in the past but which did not grow up into *Pinus taeda* forests.

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: Vegetation is composed of *Quercus nigra, Fraxinus pennsylvanica, Liquidambar styraciflua, Celtis laevigata*, and the exotics *Cinnamomum camphora, Albizia*

julibrissin, and Melia azedarach. In addition, there may be Sabal minor, and several woody vines, including *Ampelopsis arborea, Campsis radicans*, and *Toxicodendron radicans*.

Global Vegetation: The canopy of this association is dominated by *Quercus nigra*. Other oaks may be intermixed, especially *Quercus phellos*, as well as *Quercus falcata, Quercus hemisphaerica, Liquidambar styraciflua*, remnant *Pinus palustris*, weedy *Pinus elliottii var. elliottii, Carya* spp., or *Pinus taeda*. In the Upper Gulf Coastal Plain of Georgia, some examples may contain *Fagus grandifolia, Liriodendron tulipifera, Carya alba*, and *Cornus florida* in the subcanopy.

Global Dynamics: This community occurs as a successional community following either degradation of pinelands or recovery from agricultural disturbance of old fields in fairly sandy soils, as well as other forms of soil disturbance in the southern coastal plains and adjacent Piedmont. In the Piedmont area of South Carolina, this is reported to occur on areas formerly codominated by *Quercus oglethorpensis*. In these areas, the *Quercus oglethorpensis* still survives, making this modified community of more conservation value in those areas. This manifestation may be an altered version of a natural association, and not strictly "ruderal."

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus nigra*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus nigra*

CHARACTERISTIC SPECIES

Jean Lafitte National Historical Park and Preserve: *Quercus nigra*
Global: *Quercus nigra*

OTHER NOTEWORTHY SPECIES

Jean Lafitte National Historical Park and Preserve: Invasive/Exotic Plants: *Albizia julibrissin* (High/Low), *Cinnamomum camphora* (), *Melia azedarach* (Medium/Low)
Global: Vulnerable Plants: *Quercus oglethorpensis* (G3)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (modified/managed) (17-May-2002). This vegetation is presumed to be either a result of disturbance of more diverse-canopied hardwood forests, and/or a result of lack of fire on sites which would be dominated by *Pinus palustris*. In the Piedmont area of South Carolina, it may occur on areas formerly codominated by *Quercus oglethorpensis*. In these areas, the *Quercus oglethorpensis* still survives, making this modified community of more conservation value in those areas.

RELATED CONCEPTS

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Global Classification Comments: The "successional" and "ruderal" aspects of this association may need to be teased apart.

ELEMENT DISTRIBUTION

Global Range: This community is distributed throughout the southeastern United States, including within the traditional range of longleaf pine communities, mainly in the Coastal Plain from Texas up through at least South Carolina. In some parts of its range in South Carolina and Georgia, the community may be found in the Piedmont within 50 to 70 miles of the fall-line and may share dominance with other successional pine-dominated communities more common in the Piedmont. It is also found south of where pines dominate the landscape, as in southern Louisiana.
Nations: US
States/Provinces: AL, FL?, GA, LA, MS, NC, SC, TX?
TNC Ecoregions: 31:C, 41:P, 42:?, 43:C, 52:C, 53:C, 55:?, 56:C, 57:C
USFS Ecoregions (1994/95): 231A:CC, 231Bd:CCC, 231Bi:CCC, 231Bl:CCC, 232Bm:CCC, 232Bq:CCC, 232Br:CCC, 232Ca:CCC, 232Cb:CCC, 232Eb:CPP, 234Aa:???, 234Ab:???, 234Ac:???, 234Ag:???, 234Ah:???, 234Ak:???, 234Al:???, 234Am:???, 234An:???
Federal Lands: DOD (Fort Benning, Fort Gordon, Fort Stewart); NPS (Chattahoochee River, Cowpens, Jean Lafitte, Moores Creek, Natchez Trace, Ninety Six); USFS (Talladega (Oakmulgee)?, Talladega (Talladega)?, Talladega?, Tuskegee?)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Plots: JELA_AA_0043, JELA_AA_0058.
Jean Lafitte National Historical Park and Preserve Description Author(s): M. Pyne
Global Description Author(s): M. Pyne
References: McCrain and Church 1985, McManamay et al. 2012, NatureServe Ecology - Southeastern U.S. unpubl. data, Nordman et al. 2011, Southeastern Ecology Working Group n.d.*, White 2004, White and Govus 2003

[CEPS004809] Ruderal Mixed Deciduous Forest [Park Special]

Translated Name: **Ruderal Mixed Deciduous Forest**
Common Name: **Ruderal Mixed Deciduous Forest**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	Southeastern North American Forest & Woodland (1.B.1.Na)
Macrogroup	Southeastern North American Ruderal Forest (M305)
Group	Southeastern Native Ruderal Forest (G031)
Alliance	*Liquidambar styraciflua - Celtis laevigata - Quercus nigra* Ruderal Forest Alliance (A3232)

ELEMENT CONCEPT

Global Summary: This type is a conceptual placeholder, designed only to act as a provisional type for vegetation complexes, ruderal or early-successional vegetation, and other types that cannot be reliably classified. It is created to facilitate regularized local land unit mapping of a managed area and to provide a standard label for polygons in a vegetation map. It is a diverse map class representing upland successional deciduous forests of highly variable composition. Any successional upland forest not captured in the associations listed for a particular area can be included here.

ENVIRONMENTAL DESCRIPTION

Jean Lafitte National Historical Park and Preserve Environment: This community occurs on highly disturbed soils, in both upland and wetland environments. It also may be found where the canopy of a natural forest has been removed and the dominant trees have failed to regenerate.

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: This is a diverse map class representing upland or wetland successional deciduous forests of variable composition, composed of native and exotic trees over mixed, weedy shrubs. At Jean Lafitte, this will typically include either mixtures of *Celtis laevigata, Morus alba, Quercus nigra*, and other essentially upland species, or mixtures of *Acer negundo, Acer rubrum, Salix nigra, Triadica sebifera*, and other wetland trees. These are ruderal, post-disturbance vegetation complexes, ruderal or early-successional vegetation, and other types that cannot be otherwise easily or reliably classified or related to a more natural type.

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer negundo*, *Acer rubrum*, *Celtis laevigata*, *Morus alba*, *Quercus nigra*, *Salix nigra*, *Triadica sebifera*

CHARACTERISTIC SPECIES

Jean Lafitte National Historical Park and Preserve: *Acer negundo, Acer rubrum, Celtis laevigata, Morus alba, Quercus nigra, Salix nigra, Triadica sebifera*
Global:

OTHER NOTEWORTHY SPECIES

Jean Lafitte National Historical Park and Preserve: Invasive/Exotic Plants: *Morus alba* (High/Medium), *Triadica sebifera* (High)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (15-Sep-2009).

RELATED CONCEPTS

CLASSIFICATION

Status: Nonstandard
Classification Confidence:

ELEMENT DISTRIBUTION

Nations: US
States/Provinces: AL, DC, LA, MD, MS, TN, VA, WV
TNC Ecoregions: 31:C
USFS Ecoregions (1994/95): 232Eb:CCC
Federal Lands: NPS (Antietam, C&O Canal, Catoctin Mountain, George Washington Parkway, Harpers Ferry, Jean Lafitte, Manassas, Monocacy, Natchez Trace, National Capital-East, Rock Creek, Wolf Trap)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Plots: JELA_AA_0003, JELA_AA_0061, JELA_AA_0089, JELA_AA_0091, JELA_AA_0094, JELA_AA_0095.
Jean Lafitte National Historical Park and Preserve Description Author(s): M. Pyne
Global Description Author(s):
References: Eastern Ecology Working Group n.d.*

[CEPS009725] Ruderal Mixed Spoil Bank Forest [Park Special]

Translated Name: **Ruderal Mixed Spoil Bank Forest**
Common Name: **Ruderal Mixed Spoil Bank Forest**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	Southeastern North American Forest & Woodland (1.B.1.Na)
Macrogroup	Southeastern North American Ruderal Forest (M305)
Group	Southeastern Native Ruderal Forest (G031)
Alliance	*Liquidambar styraciflua - Celtis laevigata - Quercus nigra* Ruderal Forest Alliance (A3232)

ELEMENT CONCEPT

Global Summary: This park special association for Jean Lafitte National Historical Park and Preserve consists of narrow bands of ruderal vegetation adjacent to and directly flanking waterways, found on narrow spoil banks, artificial levees, and embankments, made of a conglomerate of mineral and muck soils and consisting of a series of narrow patches below-minimum mapping unit (MMU) of various forested natural communities that in total cover many hectares. These narrow patches are too small to be a mappable or functional example of any of those possible communities. Component species can include any of the following (more or less from wet to dry): *Taxodium distichum, Nyssa aquatica, Fraxinus profunda, Salix nigra, Acer rubrum, Acer negundo, Fraxinus pennsylvanica, Liquidambar styraciflua, Quercus nigra, Quercus virginiana*, and others, as well as the exotic *Triadica sebifera*. A shrub layer of *Morella cerifera* and/or *Baccharis halimifolia* is often also present.

ENVIRONMENTAL DESCRIPTION

Jean Lafitte National Historical Park and Preserve Environment: The environment consists of narrow artificial landforms adjacent to and directly flanking waterways. These are narrow spoil banks, artificial levees, and embankments containing a series of narrow patches below-minimum mapping unit (MMU) of various forested natural communities. In this context, a variety of different environments are compressed into a narrow linear strip less than 20 m wide, varying in wetness/dryness of soils. The vegetation stands in these narrow patches are too small to be mappable or functional examples of any of those possible communities.
Global Environment: This vegetation is found on narrow artificial landforms adjacent to and directly flanking waterways, including narrow spoil banks, artificial levees, and embankments.

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: Component species in this mixture of small patches of various natural communities can include any of the following (more or less from wet to dry): *Taxodium distichum, Nyssa aquatica, Fraxinus profunda, Salix nigra, Acer rubrum, Acer negundo, Fraxinus pennsylvanica, Liquidambar styraciflua, Quercus nigra, Quercus virginiana*, and others, as well as the exotic *Triadica sebifera*. A shrub layer of *Morella cerifera* and/or *Baccharis halimifolia* is often also present.

Global Vegetation: Component species in this mixture of small patches of various natural communities can include any of the following (more or less from wet to dry): *Taxodium distichum, Nyssa aquatica, Fraxinus profunda, Salix nigra, Acer rubrum, Acer negundo, Fraxinus pennsylvanica, Liquidambar styraciflua, Quercus nigra, Quercus virginiana*, and others, as well as the exotic *Triadica sebifera*. A shrub layer of *Morella cerifera* and/or *Baccharis halimifolia* is often also present.

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Taxodium distichum*
Tree canopy	Broad-leaved deciduous tree	*Acer negundo*, *Acer rubrum*, *Fraxinus pennsylvanica*, *Fraxinus profunda*, *Liquidambar styraciflua*, *Nyssa aquatica*, *Quercus nigra*, *Salix nigra*, *Triadica sebifera*
Tree canopy	Broad-leaved evergreen tree	*Quercus virginiana*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Baccharis halimifolia*, *Morella cerifera*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Taxodium distichum*
Tree canopy	Broad-leaved deciduous tree	*Acer negundo*, *Acer rubrum*, *Fraxinus pennsylvanica*, *Fraxinus profunda*, *Liquidambar styraciflua*, *Quercus nigra*, *Salix nigra*

CHARACTERISTIC SPECIES

Jean Lafitte National Historical Park and Preserve: *Acer negundo, Acer rubrum, Fraxinus pennsylvanica, Fraxinus profunda, Liquidambar styraciflua, Quercus nigra, Salix nigra, Taxodium distichum*
Global: *Acer negundo, Acer rubrum, Fraxinus pennsylvanica, Fraxinus profunda, Liquidambar styraciflua, Quercus nigra, Salix nigra, Taxodium distichum*

OTHER NOTEWORTHY SPECIES

Jean Lafitte National Historical Park and Preserve: Invasive/Exotic Plants: *Triadica sebifera* (High)
Global: Invasive/Exotic Plants: *Triadica sebifera* (High)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (6-Oct-2015). This is ruderal vegetation and does not receive a conservation rank.

RELATED CONCEPTS

CLASSIFICATION

Status: Nonstandard
Classification Confidence:
Element Distribution
Jean Lafitte National Historical Park and Preserve Range: This vegetation has been observed along narrow artificial landforms adjacent to and directly flanking various heavily travelled waterways.

Global Range: This Park Special association is described from Jean Lafitte National Historical Park and Preserve, Louisiana.
Nations: US
States/Provinces: LA
TNC Ecoregions: 31:C
USFS Ecoregions (1994/95): 232Eb:CCC
Federal Lands: NPS (Jean Lafitte)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Inventory Notes: This vegetation has been observed along narrow artificial landforms adjacent to and directly flanking various heavily travelled waterways. Its composition and configuration would confound conventional data collection methods.
Jean Lafitte National Historical Park and Preserve Plots: None.
Jean Lafitte National Historical Park and Preserve Description Author(s): M. Pyne and A. Strassman
Global Description Author(s): M. Pyne and A. Strassman
References: Southeastern Ecology Working Group n.d.*

1.B.3. Temperate Flooded & Swamp Forest

1.B.3.Nb. SOUTHEASTERN NORTH AMERICAN FLOODED & SWAMP FOREST

M310. Southeastern North American Ruderal Flooded & Swamp Forest

G762. SOUTHEASTERN EXOTIC RUDERAL FLOODED & SWAMP FOREST

Group Summary Description: These forests occupy wetland sites which may not have been subject to anthropogenic disturbance but have become dominated by invasive exotic trees such as *Triadica sebifera, Schinus terebinthifolius*, and *Melaleuca quinquenervia*. Other invasive exotic trees and shrubs may be common, such as *Ligustrum sinense*.

A3339 *Triadica sebifera - Melaleuca quinquenervia - Schinus terebinthifolius* Ruderal Flooded & Swamp Forest Alliance

Chinese Tallow - Punktree - Brazilian Peppertree Ruderal Flooded & Swamp Forest Alliance
Southern Exotic Ruderal Flooded & Swamp Forest

ALLIANCE CONCEPT

Summary: These warm temperate wetland forests and woodlands of floodplains, riparian areas, depressions, and wet flats are dominated by exotic trees, such as *Triadica sebifera, Melaleuca quinquenervia*, or *Schinus terebinthifolius*. These introduced trees have spread and come to dominate or codominate wetlands in the southern and southeastern United States. There are a variety of other ruderal native and exotic trees which may occur in these wetlands.
Classification Comments: This alliance could be divided further based on HGM criteria, such as depression, flats, and riverine wetlands dominated by exotic species. However, it is not clear that HGM-based alliances would be supported based upon the floristics of the vegetation. *Schinus terebinthifolius*-dominated communities are known from the vicinity of Corpus Christi, Texas, and south along the coast.
Similar Alliances:

- *Acer rubrum - Liriodendron tulipifera* Ruderal Flooded & Swamp Forest Alliance (A3343) is a deciduous native ruderal wetland forest.

- *Pinus taeda - Liquidambar styraciflua* Ruderal Flooded & Swamp Forest Alliance (A3345) is a mixed evergreen-deciduous native ruderal wetland forest.

Diagnostic Characteristics: Wetland forest and woodlands of the southern and southeastern United States which are dominated by exotic tree species.

Related Concepts:

- Brazilian Pepper - Guava Forest (Hilsenbeck et al. 1979) **?**
- Brazilian Pepper Monoculture (Hilsenbeck et al. 1979) **?**
- Saltbush - Brazilian Pepper Community (Hilsenbeck et al. 1979) **?**

ALLIANCE DESCRIPTION

Environment: This community occurs in a variety of hydrologic conditions, especially shallow seasonally flooded wetlands with mean hydroperiods of 75-240 days.

Vegetation: These wetlands are dominated by exotic trees, such as *Triadica sebifera, Melaleuca quinquenervia*, or *Schinus terebinthifolius*. Other wetland trees may be present, including *Acer rubrum, Salix nigra*, and *Salix caroliniana*. Some exotics more typical of uplands can also occur in these ruderal wetlands, including *Albizia julibrissin, Broussonetia papyrifera, Cinnamomum camphora, Melia azedarach*, and *Morus alba*. On southern Florida's abandoned farmland, *Schinus terebinthifolius* often codominates with various woody species, including the exotics *Psidium guajava* and *Cestrum diurnum*, and natives including *Baccharis halimifolia, Ficus aurea, Ilex cassine, Persea palustris*, and *Salix caroliniana*. In more open stands of *Melaleuca quinquenervia* in southern Florida, *Cladium mariscus ssp. jamaicense* may be an herbaceous stratum dominant.

Physiognomy and Structure: Forests and tall shrublands (>5 m) of this alliance can be extremely dense. Shade and perhaps allelopathic factors limit the presence of other vascular plants.

Floristics: These wetlands are dominated by exotic trees, such as *Triadica sebifera, Melaleuca quinquenervia*, or *Schinus terebinthifolius*. Other wetland trees may be present, including *Acer rubrum, Salix nigra*, and *Salix caroliniana*. Some exotics more typical of uplands can also occur in these ruderal wetlands, including *Albizia julibrissin, Broussonetia papyrifera, Cinnamomum camphora, Melia azedarach*, and *Morus alba*. On southern Florida's abandoned farmland, *Schinus terebinthifolius* often codominates with various woody species, including the exotics *Psidium guajava* and *Cestrum diurnum*, and natives including *Baccharis halimifolia, Ficus aurea, Ilex cassine, Persea palustris*, and *Salix caroliniana*. In more open stands of *Melaleuca quinquenervia* in southern Florida, *Cladium mariscus ssp. jamaicense* may be an herbaceous stratum dominant.

Dynamics: This exotic vegetation is a target of suppression and control efforts in portions of the southern United States. These exotic trees disperse and spread easily. *Melaleuca quinquenervia* is tolerant of fire.

ALLIANCE DISTRIBUTION

Range: This alliance is found in warm temperate areas of the south-central and southeastern United States, from South Carolina to Florida, and west to Arkansas and Texas.

Nations: US

Subnations: AL, AR, FL, GA, LA, MS, NC?, SC, TN?, TX

Alliance Sources

References: Alexander and Crook 1984, Duever et al. 1986, Ewel 1986, Faber-Langendoen et al. 2017b*, Hilsenbeck et al. 1979, Loope et al. 1994, Myers 1983, Myers 1984, Olmsted and Loope 1984

Author of Concept: Faber-Langendoen et al. 2017b

Author of Description: C. Nordman, in Faber-Langendoen et al. (2013)

[CEGL007412] *Triadica sebifera* Ruderal Wet Forest

Translated Name: **Chinese Tallow Ruderal Wet Forest**
Common Name: **Ruderal Chinese Tallow Wet Forest**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	Southeastern North American Flooded & Swamp Forest (1.B.3.Nb)
Macrogroup	Southeastern North American Ruderal Flooded & Swamp Forest (M310)
Group	Southeastern Exotic Ruderal Flooded & Swamp Forest (G762)
Alliance	*Triadica sebifera - Melaleuca quinquenervia - Schinus terebinthifolius* Ruderal Flooded & Swamp Forest Alliance (A3339)

ELEMENT CONCEPT

Global Summary: This wetland forest type is broadly defined to cover a variety of sites strongly dominated by the exotic tree *Triadica sebifera (= Sapium sebiferum)* (Euphorbiaceae). Other wetland trees may be present, including *Acer rubrum var. drummondii, Salix nigra*, and *Salix caroliniana*. Various wetland grasses, sedges, and forbs are present.

ENVIRONMENTAL DESCRIPTION

Jean Lafitte National Historical Park and Preserve Environment: This community occurs on lower elevation (wetter) spoil banks.

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: This community is dominated by *Triadica sebifera*. Common associates include *Acer rubrum, Salix nigra, Baccharis halimifolia, Solidago sempervirens, Eleocharis* spp., *Polygonum hydropiperoides*, and the non-native *Alternanthera philoxeroides*.
Global Vegetation: Stands are strongly dominated by the exotic tree *Triadica sebifera (= Sapium sebiferum)* (Euphorbiaceae). Other wetland trees may be present including *Acer rubrum var. drummondii, Salix nigra*, and *Salix caroliniana*. Various wetland grasses, sedges, and forbs are present.

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*, *Triadica sebifera*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Baccharis halimifolia*, *Salix nigra*
Herb (field)	Flowering forb	*Alternanthera philoxeroides*, *Polygonum hydropiperoides*, *Solidago sempervirens*
Herb (field)	Graminoid	*Eleocharis* spp.

Global

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Triadica sebifera*

CHARACTERISTIC SPECIES

Jean Lafitte National Historical Park and Preserve: *Acer rubrum*, *Alternanthera philoxeroides*, *Baccharis halimifolia*, *Eleocharis* spp., *Polygonum hydropiperoides*, *Salix nigra*, *Solidago sempervirens*, *Triadica sebifera*
Global: *Triadica sebifera*

OTHER NOTEWORTHY SPECIES

Jean Lafitte National Historical Park and Preserve: Invasive/Exotic Plants: *Alternanthera philoxeroides* (Medium), *Triadica sebifera* (High)
Global: Invasive/Exotic Plants: *Triadica sebifera* (High)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (invasive) (22-Nov-1997).

RELATED CONCEPTS

Global Related Concepts:

- *Sapium* dominated forest (Nijjer et al. 2007) =

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Jean Lafitte National Historical Park and Preserve Classification Comments: This vegetation was identified during a cluster analysis of 159 plots from Jean Lafitte National Historical Park and Preserve, Louisiana. This vegetation is described from 6 plots that formed a fairly distinctive group in cluster analysis. Homoteneity (0.667) and Bray-Curtis Similarity (0.447) were moderate within the group of plots.

ELEMENT DISTRIBUTION

Jean Lafitte National Historical Park and Preserve Range: This community occurs on lower elevation (wetter) spoil banks.
Global Range: This association is found in the southeastern coastal plains of the United States, from South Carolina to Texas. It has been documented from the states of Alabama, Florida, Georgia, Louisiana, Mississippi, South Carolina, and Texas.
Nations: US
States/Provinces: AL, FL, GA, LA, MS, SC, TX
TNC Ecoregions: 31:C, 40:C, 41:P, 53:C, 56:C
USFS Ecoregions (1994/95): 231E:CC, 231Fa:CCC, 231Fb:CCC, 232Ce:CCC, 232Dc:CCC, 232Ea:CCC, 232Eb:CCC, 255Da:CCC, 255Db:CCP, 255Dc:CCC
Federal Lands: NPS (Big Thicket, Jean Lafitte, Natchez Trace, Timucuan?); USFWS (Anahuac, Bon Secour, Brazoria)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Inventory Notes: Plot data were collected by a number of different observers. Data for this analysis and analytical assistance were provided by NPS.
Jean Lafitte National Historical Park and Preserve Plots: LE1a, LE6a, LE8a, Levee3a, Levee4a, Levee5a.
Jean Lafitte National Historical Park and Preserve Description Author(s): J. Teague
Global Description Author(s): A.S. Weakley
References: Nijjer et al. 2007, Southeastern Ecology Working Group n.d.*

G553. SOUTHEASTERN NATIVE RUDERAL FLOODED & SWAMP FOREST

Group Summary Description: This forest group represents vegetation growing on wetland sites which have been subjected to anthropogenic disturbance and are dominated by native trees which are characteristic of disturbed wetland sites, such as *Acer rubrum, Celtis laevigata, Liquidambar styraciflua, Liriodendron tulipifera*, and *Pinus taeda*. Managed tree plantations are not included here, except for planted stands which are not managed and have become mixed with other trees. This group does not include stands managed as monocultures of one tree species, for forestry or in orchards. Wetland forests are subject to natural disturbances such as flooding, tornados, and hurricanes. Successional forests in functioning natural landscapes may regenerate following natural disturbances; those forests are not considered ruderal and are not included here.

A3343 *Acer rubrum - Liriodendron tulipifera* Ruderal Flooded & Swamp Forest Alliance

Red Maple - Tuliptree Ruderal Flooded & Swamp Forest Alliance

Southern Native Ruderal Flooded & Swamp Forest

ALLIANCE CONCEPT

Summary: These broad-leaved deciduous forests are successional or ruderal and occur in wetlands, bottomlands, and temporarily or seasonally flooded riparian areas. They are dominated by trees such as *Acer rubrum, Liriodendron tulipifera, Liquidambar styraciflua, Nyssa biflora*, and on wetter sites *Fraxinus pennsylvanica, Salix nigra*, and even *Taxodium distichum* in areas which have long hydroperiods. Exotic trees can be present, but are not dominant in these ruderal wetlands, including *Albizia julibrissin, Melia azedarach, Morus alba*, and in the Gulf Coastal Plain *Triadica sebifera*. A shrub midstory is typical, mostly of broad-leaved, deciduous shrubs. In general there are more broad-leaved, evergreen shrubs further south and closer to the coast. *Morella cerifera* is a very common nitrogen-fixing shrub in the Southern Coastal Plain. Herbaceous species are sparse, but can include certain ferns, graminoids and forbs. Understory exotic plants (of various growth forms) such as *Ligustrum sinense, Lonicera japonica*, and *Microstegium vimineum* commonly occur in forests of this alliance. This alliance occurs in the south-central and southeastern United States. The many different kinds of sites have varied duration and depth of flooding.

Classification Comments: These deciduous forests are separated from wetland and floodplain pine - mixed hardwood ruderal forests.

Similar Alliances:

- *Liquidambar styraciflua - Fraxinus pennsylvanica - Acer rubrum* Flooded & Swamp Forest Alliance (A3625) is a natural, not ruderal alliance.
- *Pinus taeda - Liquidambar styraciflua* Ruderal Flooded & Swamp Forest Alliance (A3345) is codominated by *Pinus taeda* or *Pinus elliottii var. elliottii*.
- *Quercus laurifolia - Quercus phellos - Pinus taeda* Coastal Plain Riparian Forest Alliance (A3628) is a natural wetland forest codominated by *Pinus taeda*, which occurs along streams.
- *Triadica sebifera - Melaleuca quinquenervia - Schinus terebinthifolius* Ruderal Flooded & Swamp Forest Alliance (A3339) is dominated by exotic trees, not native to the southern U.S.

Similar Alliance Comments: This ruderal wetland forest vegetation is not codominated by *Pinus taeda* or *Pinus elliottii var. elliottii* and is not dominated by exotic trees.

Diagnostic Characteristics: These wetland and bottomland ruderal successional forests are broad-leaved deciduous and are dominated by trees such as *Acer rubrum, Liriodendron tulipifera, Liquidambar styraciflua, Nyssa biflora*, and on wetter sites *Fraxinus pennsylvanica, Salix nigra*, and even *Taxodium distichum* in areas which have long hydroperiods.

Related Concepts:

- Sweetgum - Yellow Poplar 87 (Eyre 1980) =

ALLIANCE DESCRIPTION

Environment: These forests are successional or ruderal and occur in wetlands, bottomlands, and temporarily or seasonally flooded riparian areas. The many different kinds of sites have varied duration and depth of flooding.

Vegetation: These ruderal successional forests are broad-leaved deciduous and are dominated by trees such as *Acer rubrum, Liriodendron tulipifera, Liquidambar styraciflua, Nyssa biflora*, and on wetter sites *Fraxinus pennsylvanica, Salix nigra*, and even *Taxodium distichum* in areas which have long hydroperiods. Other common tree species include *Acer negundo, Arundinaria gigantea ssp. gigantea, Betula nigra, Cornus florida, Ilex opaca, Magnolia virginiana, Morus rubra, Platanus occidentalis, Populus deltoides, Populus heterophylla, Quercus laurifolia, Quercus michauxii, Quercus pagoda*, and *Salix caroliniana*. Exotic trees can be present, but are not dominant in these ruderal wetlands, including *Albizia julibrissin, Melia azedarach, Morus alba*, and in the Gulf Coastal Plain *Triadica sebifera*. A shrub midstory is typical, mostly of broad-leaved deciduous shrubs. In general there are more broad-leaved evergreen shrubs further south and closer to the coast. *Morella cerifera* is a very common nitrogen-fixing shrub in the Southern Coastal Plain. Other shrubs of this alliance include *Asimina triloba, Clethra alnifolia, Lindera benzoin, Persea palustris, Vaccinium elliottii, Vaccinium formosum*, and *Vaccinium fuscatum*. Native lianas include *Bignonia capreolata, Campsis radicans, Smilax bona-nox, Smilax rotundifolia, Smilax glauca, Toxicodendron radicans ssp. radicans*, and *Vitis* spp. Herbaceous species are sparse, but can include the ferns *Asplenium platyneuron, Botrychium virginianum, Ophioglossum vulgatum, Osmunda cinnamomea, Osmunda regalis var. spectabilis, Polystichum acrostichoides*, and *Woodwardia virginica*. Graminoids and forbs may also be present and are more abundant in canopy gaps or following disturbance such as windthrow or logging. Understory exotic plants (of various growth forms) such as *Ligustrum sinense, Lonicera japonica*, and *Microstegium vimineum* commonly occur in forests of this alliance.

Physiognomy and Structure: These are broad-leaved deciduous forests.

Floristics: These ruderal successional forests are broad-leaved deciduous and are dominated by trees such as *Acer rubrum, Liriodendron tulipifera, Liquidambar styraciflua, Nyssa biflora*, and on wetter sites *Fraxinus pennsylvanica, Salix nigra*, and even *Taxodium distichum* in areas which have long hydroperiods. Other common tree species include *Acer negundo, Arundinaria gigantea ssp. gigantea, Betula nigra, Cornus florida, Ilex opaca, Magnolia virginiana, Morus rubra, Platanus occidentalis, Populus deltoides, Populus heterophylla, Quercus laurifolia, Quercus michauxii, Quercus pagoda*, and *Salix caroliniana*. Exotic trees can be present, but are not dominant in these ruderal wetlands, including *Albizia julibrissin, Melia azedarach, Morus alba*, and in the Gulf Coastal Plain *Triadica sebifera*. A shrub midstory is typical, mostly of broad-leaved deciduous shrubs. In general there are more broad-leaved evergreen shrubs further south and closer to the coast. *Morella cerifera* is a very common nitrogen-fixing shrub in the Southern Coastal Plain. Other shrubs of this alliance include *Asimina triloba, Clethra alnifolia, Lindera benzoin, Persea palustris, Vaccinium elliottii, Vaccinium formosum*, and *Vaccinium fuscatum*. Native lianas include *Bignonia capreolata, Campsis radicans, Smilax bona-nox, Smilax rotundifolia, Smilax glauca, Toxicodendron radicans ssp. radicans*, and *Vitis* spp. Herbaceous species are sparse, but can include the ferns *Asplenium platyneuron, Botrychium virginianum, Ophioglossum vulgatum, Osmunda cinnamomea, Osmunda regalis var. spectabilis, Polystichum acrostichoides*, and *Woodwardia virginica*. Graminoids and forbs may also be present and are more abundant in canopy gaps or following disturbance such as windthrow or logging. Understory exotic plants (of various growth forms) such as *Ligustrum sinense, Lonicera japonica*, and *Microstegium vimineum* commonly occur in forests of this alliance.

Dynamics: These forests are successional or ruderal and occur in wetlands, bottomlands, and temporarily or seasonally flooded riparian areas. The sites where it occurs have a history of disturbance, such as bottomland old fields, bottomlands and floodplains that have been cut over in the past, former impoundments, and other successional bottomland or floodplain sites. Beaver activity may be a driver of the vegetation dynamics at sites where beavers occur, especially outside the range of alligators.

ALLIANCE DISTRIBUTION

Range: This alliance is found in warm temperate areas in the south-central and southeastern United States, from New Jersey south to Florida, and west to Arkansas, Oklahoma, and Texas.
Nations: US
Subnations: AL, AR, DC, FL, GA, KY, LA, MD, MS, NC, NJ, OK, SC, TN, VA, WV
Alliance Sources
References: Eyre 1980, Faber-Langendoen et al. 2017b*
Author of Concept: Faber-Langendoen et al. 2017b
Author of Description: C. Nordman, in Faber-Langendoen et al. (2013)

[CEGL007437] *Salix nigra / Morella cerifera* Ruderal Wet Forest

Translated Name: **Black Willow / Wax-myrtle Ruderal Wet Forest**
Common Name: **Ruderal Black Willow / Wax-myrtle Wet Forest**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	Southeastern North American Flooded & Swamp Forest (1.B.3.Nb)
Macrogroup	Southeastern North American Ruderal Flooded & Swamp Forest (M310)
Group	Southeastern Native Ruderal Flooded & Swamp Forest (G553)
Alliance	*Acer rubrum - Liriodendron tulipifera* Ruderal Flooded & Swamp Forest Alliance (A3343)

ELEMENT CONCEPT

Global Summary: This *Salix nigra* swamp forest is documented near Lake Pontchartrain, Louisiana, and probably occurs in other parts of the outer coastal plains, including the deltaic plain. It is composed of a nearly pure willow canopy and dense shrub layer dominated by *Morella cerifera (= Myrica cerifera)*. This community is apparently the result of cutting and alteration of former *Taxodium distichum* swamps.

ENVIRONMENTAL DESCRIPTION

Jean Lafitte National Historical Park and Preserve Environment: This community is apparently the result of cutting and alteration of former *Taxodium distichum* swamps.
Global Environment: This community is apparently the result of cutting and alteration of former *Taxodium distichum* swamps.

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: This association has a nearly pure canopy of *Salix nigra* and a dense shrub layer dominated by *Morella cerifera (= Myrica cerifera)*.
Global Vegetation: This association has a nearly pure canopy of *Salix nigra* and a dense shrub layer dominated by *Morella cerifera (= Myrica cerifera)*.
Global Dynamics: This community is apparently the result of cutting and alteration of former *Taxodium distichum* swamps.

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Salix nigra*
Short shrub/sapling	Broad-leaved evergreen shrub	*Morella cerifera*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Salix nigra*
Short shrub/sapling	Broad-leaved evergreen shrub	*Morella cerifera*

CHARACTERISTIC SPECIES

Jean Lafitte National Historical Park and Preserve: *Morella cerifera, Salix nigra*
Global: *Morella cerifera, Salix nigra*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (14-Feb-2001). This is a successional forest, which occurs as a result of clearcut logging of forests dominated by other more valuable timber species. Stands of this vegetation are not conservation targets in their own right, but may have value as sites for restoration of *Taxodium distichum* swamps.

RELATED CONCEPTS

Global Similar Types:

- *Salix nigra / (Clethra alnifolia, Morella cerifera) / Nyssa aquatica* Ruderal Wet Forest (CEGL007411) a more widespread type.

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak

ELEMENT DISTRIBUTION

Global Range: This *Salix nigra* swamp forest is documented near Lake Pontchartrain, Louisiana, and probably occurs in other parts of the outer coastal plains, including the deltaic plain.
Nations: US
States/Provinces: LA
TNC Ecoregions: 31:?, 41:?, 42:C
USFS Ecoregions (1994/95): 232Eb:CPP, 234A:CC
Federal Lands: NPS (Jean Lafitte?)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Plots: JELA_AA_0062.
Jean Lafitte National Historical Park and Preserve Description Author(s): M. Pyne
Global Description Author(s): A.S. Weakley, L.M. Smith, M. Pyne
References: LNHP 2009, Southeastern Ecology Working Group n.d.*

[CEPS006671] Disturbed Woody Wetland [Park Special]

Translated Name: **Disturbed Woody Wetland**
Common Name: **Disturbed Woody Wetland**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	Southeastern North American Flooded & Swamp Forest (1.B.3.Nb)
Macrogroup	Southeastern North American Ruderal Flooded & Swamp Forest (M310)
Group	Southeastern Native Ruderal Flooded & Swamp Forest (G553)
Alliance	*Acer rubrum - Liriodendron tulipifera* Ruderal Flooded & Swamp Forest Alliance (A3343)

ELEMENT CONCEPT

Global Summary: This type is a conceptual placeholder, designed only to act as a provisional type for vegetation complexes, ruderal or early-successional vegetation, and other types that cannot be reliably classified. It is created to facilitate regularized local land unit mapping of a managed area and to provide a standard label for polygons in a vegetation map. It includes successional shrublands and woodlands of disturbed floodplains, seepage wetlands, and artificial impoundments (including impoundments due to beaver activity). They are typically dominated by *Salix nigra, Populus deltoides, Alnus serrulata*, and/or *Cephalanthus occidentalis*. Standing snags of dead or dying trees are often present.

ENVIRONMENTAL DESCRIPTION

VEGETATION DESCRIPTION

MOST ABUNDANT SPECIES

CHARACTERISTIC SPECIES

Global:

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (modified/managed) (9-Dec-2008).

RELATED CONCEPTS

CLASSIFICATION

Status: Nonstandard
Classification Confidence:
Global Classification Comments: Also called Successional Woody Wetland.

ELEMENT DISTRIBUTION

Nations: US
States/Provinces: DC, LA, VA
TNC Ecoregions:
Federal Lands: NPS (C&O Canal, Catoctin Mountain, George Washington Parkway, Harpers Ferry, Jean Lafitte, Manassas, National Capital-East, Prince William)

ELEMENT SOURCES

Global Description Author(s):
References: Eastern Ecology Working Group n.d.*

M031. Southern Coastal Plain Floodplain Forest

G033. BALD-CYPRESS - TUPELO FLOODPLAIN FOREST

Group Summary Description: This wetland forest group is primarily affiliated with the Atlantic and Gulf coastal plains from southeastern Virginia (rarely north into the Chesapeake Bay) to Texas, portions of the adjacent Piedmont and interior regions, and the Mississippi River Alluvial Plain and adjacent Upper East Gulf Coastal Plain from southern Illinois, western Kentucky and southeastern Missouri, south to the Gulf of Mexico, and west in the coastal plains of Louisiana and Texas. Dominant and characteristic trees are *Taxodium distichum* (and occasionally *Taxodium ascendens*) and *Nyssa aquatica* (and occasionally *Nyssa biflora*). These are generally known as "Bald-Cypress - Tupelo Forests." Both *Taxodium distichum* and *Nyssa aquatica* are primarily, if not entirely, found in the coastal plains. Their ranges are not entirely congruent, with *Nyssa aquatica* being more limited. So, vegetation may be dominated by either or both of these characteristic species (and occasionally including *Taxodium ascendens* and/or *Nyssa biflora* as noted above). Also included here are embedded patches of smaller trees, including *Forestiera acuminata, Itea virginica*, and *Planera aquatica*, as well as *Cephalanthus occidentalis*, which can range in lifeform from small tree to shrub. These are usually smaller-patch features embedded within larger-patch (and taller stature) bald-cypress - tupelo forests. The basis of this group is floristic rather than purely hydrologic. This group primarily encompasses communities of streams and rivers of all orders and sizes, including some (or most) tidal forests. Stands are typically flooded for periods of up to 3 months, but not during the growing season. Stands are mainly from low bottomlands, depressions, sloughs and abandoned channel segments, and are not typically affiliated with elevated features such as riverfronts, point bars, natural levees, high bottomlands, levees, ridges, and upper terraces. This group includes forests known as "blackwater" as well as "brownwater" examples, as well as several tidally flooded associations. Isolated wetlands such as depression ponds dominated by *Taxodium* are excluded.

A3592 *Acer rubrum - Gleditsia aquatica - Fraxinus profunda* Swamp Forest Alliance

Red Maple - Water-locust - Pumpkin Ash Swamp Forest Alliance
Mississippi River Alluvial Plain Maple - Ash Swamp Forest

ALLIANCE CONCEPT

Summary: This bottomland forest vegetation is found in the Mississippi River Alluvial Plain of the United States and adjacent riverine areas. Stands are dominated by a combination of *Acer rubrum, Gleditsia aquatica*, and *Fraxinus profunda*. In addition, *Acer saccharinum, Liquidambar styraciflua, Quercus bicolor, Quercus lyrata*, and *Ulmus rubra* may occur as well. The shrub layer can include a diverse mixture, including *Cephalanthus occidentalis, Forestiera acuminata*, and *Ilex decidua*, but *Itea virginica* is characteristic. The herbaceous layer is usually well-developed, displaying a preponderance of plant species of bottomland habitats, including *Boehmeria cylindrica, Carex* spp., *Glyceria* spp., *Juncus* spp., *Laportea canadensis, Leersia* spp., and *Pilea pumila*. *Vitis* spp. are characteristic vines of this community, but *Toxicodendron radicans* and *Campsis radicans* are also prominent. Stands occur on the seasonally flooded bottomlands along rivers and large streams. Soils which support this forest are predominantly medium- and fine-textured, level or nearly level soils that formed in water-deposited clayey, slowly permeable, alluvial sediments in slackwater areas of floodplains. The water regime is characterized by seasonal shallow flooding, although hydrologic conditions are often extremely variable.
Similar Alliances:

- *Pascopyrum smithii* Wet Meadow Alliance (A3597)

Similar Alliance Comments: Within this group, this alliance is of distinctive composition, not having *Taxodium* or *Nyssa* as typical dominants.
Diagnostic Characteristics: These forests of the south-central United States have *Gleditsia aquatica* and *Fraxinus profunda* as characteristic and usually dominant components.
Rationale for Nominal Species or Physiognomic Features: *Gleditsia aquatica* and *Fraxinus profunda* as characteristic and usually dominant components.
Related Concepts:

- *Acer rubrum - Nyssa aquatica* forest (Robertson et al. 1984) **?**
- *Acer rubrum* forest alliance (Hoagland 1998a) **?**
- Bottomland hardwood swamp (Evans 1991) **><**
- Depression swamp (Evans 1991) **><**
- Floodplain Forest (FNAI 1992a) **?**
- Floodplain Forest, Overcup Oak/Water Hickory Flat subtype (FNAI 1992b) **?**
- IIA5a. Overcup Oak - Water Hickory Bottomland Forest (Allard 1990) **?**
- Overcup Oak - Water Hickory: 96 (Eyre 1980) **><**
- Overcup Oak / *Justicia* Clayey/Loamy Seasonally Flooded Low River Floodplains (Turner et al. 1999) **?**
- Overcup Oak Forest (Foti 1994b) **?**
- Overcup Oak Series (Diamond 1993) **><**
- P1B3cI. *Quercus lyrata* (Foti et al. 1994) **><**
- P1B3cI4a. *Quercus lyrata - Quercus nuttallii (= Q. texana) - Liquidambar styraciflua* (Foti et al. 1994) **?**
- P1B3cVII14b. *Quercus phellos - Quercus palustris - Quercus lyrata* (Foti et al. 1994) **?**
- Red maple-green ash (Wharton et al. 1982) **?**

ALLIANCE DESCRIPTION

Environment: Sites which support stands of this alliance have level or nearly level soils that formed in water-deposited clayey or loamy sediments on low, wet, seasonally flooded floodplains of the Mississippi and other rivers, as well as large perennial streams in the Gulf Coastal Plain. These soils are deep, fine- to very fine-textured (clays) of the Orders Ultisol and Vertisol and have excessive moisture available for vegetation during the growing season (hydric). Sites are flooded or saturated for a significant portion of the growing season, and water may be ponded for most of the year in shallow depressions. Flooding can reach 1 m (Robertson et al. 1984). Flooding occurs during the winter and spring and often extends into the growing season. Occasional prolonged deep flooding causes increased tree mortality, creating openings which are quickly recolonized after the water recedes (Johnson and Bell 1976).
Vegetation: Stands are dominated by a combination of *Acer rubrum, Gleditsia aquatica*, and *Fraxinus profunda*. In addition *Liquidambar styraciflua, Quercus bicolor, Quercus lyrata*, and *Ulmus rubra* may occur as well. *Populus heterophylla* is an uncommon associate and *Quercus texana* may occur within its range. *Carya aquatica* is more likely to be abundant or dominant in the wetter sites. Other canopy species commonly encountered include *Acer saccharinum, Celtis laevigata, Diospyros virginiana, Fraxinus profunda, Liquidambar styraciflua, Planera aquatica, Quercus bicolor, Quercus laurifolia, Quercus lyrata, Quercus michauxii, Quercus palustris, Quercus phellos, Taxodium distichum*, and *Ulmus americana*. The individuals of *Quercus* spp. are generally of medium height, while *Liquidambar styraciflua* may reach 45 m in height with tall, straight trunks which are clear of branches for much of their height. The understory is well-developed (75-100%) and dominated by *Crataegus viridis* and *Ulmus americana*. Other common understory and shrub associates include *Carpinus caroliniana, Cephalanthus occidentalis, Cornus foemina (= Cornus stricta), Crataegus viridis, Forestiera acuminata, Ilex decidua*, and *Itea virginica*, with *Itea virginica* being characteristic. Vines are often quite dense and include *Brunnichia ovata (= Brunnichia cirrhosa), Campsis radicans, Toxicodendron radicans*, and *Vitis palmata*. Species composition and density of the herbaceous stratum vary with geography and frequency of flooding. Commonly encountered herbaceous species include *Acmella oppositifolia var. repens (= Spilanthes americana), Boehmeria cylindrica, Carex intumescens, Carex joorii, Diodia virginiana, Gratiola virginiana, Justicia ovata, Laportea canadensis,*

Leersia lenticularis, Lobelia cardinalis, Ludwigia palustris, Mikania scandens, Onoclea sensibilis, Ophioglossum vulgatum, Penstemon alluviorum, Pilea pumila, Saururus cernuus, and *Symphyotrichum lateriflorum (= Aster lateriflorus)*.

Physiognomy and Structure: These are closed-canopy forests that can develop considerable stature (over 40 m in height), with generally well-developed understory and shrub strata, and well-developed herbaceous strata dominated by plant species of bottomland habitats.

Floristics: Stands are dominated by a combination of *Acer rubrum, Gleditsia aquatica*, and *Fraxinus profunda*. In addition *Liquidambar styraciflua, Quercus bicolor, Quercus lyrata*, and *Ulmus rubra* may occur as well. *Populus heterophylla* is an uncommon associate and *Quercus texana* may occur within its range. *Carya aquatica* is more likely to be abundant or dominant in the wetter sites. Other canopy species commonly encountered include *Acer saccharinum, Celtis laevigata, Diospyros virginiana, Fraxinus profunda, Liquidambar styraciflua, Planera aquatica, Quercus bicolor, Quercus laurifolia, Quercus lyrata, Quercus michauxii, Quercus palustris, Quercus phellos, Taxodium distichum*, and *Ulmus americana*. The individuals of *Quercus* spp. are generally of medium height, while *Liquidambar styraciflua* may reach 45 m in height with tall, straight trunks which are clear of branches for much of their height. The understory is well-developed (75-100%) and dominated by *Crataegus viridis* and *Ulmus americana*. Other common understory and shrub associates include *Carpinus caroliniana, Cephalanthus occidentalis, Cornus foemina (= Cornus stricta), Crataegus viridis, Forestiera acuminata, Ilex decidua*, and *Itea virginica*, with *Itea virginica* being characteristic. Vines are often quite dense and include *Brunnichia ovata (= Brunnichia cirrhosa), Campsis radicans, Toxicodendron radicans*, and *Vitis palmata*. Species composition and density of the herbaceous stratum vary with geography and frequency of flooding. Commonly encountered herbaceous species include *Acmella oppositifolia var. repens (= Spilanthes americana), Boehmeria cylindrica, Carex intumescens, Carex joorii, Diodia virginiana, Gratiola virginiana, Justicia ovata, Laportea canadensis, Leersia lenticularis, Lobelia cardinalis, Ludwigia palustris, Mikania scandens, Onoclea sensibilis, Ophioglossum vulgatum, Penstemon alluviorum, Pilea pumila, Saururus cernuus*, and *Symphyotrichum lateriflorum (= Aster lateriflorus)*.

Alliance Distribution

Range: Vegetation of this alliance is found primarily in the Mississippi River Alluvial Plain from Illinois south to Mississippi and Louisiana, as well as in riverine areas of the Interior Low Plateau of Kentucky, the Ozarks of Arkansas and Missouri, and possibly the West Gulf Coastal Plain of Texas.

Nations: US

Subnations: AR, IL, IN?, KY, LA, MO, MS, TN?, TX

TNC Ecoregions: 38:C, 39:?, 40:?, 41:?, 42:C, 43:C, 44:C

ALLIANCE SOURCES

References: Allard 1990, Campbell and Grubbs 1992, Diamond 1993, Evans 1991, Eyre 1980, FNAI 1992a, FNAI 1992b, Faber-Langendoen et al. 2017b*, Foti 1994b, Foti et al. 1994, Hoagland 1998a, Johnson and Bell 1976, Klimas 1988b, Robertson et al. 1984, Turner et al. 1999, Wharton et al. 1982

Author of Concept: Faber-Langendoen et al. 2017b

Author of Description: M. Pyne, in Faber-Langendoen et al. (2013)

[CEGL007229] *Acer rubrum* - (*Fraxinus profunda*) / Sabal minor Swamp Forest

Translated Name: **Red Maple - (Pumpkin Ash) / Dwarf Palmetto Swamp Forest**

Common Name: **Mississippi River Delta Levee Backslope Red Maple - Pumpkin Ash / Dwarf Palmetto Swamp Forest**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	Southeastern North American Flooded & Swamp Forest (1.B.3.Nb)
Macrogroup	Southern Coastal Plain Floodplain Forest (M031)
Group	Bald-cypress - Tupelo Floodplain Forest (G033)
Alliance	*Acer rubrum - Gleditsia aquatica - Fraxinus profunda* Swamp Forest Alliance (A3592)

ELEMENT CONCEPT

Global Summary: This is a short-statured swamp forest occurring at the transition from upland to swamp along the coast of Louisiana in the Mississippi River delta. The canopy is dominated by *Acer rubrum var. drummondii* and *Fraxinus profunda*. Associated trees include *Fraxinus pennsylvanica, Liquidambar styraciflua, Salix nigra, Quercus nigra*, and *Taxodium distichum*. The understory is dominated by *Sabal minor*. Associated shrubs may include *Cephalanthus occidentalis, Baccharis halimifolia*, and *Morella cerifera*. Herbaceous cover is typically low but may be high in some occurrences. Characteristic species include *Polygonum hydropiperoides, Pontederia cordata, Rhynchospora corniculata, Thelypteris palustris, Hydrocotyle* spp., *Brunnichia ovata*, and the non-native *Alternanthera philoxeroides*. Floating aquatics, including *Lemna obscura* and the non-native *Salvinia minima*, may occur in some examples. The non-native invasive tree *Triadica sebifera* is also common in this community.

ENVIRONMENTAL DESCRIPTION

Jean Lafitte National Historical Park and Preserve Environment: This swamp forest was documented as the first community encountered as the natural levee transitions to wetland. The wetland it transitions into further downslope is typically either a swamp forest dominated by *Taxodium distichum* and *Nyssa aquatica*, or a freshwater/oligohaline marsh often with an open canopy of *Taxodium distichum* and/or *Morella cerifera*.
Global Environment: This swamp forest was documented at Jean Lafitte National Historical Park and Preserve in the Mississippi River delta as the first community encountered as the natural levee transitions to wetland. The wetland it transitions into further downslope is typically either a swamp forest dominated by *Taxodium distichum* and *Nyssa aquatica*, or a freshwater/oligohaline marsh often with an open canopy of *Taxodium distichum* and/or *Morella cerifera*. *Quercus virginiana* does not easily tolerate regular deep flooding as does *Fraxinus profunda*. As one comes off the natural levee ridge backslope, this is the first community encountered, as the natural levee transitions to a longer hydroperiod wetland. The ridge is wetter now than it used to be; it was higher, but now no longer receives sediment and has subsided. One encounters this vegetation type between the ridge and the deeper *Taxodium distichum - Nyssa aquatica* swamp.

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: The canopy of this short-statured forest is dominated by *Acer rubrum var. drummondii* and *Fraxinus profunda*, both typically multi-stemmed. Associated trees include *Fraxinus pennsylvanica, Liquidambar styraciflua, Salix nigra, Quercus nigra*, and *Taxodium distichum*. Some stands may be very open. The understory cover is variable and frequently dominated by *Sabal minor*. Associated shrubs may include *Cephalanthus occidentalis, Baccharis halimifolia*, and *Morella cerifera*. Herbaceous cover is typically low but may be high in some occurrences. Characteristic species include *Polygonum hydropiperoides (= Persicaria hydropiperoides), Pontederia cordata, Rhynchospora corniculata, Thelypteris palustris, Hydrocotyle* spp., *Brunnichia ovata*, and the non-native *Alternanthera philoxeroides*. *Carex hyalinolepis* may be present in some stands. Floating aquatics, including *Lemna obscura* and the non-native *Salvinia minima*, may also occur in some occurrences. The non-native invasive tree *Triadica sebifera* is also common in this community. Some examples may be very open. More information is needed to determine if the low cover of *Taxodium distichum* in the canopy is a result of past logging, or is due to subsidence and increased hydroperiod, leading to decreased *Taxodium* recruitment.

Global Vegetation: The canopy of this short-statured forest is dominated by *Acer rubrum var. drummondii* and *Fraxinus profunda*, both typically multi-stemmed. Associated trees include *Fraxinus pennsylvanica, Liquidambar styraciflua, Salix nigra, Quercus nigra*, and *Taxodium distichum*. The understory cover is variable and frequently dominated by *Sabal minor*. Associated shrubs may include *Cephalanthus occidentalis, Baccharis halimifolia*, and *Morella cerifera*. Herbaceous cover is typically low but may be high in some occurrences. Characteristic species include *Polygonum hydropiperoides, Pontederia cordata, Rhynchospora corniculata, Thelypteris palustris, Hydrocotyle* spp., *Brunnichia ovata*, and the non-native *Alternanthera philoxeroides*. Floating aquatics, including *Lemna obscura* and the non-native *Salvinia minima*, may also occur in some occurrences. The non-native invasive tree *Triadica sebifera* is also common in this community. Some examples may be very open. More information is needed to determine if the low cover of *Taxodium distichum* in the canopy is a result of past logging, or is due to subsidence and increased hydroperiod, leading to decreased *Taxodium* recruitment.

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*, *Fraxinus pennsylvanica*, *Fraxinus profunda*
Short shrub/sapling	Palm tree	*Sabal minor*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum* var. *drummondii*, *Fraxinus profunda*
Short shrub/sapling	Palm tree	*Sabal minor*

CHARACTERISTIC SPECIES

Jean Lafitte National Historical Park and Preserve: *Acer rubrum*, *Fraxinus profunda*, *Polygonum hydropiperoides*, *Pontederia cordata*
Global: *Acer rubrum* var. *drummondii*, *Fraxinus profunda*, *Polygonum hydropiperoides*, *Pontederia cordata*

OTHER NOTEWORTHY SPECIES

Jean Lafitte National Historical Park and Preserve: Invasive/Exotic Plants: *Alternanthera philoxeroides* (Medium), *Salvinia minima* (), *Triadica sebifera* (High)
Global: Invasive/Exotic Plants: *Alternanthera philoxeroides* (Medium), *Salvinia minima* (), *Triadica sebifera* (High)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (6-Oct-2014).

RELATED CONCEPTS

Global Related Concepts:

- Lower Elevation *Acer rubrum* - *Fraxinus profunda* (Denslow and Battaglia 2002) =

CLASSIFICATION

Status: Provisional
Classification Confidence: 3 - Weak

Jean Lafitte National Historical Park and Preserve Classification Comments: This vegetation was identified during a cluster analysis of 159 plots from Jean Lafitte National Historical Park and Preserve, Louisiana. It is described from 16 plots at Jean Lafitte National Historical Park and Preserve that loosely clustered together. Questions about species identifications, especially for distinguishing *Fraxinus profunda* and *Fraxinus pennsylvanica*, resulted in concerns about the quality of the data and made classification of this community difficult. Both species are included in the description. *Fraxinus profunda* is listed as more tolerant of flooding than *Fraxinus pennsylvanica* (McKnight 1981). Cluster analysis revealed the possibility of two subtypes, but better and more information is needed to describe these possible differences. The presence of this type is also supported by Denslow and Battaglia's (2002) "lower elevation *Acer rubrum* - *Fraxinus profunda*" type. There were no existing communities that resembled this concept present at Jean Lafitte, hence this new association. Another question regarding the classification of this community involves a lack of information about the land-use history of these occurrences. Did some of these occurrences have a higher canopy of *Taxodium distichum* that has since been selectively removed because the trees were more accessible from these swamp edges? *Taxodium distichum* was recorded in the canopy of 8 out of 16 plots classified as this community.
Global Classification Comments: This vegetation was identified during a cluster analysis of 159 plots from Jean Lafitte National Historical Park and Preserve, Louisiana. It is described from 16 plots at Jean Lafitte National Historical Park and Preserve that loosely clustered together. Questions about species identifications, especially for distinguishing *Fraxinus profunda* and *Fraxinus pennsylvanica*, resulted in concerns about the quality of the data and made classification of this community difficult. Both species are included in the description. *Fraxinus profunda* is listed as more tolerant of flooding than *Fraxinus pennsylvanica* (McKnight 1981). Cluster analysis revealed the possibility of two subtypes, but better and more information is needed to describe these possible differences. The presence of this type is also supported by Denslow and Battaglia's (2002) "lower elevation *Acer rubrum* - *Fraxinus profunda*" type. There were no existing communities that resembled this concept present at Jean Lafitte, hence this new association. Another question regarding the classification of this community involves a lack of information about the land-use history of these occurrences. Did some of these occurrences have a higher canopy of *Taxodium distichum* that has since been selectively removed because the trees were more accessible from these swamp edges? *Taxodium distichum* was recorded in the canopy of 8 out of 16 plots classified as this community.

ELEMENT DISTRIBUTION

Jean Lafitte National Historical Park and Preserve Range: This swamp forest was documented as the first community encountered as the natural levee transitioned to wetland.
Global Range: This swamp forest was documented at Jean Lafitte National Historical Park and Preserve in the Mississippi River delta as the first community encountered as the natural levee transitions to wetland.
Nations: US
States/Provinces: LA
TNC Ecoregions: 31:C, 42:C
Federal Lands: NPS (Jean Lafitte)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Inventory Notes: Plot data were collected by a number of different observers. Data for this analysis and analytical assistance were provided by NPS.
Jean Lafitte National Historical Park and Preserve Plots: BAT_1, BAT_2, BAT_J36, FH20a, FH5a, FH9a, FM13a, Forest16, Forest18, Forest20, BAT_NJ12, Plot11, Plot6, Plot8, Plot9, Plot10, JELA_AA_0042.
Jean Lafitte National Historical Park and Preserve Description Author(s): J. Teague and M. Pyne
Global Description Author(s): J. Teague and M. Pyne
References: Denslow and Battaglia 2002, McKnight et al. 1981, Southeastern Ecology Working Group n.d.*

A3594 *Taxodium distichum - Nyssa aquatica - Nyssa biflora* Floodplain Forest Alliance

Bald-cypress - Water Tupelo - Swamp Tupelo Floodplain Forest Alliance

Southern Bald-cypress - Tupelo Floodplain Forest

ALLIANCE CONCEPT

Summary: Examples of this alliance are floodplain forests, with a variety of hydrologic flooding regimes. Stands occur in the Southeastern Coastal Plain from Virginia south to Florida, west to eastern Texas, and in the Mississippi River alluvial valley north to southern Illinois. These forests are dominated by *Taxodium distichum* and usually one or more of the following: *Nyssa aquatica, Nyssa biflora*, and/or *Nyssa ogeche*. Other characteristic woody species include *Acer rubrum, Carya aquatica, Forestiera acuminata, Fraxinus caroliniana, Ilex decidua, Liquidambar styraciflua, Planera aquatica, Populus heterophylla, Quercus laurifolia*, and *Quercus lyrata*. Herbaceous and vine species that may be present include *Ampelopsis arborea, Boehmeria cylindrica, Campsis radicans, Carex bromoides, Carex intumescens, Commelina communis, Hydrocotyle verticillata, Justicia ovata, Leersia lenticularis, Ludwigia palustris, Mikania scandens, Onoclea sensibilis, Phanopyrum gymnocarpon (= Panicum gymnocarpon), Pilea pumila, Saururus cernuus*, and *Smilax tamnoides (= Smilax hispida)*. Stands dominated by *Planera aquatica* and *Forestiera acuminata* are included here rather than being placed in a separate alliance, despite their slightly different stature.

Classification Comments: *Nyssa*-dominated forests are separated from mixed *Nyssa-Taxodium* forests, but are not strictly separated by flooding regime (temporary, seasonal, semipermanent). Description information is primarily from the old alliance *Taxodium distichum - Nyssa (aquatica, biflora, ogeche)* Seasonally Flooded Forest Alliance (A.337). Stands dominated by *Planera aquatica* and *Forestiera acuminata* are included here rather than being placed in a separate alliance, despite their slightly different stature.

Similar Alliances:

Nyssa aquatica Swamp Forest Alliance (A0345)
Nyssa biflora - Nyssa aquatica Floodplain Forest Alliance (A0323)
Taxodium distichum - Nyssa biflora Tidal Swamp Forest Alliance (A3595)
Taxodium distichum Nonriverine Swamp Forest Alliance (A3596)

Similar Alliance Comments: Other *Nyssa* and *Taxodium* forests in this alliance.

Diagnostic Characteristics: These are primarily coastal plain floodplain forests dominated by *Taxodium distichum* and usually one or more of the following: *Nyssa aquatica, Nyssa biflora*, and/or *Nyssa ogeche*. Examples dominated by *Planera aquatica* and *Forestiera acuminata* are also included.

Related Concepts:

- *Forestiera acuminata - Cephalanthus occidentalis* shrubland alliance (Hoagland 1998a) **?**
- Bald Cypress - Water Tupelo Swamp (Wieland 1994b) **?**
- Baldcypress / *Ceratophyllum* Semi-Permanently Flooded Swamps (Turner et al. 1999) ><
- Baldcypress-Water Tupelo Series (Diamond 1993) ><
- Cypress - Tupelo Swamp (Foti 1994b) **?**
- Cypress swamp (Evans 1991) ><
- Cypress/Cypress-Tupelo Swamp (Smith 1996a) ><
- Floodplain Swamp (FNAI 1992a) ><
- Floodplain Swamp, Water Elm Slough subtype (FNAI 1992b) **?**
- Floodplain Swamp, Water Elm/Pop Ash Slough subtype (FNAI 1992b) **?**
- IIA4b. Bald Cypress - Water Tupelo Swamp (Allard 1990) ><
- P1B3dI1b. *Taxodium distichum - Nyssa aquatica* (Foti et al. 1994) **?**
- P4B3cII3a. *Forestiera acuminata* (Foti et al. 1994) **?**
- Palustrine *Taxodium distichum-Nyssa* spp. Series (Pyne 1994) ><
- Shrub Swamp (Foti 1994b) ><

- Water Elm / *Justicia Clayey* Intermittently Exposed Swamps (Turner et al. 1999) **?**

ALLIANCE DESCRIPTION

Environment: Examples of this alliance are floodplain forests, with a variety of hydrologic flooding regimes.
Vegetation: These forests are dominated by *Taxodium distichum* and usually one or more of the following: *Nyssa aquatica, Nyssa biflora*, and/or *Nyssa ogeche*. Other characteristic woody species include *Acer rubrum, Betula nigra, Carya aquatica, Forestiera acuminata, Fraxinus caroliniana, Fraxinus pennsylvanica, Ilex decidua, Liquidambar styraciflua, Planera aquatica, Populus heterophylla, Quercus laurifolia*, and *Quercus lyrata*. Stands dominated by *Planera aquatica* and *Forestiera acuminata* are included here rather than being placed in a separate alliance, despite their slightly different stature. Herbaceous and vine species that may be present include *Ampelopsis arborea, Boehmeria cylindrica, Campsis radicans, Carex bromoides, Carex intumescens, Commelina communis, Hydrocotyle verticillata, Justicia ovata, Leersia lenticularis, Ludwigia palustris, Mikania scandens, Onoclea sensibilis, Phanopyrum gymnocarpon (= Panicum gymnocarpon), Pilea pumila, Saururus cernuus*, and *Smilax tamnoides (= Smilax hispida)*.
Physiognomy and Structure: The canopy layer in these forests often is dense. The subcanopy, shrub and herbaceous layers range from sparse to moderate. Vines will typically be present and may be abundant. Some stands dominated by *Planera aquatica* and *Forestiera acuminata* are included as well.
Floristics: These forests are dominated by *Taxodium distichum* and usually one or more of the following: *Nyssa aquatica, Nyssa biflora*, and/or *Nyssa ogeche*. Other characteristic woody species include *Acer rubrum, Betula nigra, Carya aquatica, Forestiera acuminata, Fraxinus caroliniana, Fraxinus pennsylvanica, Ilex decidua, Liquidambar styraciflua, Planera aquatica, Populus heterophylla, Quercus laurifolia*, and *Quercus lyrata*. Stands dominated by *Planera aquatica* and *Forestiera acuminata* are included here rather than being placed in a separate alliance, despite their slightly different stature. Herbaceous and vine species that may be present include *Ampelopsis arborea, Boehmeria cylindrica, Campsis radicans, Carex bromoides, Carex intumescens, Commelina communis, Hydrocotyle verticillata, Justicia ovata, Leersia lenticularis, Ludwigia palustris, Mikania scandens, Onoclea sensibilis, Phanopyrum gymnocarpon (= Panicum gymnocarpon), Pilea pumila, Saururus cernuus*, and *Smilax tamnoides (= Smilax hispida)*.

ALLIANCE DISTRIBUTION

Range: These forests are found in the Atlantic and Gulf coastal plains from Delaware and Virginia south and west to Texas, with some associations ranging north in the interior to the Ozarks of Arkansas and Missouri and the Interior Low Plateau of southern Indiana.
Nations: US
Subnations: AL, AR, DE, FL, GA, IL, IN, KY, LA, MD, MO, MS, NC, OK, SC, TN, TX, VA
TNC Ecoregions: 31:C, 38:C, 39:C, 40:C, 41:C, 42:C, 43:C, 44:C, 53:C, 56:C, 57:C, 58:C

ALLIANCE SOURCES

References: Allard 1990, Conner and Day 1976, Conner et al. 1981, Diamond 1993, Evans 1991, FNAI 1992a, FNAI 1992b, Faber-Langendoen et al. 2017b*, Foti 1994b, Foti et al. 1994, Hoagland 1998a, Jones et al. 1981b, Martin and Smith 1991, Pyne 1994, Schafale and Weakley 1990, Schneider et al. 1989, Smith 1996a, Turner et al. 1999, Wharton 1978, Wharton et al. 1982, Whipple et al. 1981, Wieland 1994b
Author of Concept: Faber-Langendoen et al. 2017b
Author of Description: M. Pyne, in Faber-Langendoen et al. (2013)

[CEGL002421] ***Taxodium distichum - (Nyssa aquatica) / Forestiera acuminata - Planera aquatica* Floodplain Forest**

Translated Name: **Bald-cypress - (Water Tupelo) / Eastern Swamp-privet - Planertree Floodplain Forest**
Common Name: **Bald-cypress - Water Tupelo Floodplain Forest**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	Southeastern North American Flooded & Swamp Forest (1.B.3.Nb)
Macrogroup	Southern Coastal Plain Floodplain Forest (M031)
Group	Bald-cypress - Tupelo Floodplain Forest (G033)
Alliance	*Taxodium distichum - Nyssa aquatica - Nyssa biflora* Floodplain Forest Alliance (A3594)

ELEMENT CONCEPT

Global Summary: This type represents bald-cypress - water tupelo swamp forests found in the Mississippi River Alluvial Plain and adjacent areas of the Gulf Coastal Plain of the southern United States, apparently extending northeast to the Interior Low Plateau. Stands are characterized by the presence of shallow standing water all or most of the year. The vegetation contains mixed dominants of *Taxodium distichum* and *Nyssa aquatica*. *Taxodium* is often emergent in the overstory above shorter individuals of *Nyssa aquatica*. In some instances *Carya aquatica* and (rarely) *Quercus lyrata* may also be present. Dominant trees exhibit tall, straight growth and swelled buttresses. The subcanopy is sparse, consisting primarily of *Forestiera acuminata, Cephalanthus occidentalis*, and *Planera aquatica*. Shrubs may include *Cephalanthus occidentalis* and *Itea virginica* with a variety of other species, such as *Acer rubrum var. drummondii, Acer negundo, Cornus obliqua (= Cornus amomum ssp. obliqua), Fraxinus pennsylvanica, Ilex decidua*, and *Liquidambar styraciflua*, mostly occurring around the slough margins. Woody vines are uncommon but may include *Ampelopsis arborea* and *Berchemia scandens*. The herbaceous layer is also very sparse, being restricted to rotting logs, buttresses of trees, and small mounds and ridges which remain dry most of the growing season.

ENVIRONMENTAL DESCRIPTION

Jean Lafitte National Historical Park and Preserve Environment: This community was documented in backswamps that were mapped as semipermanently flooded (NPS 2005), but could be closer to permanently flooded today. All locations were impacted by levees and ditches that could be disrupting the flow of water.

Global Environment: Stands occur in semipermanently flooded back sloughs, abandoned tributaries, and floodplain depressions. They are often linear in shape and range in size from less than one acre to hundreds of acres. All examples are characterized by shallow standing water all or most of the year. Soils are poorly drained and tend to be organic. Bedrock of deeply buried Paleozoic rock, exhibits little or no effect on plant communities. Deep accumulation of duff and litter can occur where not scoured by floodwaters. This community can be found adjacent to all other floodplain forests. Hydroperiod determines bald-cypress regeneration and understory layer composition. Poor bald-cypress regeneration in individual stands suggests that hydrology has changed since stand establishment and that different hydrologic conditions may be required for future regeneration of bald-cypress and water tupelo.

Soils are deep and nearly level on broad flats and narrow depressions or sloughs on the floodplains of the Mississippi and Ohio rivers. Soils are difficult to till with silty clay surface and subsurface layers, high shrink-swell capacity, and slow permeability, with ponding of water common. Inundated soils are anaerobic. Inundation is continuous, fluctuating seasonally with high water occurring during spring and fall.

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: This community includes occurrences with an open to closed canopy dominated by *Taxodium distichum*, codominated by *Taxodium distichum* and *Nyssa aquatica*, and dominated by *Nyssa aquatica*. The subcanopy is open and dominated by *Acer rubrum*. The shrub layer is typically open and characterized by *Cephalanthus occidentalis* and *Morella cerifera*. Herbaceous cover is often low except for scattered wetland herbs growing on buttressed trunks. This community is characterized by high cover of floating aquatics, including *Lemna obscura, Spirodela polyrrhiza, Wolffia* spp., and the exotics *Salvinia minima* and *Eichhornia crassipes*.

Global Vegetation: This type tends to be dominated by *Taxodium distichum* and *Nyssa aquatica* with *Taxodium* often emergent in the overstory above shorter individuals of *Nyssa aquatica*. In some instances *Carya aquatica* and (rarely) *Quercus lyrata* may also be present. Dominant trees exhibit tall, straight growth and swelled buttresses. The canopy can be closed but is more commonly partially open. Water depth is highly correlated with canopy dominance, with *Taxodium distichum* dominating deeper, more permanent water, small *Taxodium distichum* and mature *Nyssa aquatica* in shallower zones, and mixed bottomland species in expansive shallower zones (Faircloth 1971). The subcanopy is sparse, consisting primarily of *Forestiera acuminata, Cephalanthus occidentalis*, and *Planera aquatica*. Shrubs and herbs tend to occur sporadically, most often growing on old stumps, tree buttresses, fallen logs, or along slough margins. Shrubs may include *Cephalanthus occidentalis* and *Itea virginica* with a variety of other species, such as *Acer rubrum var. drummondii, Acer negundo, Cornus obliqua (= Cornus amomum ssp. obliqua), Fraxinus pennsylvanica, Ilex decidua*, and *Liquidambar styraciflua*, mostly occurring around the slough margins. Woody vines are uncommon but may include *Ampelopsis arborea* and *Berchemia scandens*. Common herbaceous species may include *Asclepias perennis, Bidens aristosa, Bignonia capreolata, Boehmeria cylindrica, Carex lupulina, Carex joorii, Commelina virginica, Cyperus* sp., *Erechtites hieraciifolia, Leersia oryzoides, Lemna minor, Onoclea sensibilis, Pilea pumila, Polygonum hydropiperoides, Saururus cernuus*, and *Triadenum tubulosum*. This community exhibits shifts in dominance largely governed by water fluctuations, windthrows, beaver predation, senescence and fire. Summer low-water periods exhibit increased herbaceous growth, woody regeneration, and high primary productivity. Fall and spring high water levels contribute to woody mortality and associated canopy openings.

Global Dynamics: Flooding and drought effects are seasonal, of variable duration, and subject to local weather patterns. Inundation is continuous, fluctuating seasonally with high water occurring during spring and fall. Extensive beaver predation on water tupelo may severely impact community composition. Beavers may alter vegetative composition, hydrologic conditions, and sedimentation rates by removing trees and pooling water. Prolonged flooding increases senescence of mature trees, subcanopy and herbaceous vegetation which may create openings and encourage gap-phase regeneration during normal hydrologic periods. Drought encourages woody regeneration which is typically absent in bald-cypress - water tupelo swamp communities. Typical swamps consist of a few large, very old trees, numerous medium-aged trees, and few saplings or seedlings.

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Taxodium distichum*
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*, *Nyssa aquatica*
Floating aquatic	Aquatic herb	*Lemna obscura*, *Salvinia minima*, *Spirodela polyrrhiza*, *Wolffia* spp.

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Taxodium distichum*
Tree canopy	Broad-leaved deciduous tree	*Nyssa aquatica*
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum* var. *drummondii*, *Planera aquatica*
Tall shrub/sapling	Broad-leaved deciduous tree	*Cephalanthus occidentalis*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Forestiera acuminata*
Floating aquatic	Aquatic herb	*Spirodela polyrrhiza*

CHARACTERISTIC SPECIES

Jean Lafitte National Historical Park and Preserve: *Acer rubrum*, *Lemna obscura*, *Nyssa aquatica*, *Salvinia minima*, *Spirodela polyrrhiza*, *Taxodium distichum*, *Wolffia* spp.
Global:

OTHER NOTEWORTHY SPECIES

Jean Lafitte National Historical Park and Preserve: Invasive/Exotic Plants: *Eichhornia crassipes* (High), *Salvinia minima* ()
Global: Vulnerable Plants: *Carex decomposita* (G3G4); **Other Plants**: *Carex oxylepis* (G5?), *Dryopteris celsa* (G4), *Iris fulva* (G5)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G5 (5-Apr-2000).

RELATED CONCEPTS

Global Similar Types:

- *Acer rubrum - Gleditsia aquatica - Planera aquatica - Fraxinus profunda* Swamp Forest (CEGL002422)
- *Cephalanthus occidentalis / Carex* spp. - *Lemna* spp. Southern Shrub Swamp (CEGL002191) has scattered trees (crowns not touching) seldom over 5 m in height, although occasional large trees do occur.
- *Nyssa aquatica - Nyssa biflora* Swamp Forest (CEGL007429)
- *Nyssa aquatica* Swamp Forest (CEGL002419) is dominated by water tupelo. Bald-cypress may or may not be present, but it never equals the water tupelo in density or canopy cover.
- *Taxodium distichum - Nyssa aquatica - Acer rubrum / Itea virginica* Floodplain Forest (CEGL007422) has a shorter hydroperiod.
- *Taxodium distichum - Nyssa aquatica - Nyssa biflora / Fraxinus caroliniana / Itea virginica* Floodplain Forest (CEGL007432)
- *Taxodium distichum - Nyssa aquatica / Fraxinus caroliniana* Floodplain Forest (CEGL007431) of the Atlantic Coastal Plain, is clearly dominated by bald-cypress, and water tupelo may or may not be present.
- *Taxodium distichum / Lemna minor* Floodplain Forest (CEGL002420) has a longer hydroperiod, is clearly dominated by bald-cypress, and water tupelo may or may not be present.

Global Related Concepts:

- Baldcypress - Tupelo: 102 (Eyre 1980) >
- Baldcypress-Water Tupelo Series (Diamond 1993) >
- Cypress (Tupelo) Swamp (Evans 1991) >
- Cypress - Tupelo Swamp (TNC 1995a) >

- Cypress -Gum Swamps (Penfound and Hathaway 1938) ><
- Cypress-Water Elm (Van Kley and Hine 1998) **?**
- Eastern Broadleaf and Needleleaf Forests: 113: Southern Floodplain Forest (*Quercus-Nyssa-Taxodium*) (Küchler 1964) >
- Palustrine: Forested Wetland: Riparian (TNC 1985) >
- Palustrine: Palustrine Forested Wetland (Cowardin et al. 1979) >
- UNESCO FORMATION CODE: I.B.3e (UNESCO 1973) >

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Jean Lafitte National Historical Park and Preserve Classification Comments: This vegetation was identified during a cluster analysis of 159 plots from Jean Lafitte National Historical Park and Preserve, Louisiana. This vegetation is described from 11 plots that formed a fairly distinctive group in cluster analysis. Homoteneity (0.641) and Bray-Curtis Similarity (0.465) were moderate within the group of plots. At Jean Lafitte, this community is intended to represent swamps dominated by *Taxodium distichum* and/or *Nyssa aquatica* with high cover of floating aquatics, and lower cover of herbaceous species at the ground layer than *Taxodium distichum - Nyssa aquatica - Acer rubrum / Itea virginica* Forest (CEGL007422). It clustered in a larger group with CEGL007422.
Global Classification Comments: Generally, semipermanently flooded bald-cypress - water tupelo swamps are found across the entire southeastern U.S. Coastal Plain. The type described here is intended to represent only the Mississippi River Alluvial Plain examples and those occurring immediately westward into the Gulf Coastal Plains of Arkansas, Texas, and Louisiana and eastward into the Upper East Gulf Coastal Plain and the adjacent Interior Low Plateau. The eastern equivalent of this type along the outer coastal plains of the Atlantic and East Gulf is represented by *Taxodium distichum - Nyssa aquatica / Fraxinus caroliniana* Floodplain Forest (CEGL007431). Dominance of bald-cypress and water tupelo varies considerably among coastal plain swamps, and it is not always clear how to best distinguish this community from *Nyssa aquatica* Swamp Forest (CEGL002419) and *Taxodium distichum / Lemna minor* Floodplain Forest (CEGL002420). Both bald-cypress and water tupelo trees live to be very old, and successional stages may last hundreds of years. Where swamp forest stands are very open with lots of *Cephalanthus occidentalis*, the distinction between forest and shrubland may be unclear.

ELEMENT DISTRIBUTION

Jean Lafitte National Historical Park and Preserve Range: This community was documented in backswamps that were mapped as semipermanently flooded (NPS 2005), but could be closer to permanently flooded today. All locations were impacted by levees and ditches that could be disrupting the flow of water.
Global Range: This community occurs primarily in the Mississippi River Alluvial Plain and adjacent ecoregions. The type occurs in the southern United States, from Louisiana and Mississippi northward to southeastern Missouri, extreme southern Illinois, and southern Indiana. Remnant bald-cypress and bald-cypress - water tupelo swamps still exist in southern Illinois, with the most significant occurrences found in the Cache River Basin. Northernmost bald-cypress and water tupelo swamps are found in the Ozark Highlands Section within the Lower Mississippi River Bottomlands Division. High-quality examples are known from Big Cypress Unique Area, Moro Bottoms Natural Area (without *Nyssa aquatica*) and Pine Bluff Arsenal in Arkansas. This community is also known from Cleveland and Jefferson counties, Arkansas. This community is found in the Arkansas River Valley and is likely extant throughout the Ouachita River Basin in Arkansas.
Nations: US
States/Provinces: AR, IL, IN?, KY, LA, MO, MS, TN, TX:S3
TNC Ecoregions: 31:C, 39:C, 40:C, 41:C, 42:C, 43:P, 44:C
USFS Ecoregions (1994/95): 222C:CC, 222D:CC, 231B:CP, 231Ga:CCC, 231Gb:CCC, 232Eb:CCC, 234Aa:CCC, 234Ac:CCC, 234Ad:CCC, 234Af:CCC, 234Ag:CCC, 234Ai:CCC, 234Al:CCC, 234Am:CCC, 234An:CCC

Federal Lands: DOD (Pine Bluff Arsenal); NPS (Jean Lafitte); USFS (Shawnee, St. Francis)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Inventory Notes: Plot data were collected by a number of different observers. Data for this analysis and analytical assistance were provided by NPS.
Jean Lafitte National Historical Park and Preserve Plots: BAT_24, BAT_25, BAT_26, BAT_29, BAT_30, BAT_31, BAT_32, BAT_33, BAT_34, Plot13, Plot14, JELA_AA_0082, JELA_AA_0083, JELA_AA_0084, JELA_AA_0085, JELA_AA_0086, JELA_AA_0087.
Jean Lafitte National Historical Park and Preserve Description Author(s): J. Teague
Global Description Author(s): M. Guetersloh, T. E. Vogt, D. Faber-Langendoen
References: Cowardin et al. 1979, Dennis 1988, Diamond 1993, Evans 1991, Evans et al. 2009, Ewel and Odum 1984b, Eyre 1980, Faircloth 1971, Homoya et al. 1988, Illinois Nature Preserve Commission 1973, Küchler 1964, NPS 2005, Nelson 2010, Niering 1985, Penfound and Hathaway 1938, Southeastern Ecology Working Group n.d.*, TNC 1985, TNC 1995a, TNHS unpubl. data, UNESCO 1973, Van Kley and Hine 1998, Wharton 1989, White and Anderson 1970, White and Madany 1978

[CEGL007422] *Taxodium distichum - Nyssa aquatica - Acer rubrum / Itea virginica* Floodplain Forest

Translated Name: **Bald-cypress - Water Tupelo - Red Maple / Virginia Sweetspire Floodplain Forest**
Common Name: **Southern Coastal Plain Bald-cypress - Tupelo Swamp Forest**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	Southeastern North American Flooded & Swamp Forest (1.B.3.Nb)
Macrogroup	Southern Coastal Plain Floodplain Forest (M031)
Group	Bald-cypress - Tupelo Floodplain Forest (G033)
Alliance	*Taxodium distichum - Nyssa aquatica - Nyssa biflora* Floodplain Forest Alliance (A3594)

ELEMENT CONCEPT

Global Summary: This association includes seasonally flooded swamps dominated by *Taxodium distichum* with *Nyssa aquatica* and other hardwood species, especially *Acer rubrum* and *Ulmus americana*. Shrub species which may be present include *Itea virginica* and *Clethra alnifolia* (within its range). Cover of the herbaceous stratum varies from sparse to moderate and is often characterized by *Saururus cernuus* and may also include *Boehmeria cylindrica, Sagittaria latifolia*, and *Smilax* spp. In the Mississippi River Alluvial Plain and Gulf Coastal Plain, this community primarily occurs in sloughs which flood for 3-4 months annually.

ENVIRONMENTAL DESCRIPTION

Jean Lafitte National Historical Park and Preserve Environment: This community occurs in low areas adjacent to other swamps and marshes that were mapped as semipermanently flooded (NPS 2005), but the higher cover of herbaceous species in the field stratum, as well as *Sabal minor*, seems more indicative of a shorter hydroperiod at time of establishment. All locations were impacted by levees and ditches that are disrupting the flow of water.
Global Environment: This association includes seasonally flooded swamps. In the Mississippi River Alluvial Plain and Gulf Coastal Plain, this community primarily occurs in sloughs which flood for 3-4 months annually. This community occurs primarily in sloughs which receive annual flooding for approximately 3 or 4 months. The acidic clay soils are very poorly drained and very slowly permeable; the Yorktown series (Typic Fluvaquent) is commonly associated with this community in Louisiana. Slopes are typically less than 1%, and the high water table is within 15

cm of the soils surface throughout the year in most years (Soil Conservation Service 1990, L. Smith pers. comm. 1995). Stands assigned here from the Savannah River Plant (South Carolina) are in "floodplains which are flooded most of the year" (Jones et al. 1981b).

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: The canopy of this community is dominated by *Taxodium distichum* with *Nyssa aquatica* as a frequent associate. The open subcanopy is dominated by *Acer rubrum*, and the open shrub layer is characterized by *Morella cerifera, Cephalanthus occidentalis*, and *Sabal minor*. The ground flora is characterized by low to moderate cover of *Pontederia cordata, Polygonum hydropiperoides (= Persicaria hydropiperoides), Saururus cernuus, Boehmeria cylindrica, Hydrocotyle* spp., and *Thelypteris palustris*, and sparse cover of many other wetland herbs. *Carex hyalinolepis* may be present in some stands. This community may also be characterized by a low cover of floating aquatics such as *Lemna obscura* and the non-natives *Salvinia minima* and *Eichhornia crassipes*. *Tillandsia usneoides* is a frequent epiphyte. The non-native tree *Triadica sebifera* is a frequent associate. The non-native invasive forb *Alternanthera philoxeroides* may also be present.

Global Vegetation: This swamp forest has a canopy dominated by *Taxodium distichum, Nyssa aquatica*, and *Acer rubrum var. drummondii*. Associated canopy species include *Styrax americanus, Fraxinus caroliniana, Liquidambar styraciflua, Quercus phellos, Fraxinus pennsylvanica, Ulmus rubra, Ulmus alata, Nyssa biflora*, and *Quercus laurifolia*. This is typically a closed-canopy community, with cover ranging approximately between 60-100%, but most often 80-90%. The sparse to patchy tall-shrub stratum (2-5 m in height) includes *Itea virginica, Cephalanthus occidentalis, Diospyros virginiana, Forestiera acuminata, Ilex decidua*, and *Carpinus caroliniana*. In the Kisatchie National Forest, *Itea virginica* has a frequency of 50% in occurrences. The short-shrub stratum (0.5-2 m in height; mean cover of 13%) is dominated by *Acer rubrum, Itea virginica, Taxodium distichum*, and *Nyssa aquatica*. Associates include *Styrax americanus, Ulmus alata, Cephalanthus occidentalis, Rubus argutus, Fraxinus pennsylvanica, Quercus* spp., *Diospyros virginiana, Quercus lyrata, Ilex decidua, Liquidambar styraciflua, Forestiera acuminata, Celtis laevigata, Fraxinus caroliniana, Carpinus caroliniana, Triadica sebifera (= Sapium sebiferum)* (exotic), *Rubus trivialis, Carya aquatica, Nyssa biflora, Crataegus viridis*, and *Quercus phellos*. The mixed graminoid-forb herbaceous layer (mean cover 33%) is dominated by *Triadenum tubulosum, Triadenum virginicum, Carex atlantica, Saururus cernuus*, and *Gratiola virginiana*. Associates include *Boehmeria cylindrica, Justicia ovata var. lanceolata, Polygonum punctatum, Proserpinaca palustris, Carex joorii, Peltandra virginica, Lycopus rubellus, Mikania scandens, Leersia virginica, Lysimachia radicans, Carex intumescens, Spiranthes cernua, Carex tribuloides, Hydrocotyle verticillata, Viola* spp., *Panicum rigidulum, Rhynchospora corniculata, Ludwigia glandulosa, Osmunda regalis, Symphyotrichum lateriflorum (= Aster lateriflorus), Carex flaccosperma, Commelina virginica, Leersia lenticularis, Bidens mitis, Carex lupulina, Carex louisianica, Penthorum sedoides, Pluchea camphorata*, and *Cyperus virens*. Minor associates (each with cover less than 1%) include *Acmella oppositifolia var. repens, Carex lonchocarpa, Onoclea sensibilis, Acalypha rhomboidea (= Acalypha virginica var. rhomboidea), Pilea pumila, Lobelia cardinalis, Sagittaria platyphylla, Dichanthelium dichotomum var. dichotomum, Carex bromoides, Mimulus alatus, Hydrolea uniflora, Juncus effusus, Micranthemum umbrosum, Mitchella repens, Elephantopus carolinianus, Helenium flexuosum, Poa autumnalis, Woodwardia areolata, Asclepias perennis, Juncus diffusissimus, Phanopyrum gymnocarpon, Cerastium glomeratum, Erechtites hieraciifolia, Erigeron philadelphicus, Ageratina altissima var. altissima, Hypericum mutilum, Dichanthelium commutatum, Sphenopholis obtusata*, and *Spirodela polyrrhiza*. *Sphagnum* spp. are not significant in this community. Within their ranges *Tillandsia usneoides* and *Pleopeltis polypodioides ssp. polypodioides* are present on canopy trees and woody shrubs (Martin and Smith 1991, Allen 1993c). *Triphora trianthophora* may occur in Louisiana examples of this community, although this species is more typical of mesic slope forests (Allen 1995c).

Global Dynamics: Hydrologic fluctuation is the main disturbance in this community and the primary ecological factor affecting the species composition and structure. The water budget of alluvial cypress swamp systems includes surface flow, groundwater inflow, precipitation throughfall, flooding, evapotranspiration, interception loss, and surface and subsurface outflow into the river channel. Hydrologic inflows are predominantly runoff from

surrounding uplands and overflow of the flooding river. Flooding generally accounts for less than 50% of the total annual water input. Seasonal pulses of floods bring in water and nutrient-rich sediments (Mitsch and Gosselink 1993).

As this community matures, the relative abundance of *Acer rubrum var. drummondii* may decrease, with the canopy becoming increasingly dominated by *Taxodium distichum* and *Nyssa aquatica*.

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Taxodium distichum*
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*, *Nyssa aquatica*
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Morella cerifera*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Cephalanthus occidentalis*
Short shrub/sapling	Palm tree	*Sabal minor*
Herb (field)	Flowering forb	*Boehmeria cylindrica*, *Hydrocotyle* spp., *Polygonum hydropiperoides*, *Saururus cernuus*
Floating aquatic	Aquatic herb	*Lemna obscura*
Submerged aquatic	Aquatic herb	*Pontederia cordata*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Taxodium distichum*
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum* var. *drummondii*, *Nyssa aquatica*
Short shrub/sapling	Broad-leaved deciduous tree	*Cephalanthus occidentalis*, *Ilex decidua*, *Styrax americanus*
Short shrub/sapling	Broad-leaved deciduous shrub	*Itea virginica*, *Rubus argutus*
Herb (field)	Flowering forb	*Gratiola virginiana*, *Saururus cernuus*, *Triadenum tubulosum*, *Triadenum virginicum*

CHARACTERISTIC SPECIES

Jean Lafitte National Historical Park and Preserve: *Acer rubrum, Boehmeria cylindrica, Cephalanthus occidentalis, Hydrocotyle spp., Lemna obscura, Morella cerifera, Nyssa aquatica, Polygonum hydropiperoides, Pontederia cordata, Sabal minor, Saururus cernuus, Taxodium distichum*

Global: *Bidens mitis, Boehmeria cylindrica, Carex atlantica, Carex flaccosperma, Carex intumescens, Carex joorii, Carex louisianica, Carex lupulina, Carex tribuloides, Carpinus caroliniana, Carya aquatica, Celtis laevigata, Commelina virginica, Crataegus viridis, Forestiera acuminata, Fraxinus caroliniana, Fraxinus pennsylvanica, Hydrocotyle verticillata, Justicia ovata var. lanceolata, Leersia lenticularis, Leersia virginica, Liquidambar styraciflua, Ludwigia glandulosa, Lycopus rubellus, Lysimachia radicans, Mikania scandens, Nyssa biflora, Osmunda regalis, Panicum rigidulum, Peltandra virginica, Penthorum sedoides, Pluchea camphorata,*

Polygonum punctatum, Proserpinaca palustris, Quercus laurifolia, Quercus phellos, Rhynchospora corniculata, Rubus trivialis, Spiranthes cernua, Styrax americanus, Ulmus alata, Ulmus rubra

OTHER NOTEWORTHY SPECIES

Jean Lafitte National Historical Park and Preserve: Invasive/Exotic Plants: *Alternanthera philoxeroides* (Medium), *Eichhornia crassipes* (High), *Salvinia minima* (), *Triadica sebifera* (High)
Global: Vulnerable Plants: *Triphora trianthophora* (G3G4); **Invasive/Exotic Plants**: *Triadica sebifera* (High)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (15-Aug-1997).

RELATED CONCEPTS

Global Similar Types:

- *Nyssa aquatica - Nyssa biflora* Swamp Forest (CEGL007429) is wetter, being semipermanently flooded, and does not contain significant *Taxodium distichum*.
- *Nyssa aquatica* Swamp Forest (CEGL002419) is a wetter community, dominated almost exclusively by *Nyssa aquatica* without *Taxodium distichum* as a significant component.
- *Nyssa biflora - Quercus laurifolia / Sphagnum* spp. Riparian Forest (CEGL007390) is wetter, being flooded/saturated for 4 to 6 months of the year and does not contain *Taxodium distichum* as a dominant.
- Taxodium distichum - (Nyssa aquatica) / Forestiera acuminata - Planera aquatica Floodplain Forest (CEGL002421) also of longer hydroperiod.
- Taxodium distichum - Fraxinus pennsylvanica - Quercus laurifolia / Acer rubrum / Saururus cernuus Floodplain Forest (CEGL007719) with a partly overlapping distribution, but apparently lacking Nyssa aquatica.
- *Taxodium distichum - Nyssa aquatica / Fraxinus caroliniana* Floodplain Forest (CEGL007431) is semipermanently flooded and does not contain a significant herbaceous layer.
- *Taxodium distichum / Lemna minor* Floodplain Forest (CEGL002420) is also associated with streams and rivers, but occurs in wetter semipermanently flooded locations and is without a significant *Nyssa aquatica* component.

Global Related Concepts:

- Bald cypress-water gum-mixed hardwood community (Jones et al. 1981b) =
- Baldcypress - Tupelo: 102 (Eyre 1980) >
- Baldcypress - Water Tupelo (67) (USFS 1988) **?**
- Baldcypress-Water Tupelo Series (Diamond 1993) >
- Cypress (Tupelo) Swamp (Evans 1991) >
- Cypress Swamp (Smith 1996a) ><
- Cypress Swamps, Cypress-Blackgum Phase (Clewell 1971) >
- Cypress-Tupelo Swamp (Smith 1996a) ><
- IIA4b. Bald Cypress - Water Tupelo Swamp (Allard 1990) >
- Palustrine *Taxodium distichum-Nyssa* spp. Series (Pyne 1994) >
- Very Wet Areas (Allen 1993b) =

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Jean Lafitte National Historical Park and Preserve Classification Comments: This vegetation was identified during a cluster analysis of 159 plots from Jean Lafitte National Historical Park and Preserve, Louisiana. This vegetation is described from 10 plots that formed a fairly distinctive group in cluster analysis. Homoteneity (0.667) and Bray-Curtis Similarity (0.494) were moderate within the group of plots. At Jean Lafitte, this community is

intended to represent swamps dominated by *Taxodium distichum* and/or *Nyssa aquatica* with higher cover of herbaceous species at the ground layer than *Taxodium distichum - (Nyssa aquatica) / Forestiera acuminata - Planera aquatica* Forest (CEGL002421). It clustered in a larger group with CEGL002421.

Global Classification Comments: This type includes data from Savannah River Site, inner Coastal Plain of South Carolina (after Jones et al. 1981b; Bald cypress-water gum-mixed hardwood community; 5 stands sampled). There are also data from the Kisatchie National Forest (Allen 1993c). No occurrences are known with dominant *Itea virginica* shrub layer in eastern Texas, but it may be possible (R. Turner pers. comm.). *Taxodium distichum - Nyssa aquatica / Fraxinus caroliniana* Floodplain Forest (CEGL007431) is similar, but apparently the conceptual difference is that CEGL007431 is semipermanently flooded while this association (CEGL007422) is seasonally flooded.

ELEMENT DISTRIBUTION

Jean Lafitte National Historical Park and Preserve Range: This community occurs in low areas adjacent to other swamps and marshes.

Global Range: This association is found in the Atlantic and Gulf coastal plains from South Carolina south to Alabama and west to Louisiana and presumably Texas and in the interior to Kentucky and Arkansas.

Nations: US

States/Provinces: AL, AR, KY, LA, MS, SC, TN, TX:S3

TNC Ecoregions: 31:C, 40:?, 41:C, 42:C, 43:?, 53:C, 56:C

USFS Ecoregions (1994/95): 231B:??, 231E:??, 232Bs:CCC, 232C:CP, 232Eb:CCC, 232F:CC, 234Aa:CCC, 234Ac:CCC, 234Ad:CCC, 234Ae:CCC, 234Af:CCC, 234Ag:CCC, 234Ah:CCC, 234Ai:CCC, 234Aj:CCC, 234Ak:CCC, 234Al:CCC, 234Am:CCC, 234An:CCC

Federal Lands: DOE (Savannah River Site); NPS (Jean Lafitte); USFS (Angelina?, Davy Crockett?, De Soto, Delta, Kisatchie, Sabine?, Sam Houston?, Tuskegee?)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Inventory Notes: Plot data were collected by a number of different observers. Data for this analysis and analytical assistance were provided by NPS.

Jean Lafitte National Historical Park and Preserve Plots: BAT_3, BAT_4, BAT_16, BAT_23, FM14a, Forest13, Forest9a, LE7a, BAT_NJ10, Plot12, JELA_AA_0063, JELA_AA_0073.

Jean Lafitte National Historical Park and Preserve Description Author(s): J. Teague and M. Pyne

Global Description Author(s): J.E. Mohan, S. Landaal and M. Pyne

References: ALNHP unpubl. data, Allan and Flecker 1993, Allard 1990, Allen 1993b, Allen 1993c, Clewell 1971, Diamond 1993, Evans 1991, Evans et al. 2009, Eyre 1980, Jones et al. 1981b, LNHP 2009, Martin and Smith 1991, Mitsch and Gosselink 1993, NPS 2005, Pyne 1994, Smith 1996a, Smith, L. pers. comm., Soil Conservation Service 1990, Southeastern Ecology Working Group n.d.*, TNHS unpubl. data, Turner et al. 1999, USFS 1988, Wieland 1994b, Wieland 2000b

A3595 *Taxodium distichum - Nyssa biflora* Tidal Swamp Forest Alliance

Bald-cypress - Swamp Tupelo Tidal Swamp Forest Alliance

Southern Bald-cypress - Swamp Blackgum Tidal Swamp Forest

ALLIANCE CONCEPT

Summary: This alliance accommodates tidally flooded forests in lower, estuarine reaches of brownwater and blackwater rivers in the Outer Coastal Plain (tidewater) and also along estuarine shores. Flooding can be either lunar-tidal or wind-tidal and can be affected as well by riverine flooding events. The trees often have a stressed appearance, and the herbaceous layer usually is well-developed and more species-rich than in most non-tidal swamps, possibly as a result of the tidal nutrient input. Various combinations of *Nyssa biflora* and *Taxodium distichum* usually dominate the canopy. Some associations may also contain *Nyssa aquatica, Magnolia virginiana*,

and/or *Pinus taeda* in the overstory. On blackwater rivers, *Nyssa aquatica* is often an indicator of a tidal condition, presumably because it requires the higher nutrients provided by tidal flooding. Other species common in tidal situations, such as *Lilaeopsis carolinensis, Morella cerifera (= Myrica cerifera), Osmunda cinnamomea, Osmunda regalis var. spectabilis, Peltandra virginica, Rosa palustris*, and *Thelypteris palustris var. pubescens*, are often common.

Classification Comments: Description information is primarily from the old alliance *Nyssa biflora - (Nyssa aquatica, Taxodium distichum)* Tidal Forest Alliance (A.357).

Similar Alliances:

- *Nyssa aquatica* Swamp Forest Alliance (A0345)
- *Nyssa biflora - Nyssa aquatica* Floodplain Forest Alliance (A0323)
- *Taxodium distichum - Nyssa aquatica - Nyssa biflora* Floodplain Forest Alliance (A3594)
- *Taxodium distichum* Nonriverine Swamp Forest Alliance (A3596)

Similar Alliance Comments: In contrast to other alliances in this group dominated by *Taxodium distichum* and *Nyssa biflora*, these forests have a tidal flooding regime.

Diagnostic Characteristics: These are tidal forests dominated by *Taxodium distichum* and *Nyssa biflora*.

Related Concepts:

- Bald Cypress/Black Gum Community Type (Odum et al. 1984) **?**
- Tidal Cypress--Gum Swamp (Schafale and Weakley 1990) **?**
- Tidal Stream Floodplain Forest (Ambrose 1990a) **?**
- Tidewater River and Swamp System (Wharton 1978) **?**

ALLIANCE DESCRIPTION

Environment: These tidally flooded forests are found in lower, estuarine reaches of brownwater and blackwater rivers in the Outer Coastal Plain (tidewater), and also along estuarine shores. Flooding can be either lunar-tidal or wind-tidal, and can be affected as well by riverine flooding events.

Vegetation: Various combinations of *Nyssa biflora*, and *Taxodium distichum* usually dominate the canopy. Some associations may also contain *Nyssa aquatica, Magnolia virginiana*, and/or *Pinus taeda* in the overstory. Because of the tidal influence in these woodlands, they are very productive and the herbaceous layer is diverse and dense. Other species common in tidal situations, such as *Lilaeopsis carolinensis, Morella cerifera (= Myrica cerifera), Osmunda cinnamomea, Osmunda regalis var. spectabilis, Peltandra virginica, Rosa palustris*, and *Thelypteris palustris var. pubescens*, are often common. Other species that may be present include *Asclepias lanceolata, Carex hyalinolepis, Centella asiatica, Cladium mariscoides, Coreopsis falcata, Eleocharis fallax, Eriocaulon decangulare var. decangulare, Nymphaea odorata, Osmunda regalis var. spectabilis, Panicum virgatum, Peltandra virginica, Physostegia leptophylla, Pogonia ophioglossoides, Pontederia cordata, Rhynchospora glomerata, Saururus cernuus, Schoenoplectus americanus (= Scirpus americanus), Triadenum walteri, Typha angustifolia, Typha latifolia*, and *Woodwardia areolata*. Typical species of non-tidal swamps, such as *Carya aquatica, Chamaecyparis thyoides, Cyrilla racemiflora, Ilex glabra, Lyonia lucida, Quercus lyrata, Quercus phellos, Smilax laurifolia, Sphagnum* spp., and *Woodwardia virginica*, and others, are absent.

Physiognomy and Structure: The trees often have a stressed appearance, and the herbaceous layer usually is well-developed and more species-rich than in most non-tidal swamps, possibly as a result of the tidal nutrient input.

Floristics: Various combinations of *Nyssa biflora*, and *Taxodium distichum* usually dominate the canopy. Some associations may also contain *Nyssa aquatica, Magnolia virginiana*, and/or *Pinus taeda* in the overstory. Because of the tidal influence in these woodlands, they are very productive and the herbaceous layer is diverse and dense. Other species common in tidal situations, such as *Lilaeopsis carolinensis, Morella cerifera (= Myrica cerifera), Osmunda cinnamomea, Osmunda regalis var. spectabilis, Peltandra virginica, Rosa palustris*, and *Thelypteris palustris var. pubescens*, are often common. Other species that may be present include *Asclepias lanceolata, Carex hyalinolepis, Centella asiatica, Cladium mariscoides, Coreopsis falcata, Eleocharis fallax, Eriocaulon decangulare var. decangulare, Nymphaea odorata, Osmunda regalis var. spectabilis, Panicum virgatum, Peltandra virginica,*

Physostegia leptophylla, Pogonia ophioglossoides, Pontederia cordata, Rhynchospora glomerata, Saururus cernuus, Schoenoplectus americanus (= Scirpus americanus), Triadenum walteri, Typha angustifolia, Typha latifolia, and *Woodwardia areolata*. Typical species of non-tidal swamps, such as *Carya aquatica, Chamaecyparis thyoides, Cyrilla racemiflora, Ilex glabra, Lyonia lucida, Quercus lyrata, Quercus phellos, Smilax laurifolia, Sphagnum* spp., and *Woodwardia virginica*, and others, are absent.
Dynamics: Flooding can be either lunar-tidal or wind-tidal, and can be affected as well by riverine flooding events.

ALLIANCE DISTRIBUTION

Range: These forests are found in the Atlantic and Gulf coastal plains from Delaware south and west to Florida and Mississippi.
Nations: US
Subnations: AL?, DE, FL, GA, MD, MS, NC, SC, VA
TNC Ecoregions: 53:C, 55:C, 56:C, 57:C, 58:C

ALLIANCE SOURCES

References: Ambrose 1990a, Beaven and Oosting 1939, Bowman 1999, Faber-Langendoen et al. 2017b*, Fleming 1998, Fleming and Moorhead 1998, Fleming et al. 2001, Frost et al. 1990, McCormick and Somes 1982, Odum et al. 1984, Schafale and Weakley 1990, Wharton 1978
Author of Concept: Faber-Langendoen et al. 2017b
Author of Description: M. Pyne, in Faber-Langendoen et al. (2013)

[CEPS009724] *Taxodium distichum - Salix nigra / Morella cerifera / Thelypteris palustris* Woodland [Park Special]

Translated Name: **Bald-cypress - Black Willow / Wax-myrtle / Eastern Marsh Fern Woodland**
Common Name: **Bald-cypress - Black Willow / Eastern Marsh Fern Louisiana Swamp Woodland**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	Southeastern North American Flooded & Swamp Forest (1.B.3.Nb)
Macrogroup	Southern Coastal Plain Floodplain Forest (M031)
Group	Bald-cypress - Tupelo Floodplain Forest (G033)
Alliance	*Taxodium distichum - Nyssa biflora* Tidal Swamp Forest Alliance (A3595)

ELEMENT CONCEPT

Global Summary: This vegetation is currently described from Jean Lafitte National Historical Park and Preserve. It has a short-statured, open tree canopy dominated by *Salix nigra*. Other canopy associates include *Taxodium distichum* and *Triadica sebifera*. An open shrub layer is dominated by *Morella cerifera* with lower cover of *Cephalanthus occidentalis* and *Baccharis halimifolia*. The herbaceous layer is dominated by high cover of *Thelypteris palustris* with low cover of many other wetland herbs, including *Polygonum hydropiperoides, Hydrocotyle umbellata, Eleocharis vivipara, Sagittaria lancifolia, Alternanthera philoxeroides, Kosteletzkya virginica, Saccharum giganteum, Panicum dichotomiflorum, Eupatorium capillifolium, Habenaria repens*, and floating aquatics such as *Salvinia minima*.

ENVIRONMENTAL DESCRIPTION

Jean Lafitte National Historical Park and Preserve Environment: This vegetation is documented from one location in an impounded area in the northeast corner of the park. The site appears to have been impacted by levees and ditches that could be disrupting the flow of water. It may be patchily distributed across the preserve.

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: This vegetation has a short-statured, open tree canopy dominated by *Salix nigra*. Other canopy associates include *Taxodium distichum* and *Triadica sebifera*. An open shrub layer is dominated by *Morella cerifera* with lower cover of *Cephalanthus occidentalis* and *Baccharis halimifolia*. The herbaceous layer is dominated by high cover of *Thelypteris palustris* with low cover of many other wetland herbs, including *Polygonum hydropiperoides, Hydrocotyle umbellata, Eleocharis vivipara, Sagittaria lancifolia, Alternanthera philoxeroides, Kosteletzkya virginica, Saccharum giganteum, Panicum dichotomiflorum, Eupatorium capillifolium, Habenaria repens*, and floating aquatics such as *Salvinia minima*.

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Triadica sebifera*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Salix nigra*
Short shrub/sapling	Broad-leaved evergreen shrub	*Morella cerifera*
Herb (field)	Fern (Spore-bearing forb)	*Thelypteris palustris*

CHARACTERISTIC SPECIES

Jean Lafitte National Historical Park and Preserve: *Morella cerifera*, *Salix nigra*, *Thelypteris palustris*
Global:

OTHER NOTEWORTHY SPECIES

Jean Lafitte National Historical Park and Preserve: Invasive/Exotic Plants: *Alternanthera philoxeroides* (Medium), *Salvinia minima* (), *Triadica sebifera* (High)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (6-Oct-2014).

RELATED CONCEPTS

CLASSIFICATION

Status: Nonstandard
Classification Confidence:
Jean Lafitte National Historical Park and Preserve Classification Comments: This community was identified from one plot dominated by at Jean Lafitte. It clustered loosely with *Taxodium distichum / Morella cerifera / Thelypteris palustris* Woodland (CEGL007065). It differs from this vegetation primarily by the dominance of *Salix nigra* in the canopy.

ELEMENT DISTRIBUTION

Jean Lafitte National Historical Park and Preserve Range: This vegetation is documented from one location in an impounded area in the northeast corner of the park.
Nations: US
States/Provinces: LA
TNC Ecoregions: 31:C, 42:C
USFS Ecoregions (1994/95): 232Eb:CCC
Federal Lands: NPS (Jean Lafitte)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Inventory Notes: This vegetation is documented from one location in an impounded area in the northeast corner of the park. The site appears to have been impacted by levees and ditches that could be disrupting the flow of water. Plot data were collected by a number of different observers. Data for this analysis and analytical assistance were provided by NPS.
Jean Lafitte National Historical Park and Preserve Plots: BAT_NJ1.
Jean Lafitte National Historical Park and Preserve Description Author(s): J. Teague
Global Description Author(s):
References: Southeastern Ecology Working Group n.d.*

[CEGL007065] *Taxodium distichum / Morella cerifera / Thelypteris palustris* Tidal Woodland

Translated Name: **Bald-cypress / Wax-myrtle / Eastern Marsh Fern Tidal Woodland**
Common Name: **Bald-cypress / Wax-myrtle / Eastern Marsh Fern Wooded Marsh**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	Southeastern North American Flooded & Swamp Forest (1.B.3.Nb)
Macrogroup	Southern Coastal Plain Floodplain Forest (M031)
Group	Bald-cypress - Tupelo Floodplain Forest (G033)
Alliance	*Taxodium distichum - Nyssa biflora* Tidal Swamp Forest Alliance (A3595)

ELEMENT CONCEPT

Global Summary: This wooded marsh vegetation is located adjacent to estuarine and riverine tidal waters. It is characterized by a scattered, short-statured overstory of *Taxodium distichum, Acer rubrum, Nyssa aquatica*, and *Morella cerifera* in combination with a variety of fresh to oligohaline marsh species. Characteristic marsh species include *Pontederia cordata, Polygonum hydropiperoides, Sagittaria lancifolia, Sagittaria latifolia, Eleocharis cellulosa, Thelypteris palustris, Typha domingensis, Panicum hemitomon*, and *Eleocharis* spp. The marsh is often mixed with no clear dominant. Common non-native species include *Triadica sebifera, Alternanthera philoxeroides, Eichhornia crassipes, Salvinia minima*, and *Salvinia molesta*. The epiphyte *Tillandsia usneoides* is common in this community.

ENVIRONMENTAL DESCRIPTION

Jean Lafitte National Historical Park and Preserve Environment: This wooded marsh vegetation is found in a marsh rather than riverine swamp context, and some examples are located adjacent to estuarine and riverine tidal waters. Many of the occurrences where it has been documented are mapped as palustrine semipermanently flooded and are not identified as tidal (NPS 2005). Though tidal influence has not been documented for these occurrences, it might be present, especially from wind tides. Tidal cypress woodlands have been documented from the general area (Conner et al. 2007, Krauss et al. 2009). In some occurrences this sparsely wooded marsh community is separated from open water by expansive herb and herb-shrub marshes. All locations are impacted by levees and ditches that are presumably disrupting the flow of water. Some examples of this community may occur with an understory and field layer which consists of a floating mat of herbaceous marsh vegetation (flotant).
Global Environment: This wooded marsh vegetation is located adjacent to estuarine and riverine tidal waters, but the occurrences where it was documented are mostly mapped as palustrine semipermanently flooded and not identified as tidal (NPS 2005). Though tidal influence has not been documented, it might be present, especially from wind tides. In some occurrences this sparsely wooded marsh community is separated from open water by expansive herb and herb-shrub marshes. All locations are impacted by levees and ditches that are presumably disrupting the flow of water. Some examples of this community may occur as a floating mat of vegetation (flotant).

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: This community is characterized by a scattered, tall to short-statured overstory of *Taxodium distichum*, with *Acer rubrum, Nyssa aquatica*, and *Morella cerifera* present in combination with a variety of fresh to oligohaline marsh species. Other shrubs may include *Ilex cassine, Baccharis halimifolia*, and *Cephalanthus occidentalis*. Characteristic marsh species include *Pontederia cordata, Polygonum hydropiperoides, Sagittaria lancifolia, Sagittaria latifolia, Eleocharis cellulosa, Thelypteris palustris, Typha domingensis, Panicum hemitomon*, and *Eleocharis* spp. The marsh is often mixed with no clear dominant. Other marsh species commonly encountered include *Boehmeria cylindrica, Eleocharis vivipara, Hydrocotyle* spp., *Kosteletzkya virginica, Phyla lanceolata, Rhynchospora corniculata, Sacciolepis striata, Saururus cernuus, Solidago sempervirens*, and the floating aquatic *Lemna obscura*. Common non-native species include *Triadica sebifera, Alternanthera philoxeroides, Eichhornia crassipes, Salvinia minima*, and *Salvinia molesta*. The epiphyte *Tillandsia usneoides* is common in this community.

Global Vegetation: This community is characterized by a scattered, short-statured overstory of *Taxodium distichum, Acer rubrum, Nyssa aquatica*, and *Morella cerifera* in combination with a variety of fresh to oligohaline marsh species. Other shrubs may include *Ilex cassine, Baccharis halimifolia*, and *Cephalanthus occidentalis*. Characteristic marsh species include *Pontederia cordata, Polygonum hydropiperoides, Sagittaria lancifolia, Sagittaria latifolia, Eleocharis cellulosa, Thelypteris palustris, Typha domingensis, Panicum hemitomon*, and *Eleocharis* spp. The marsh is often mixed with no clear dominant. Other marsh species commonly encountered include *Boehmeria cylindrica, Eleocharis vivipara, Hydrocotyle* spp., *Kosteletzkya virginica, Phyla lanceolata, Rhynchospora corniculata, Sacciolepis striata, Saururus cernuus, Solidago sempervirens*, and the floating aquatic *Lemna obscura*. Common non-native species include *Triadica sebifera, Alternanthera philoxeroides, Eichhornia crassipes, Salvinia minima*, and *Salvinia molesta*. The epiphyte *Tillandsia usneoides* is common in this community.

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Taxodium distichum*
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*, *Nyssa aquatica*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Morella cerifera*
Herb (field)	Flowering forb	*Polygonum hydropiperoides*, *Sagittaria lancifolia*
Herb (field)	Graminoid	*Typha domingensis*
Herb (field)	Fern (Spore-bearing forb)	*Thelypteris palustris*
Submerged aquatic	Aquatic herb	*Pontederia cordata*

Global

Stratum	Lifeform	Species
Tree canopy	Needle-leaved tree	*Taxodium distichum*
Tree canopy	Broad-leaved deciduous tree	*Acer rubrum*, *Nyssa aquatica*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Morella cerifera*
Herb (field)	Flowering forb	*Polygonum hydropiperoides*, *Pontederia cordata*, *Sagittaria lancifolia*
Herb (field)	Graminoid	*Typha domingensis*
Herb (field)	Fern (Spore-bearing forb)	*Thelypteris palustris*

CHARACTERISTIC SPECIES

Jean Lafitte National Historical Park and Preserve: *Acer rubrum*, *Morella cerifera*, *Nyssa aquatica*, *Polygonum hydropiperoides*, *Pontederia cordata*, *Sagittaria lancifolia*, *Taxodium distichum*, *Thelypteris palustris*, *Typha domingensis*
Global: *Acer rubrum*, *Morella cerifera*, *Nyssa aquatica*, *Polygonum hydropiperoides*, *Pontederia cordata*, *Sagittaria lancifolia*, *Taxodium distichum*, *Thelypteris palustris*, *Typha domingensis*

OTHER NOTEWORTHY SPECIES

Jean Lafitte National Historical Park and Preserve: Invasive/Exotic Plants: *Alternanthera philoxeroides* (Medium), *Eichhornia crassipes* (High), *Salvinia minima* (), *Salvinia molesta* (Medium), *Triadica sebifera* (High)
Global: Invasive/Exotic Plants: *Alternanthera philoxeroides* (Medium), *Eichhornia crassipes* (High), *Salvinia minima* (), *Salvinia molesta* (Medium), *Triadica sebifera* (High)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (6-Oct-2014).

RELATED CONCEPTS

Global Similar Types:

- *Nyssa biflora - (Taxodium distichum, Nyssa aquatica) / Morella cerifera - Rosa palustris* Tidal Forest (CEGL004484)
- *Taxodium distichum - Nyssa aquatica - Persea palustris* Tidal Forest (CEGL004681)
- *Taxodium distichum / Carex hyalinolepis* Tidal Woodland (CEGL004654)
- *Taxodium distichum / Typha angustifolia* Tidal Woodland (CEGL004231)
- *Taxodium distichum / Zizania aquatica - Carex canescens ssp. disjuncta* Tidal Woodland (CEGL004655)
- *Taxodium distichum* Tidal Woodland (CEGL003739)

CLASSIFICATION

Status: Provisional
Classification Confidence: 3 - Weak
Jean Lafitte National Historical Park and Preserve Classification Comments: This is the first tidal woodland described of the Gulf Coast of Louisiana. It was identified during a cluster analysis of 159 plots from Jean Lafitte National Historical Park and Preserve, Louisiana. This community is described from 27 plots at Jean Lafitte National Historical Park and Preserve that loosely clustered together (Homoteneity (0.680); Bray-Curtis Similarity (0.513)). The species in this community are shared with and sometimes codominant in other communities at Jean Lafitte, but the combination of species and environmental setting seems to support description of this community as a separate type. This community represents a diverse set of occurrences with seasonal and aspect dominance that

differs between sites. For classification purposes, more weight was given to perennial woody species such as *Taxodium distichum, Acer rubrum, Nyssa aquatica* and *Morella cerifera* even though total herbaceous cover was often higher than woody cover and some plots clustered with marsh vegetation. Mean canopy cover class for *Taxodium distichum, Acer rubrum*, and *Morella cerifera* was 10-25% for the groups of plots contributing to this description. Related vegetation has been described from other freshwater tidal marshes along the Gulf and Atlantic coasts.

Global Classification Comments: This is the first tidal woodland described for the Gulf Coast of Louisiana. It was identified during a cluster analysis of 159 plots from Jean Lafitte National Historical Park and Preserve, Louisiana. This community is described from 27 plots at Jean Lafitte National Historical Park and Preserve that loosely clustered together (Homoteneity (0.680); Bray-Curtis Similarity (0.513)). The species in this community are shared with and sometimes codominant in other communities at Jean Lafitte, but the combination of species and environmental setting seems to support description of this community as a separate type. This community represents a diverse set of occurrences with seasonal and aspect dominance that differs between sites. For classification purposes, more weight was given to perennial woody species such as *Taxodium distichum, Acer rubrum, Nyssa aquatica*, and *Morella cerifera* even though total herbaceous cover was often higher than woody cover and some plots clustered with marsh vegetation. Mean canopy cover class for *Taxodium distichum, Acer rubrum*, and *Morella cerifera* was 10-25% for the groups of plots contributing to this description. Related vegetation has been described from other freshwater tidal marshes along the Gulf and Atlantic coasts.

ELEMENT DISTRIBUTION

Jean Lafitte National Historical Park and Preserve Range: This community is found interspersed with marshes adjacent to the Intracoastal Waterway/Bayou Barataria, Bayou aux Carpes, Bayou Boeuf, and along the landward edge of the marsh bordering Lake Salvador.

Global Range: This community is described from Jean Lafitte National Historical Park and Preserve. Other examples are expected to occur along the coast of Louisiana.

Nations: US

States/Provinces: LA

TNC Ecoregions: 31:C, 42:C

USFS Ecoregions (1994/95): 232Eb:CCC

Federal Lands: NPS (Jean Lafitte)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Inventory Notes: Plot data were collected by a number of different observers. Data for this analysis and analytical assistance were provided by NPS.

Jean Lafitte National Historical Park and Preserve Plots: BAT_13, BAT_18, BAT_19, BAT_20, BAT_27, BAT_28, BAT_37, BAT_J14, BAT_NJ16, BAT_NJ17, BAT_NJ19, BAT_NJ2, BAT_NJ3, BAT_NJ4, BAT_NJ6, BAT_NJ8, BAT_NJ9, FH3a, FL12xa, FL1a, FL3a, FL6a, FL9a, FM15a, FM8a, MA17a, MA5a, JELA_AA_0064, JELA_AA_0088, JELA_AA_0090.

Jean Lafitte National Historical Park and Preserve Description Author(s): J. Teague

Global Description Author(s): J. Teague

References: Conner et al. 2007, Krauss et al. 2009, NPS 2005, Southeastern Ecology Working Group n.d.*

G034. OAK - SWEETGUM FLOODPLAIN FOREST

Group Summary Description: This wetland forest group is a very broad one, in its environmental amplitude, its floristic diversity, and its biogeographic range. It is primarily affiliated with the Atlantic and Gulf coastal plains from Virginia to Texas, and the Mississippi River Alluvial Plain and adjacent Upper East Gulf Coastal Plain from Illinois, Missouri and Kentucky south to Mississippi and Louisiana, but it also includes wetland, swamp, and riparian forests of the southern Piedmont from Virginia to Alabama. This group primarily encompasses vegetation dominated by members of the genus *Quercus*, along with *Liquidambar styraciflua, Ulmus* spp., and other trees,

being generally known as bottomland hardwood forests. It primarily encompasses communities of streams and rivers of all orders and sizes, as well as some forests of isolated wetlands, including depression ponds. This group includes forests known as "blackwater" as well as "brownwater" examples. Some characteristic components of blackwater forests include *Nyssa biflora*, as well as *Quercus laurifolia, Quercus lyrata, Quercus nigra, Pinus taeda*, and *Magnolia virginiana* in higher portions of the floodplain. *Nyssa aquatica* is generally scarce or absent. Brownwater examples are also likely to contain *Platanus occidentalis, Celtis laevigata, Fraxinus pennsylvanica, Acer negundo*, and others. These stands also may include *Quercus laurifolia, Quercus michauxii, Quercus pagoda*, and sometimes *Liquidambar styraciflua*. There is also some floristic variation between shorter and longer hydroperiod examples. *Quercus michauxii, Quercus pagoda*, and *Quercus shumardii* are characteristic of shorter hydroperiod examples, and *Quercus laurifolia, Quercus lyrata, Quercus phellos*, and *Nyssa biflora* of longer hydroperiod ones.

Except in the very wet examples, understory, shrub and herb layers are generally well-developed and woody vines are also prominent. *Arundinaria gigantea* is a common understory component in these forests on natural levees and higher point bars, and may become dominant after thinning or removal of the overstory. Sandbars dominated by *Salix* spp. and/or *Populus* spp. may have an open-canopy (woodland) structure.

Most vegetation placed here is associated with rivers and streams, but some are referred to as "flatwoods." It includes riverfront vegetation, which is generally temporarily (but rarely seasonally) flooded, on point bars and natural levees adjacent to the river that formed them, as well as high bottomlands, some low bottomlands, as well as levees, ridges, terraces, and some sloughs and abandoned channel segments. These features are large and well-defined in larger river systems, but the forests of smaller floodplains and bottomlands are not differentiated by these depositional landforms, because these features are small and flooding regimes are variable. The hydrologic regime and the hydroperiod are also highly diverse in this group of forests.

A3634 *Quercus virginiana - Quercus pagoda - Quercus nigra* Coastal Plain Swamp Forest Alliance

Live Oak - Cherrybark Oak - Water Oak Coastal Plain Swamp Forest Alliance
Coastal Plain Live Oak Swamp Forest

ALLIANCE CONCEPT

Summary: This alliance includes temporarily and infrequently flooded forests dominated by *Quercus virginiana* with *Quercus pagoda* and *Quercus nigra* occurring on older and more recent natural levee ridges and terraces within antecedent and current floodplain systems of large coastal plain rivers of both the Atlantic and Gulf coastal plains from South Carolina to Florida and Texas. Species composition is also variable depending on hydrology and geographic location. Other characteristic species include *Carpinus caroliniana, Carya glabra, Celtis laevigata, Fraxinus americana, Ilex opaca var. opaca, Ilex vomitoria, Liquidambar styraciflua, Magnolia grandiflora, Pinus glabra, Pinus taeda, Sabal minor*, and *Viburnum dentatum*. Hydrology is variable, including temporarily flooded areas within current floodplains and very infrequently flooded areas within antecedent floodplains.

Classification Comments: Type concept summary largely based on old alliance *Quercus virginiana* Temporarily Flooded Forest Alliance (A.57).

Diagnostic Characteristics: These are temporarily and infrequently flooded forests dominated by *Quercus virginiana* with *Quercus pagoda* and *Quercus nigra* occurring on large coastal plain rivers of both the Atlantic and Gulf coastal plains.

Related Concepts:

- Hardwood Bottom (White et al. 1983) ><
- Live Oak: 89 (Eyre 1980) ><
- Water Oak-Coastal Live Oak Series (Diamond 1993) **?**

ALLIANCE DESCRIPTION

Environment: These forests occur on older and more recent natural levee ridges and terraces within antecedent and current floodplain systems of large coastal plain rivers of both the Atlantic and Gulf coastal plains from South Carolina to Florida and Texas. Hydrology is variable, including temporarily flooded areas within current floodplains and very infrequently flooded areas within antecedent floodplains. Species composition is variable depending on hydrology and geographic location.

Vegetation: Stands of this alliance are dominated by *Quercus virginiana* with *Quercus pagoda* and *Quercus nigra*. Other characteristic species include *Carpinus caroliniana, Carya glabra, Celtis laevigata, Fraxinus americana, Ilex opaca var. opaca, Ilex vomitoria, Liquidambar styraciflua, Magnolia grandiflora, Pinus glabra, Pinus taeda, Sabal minor*, and *Viburnum dentatum*. Other shrubs include *Callicarpa americana, Morella cerifera (= Myrica cerifera var. cerifera)*. and *Sambucus canadensis*. Woody vines are common and include *Ampelopsis arborea, Berchemia scandens, Bignonia capreolata, Campsis radicans*, and *Toxicodendron radicans*. The epiphytes *Pleopeltis polypodioides ssp. michauxiana* and *Tillandsia usneoides* may also be present.

Floristics: Stands of this alliance are dominated by *Quercus virginiana* with *Quercus pagoda* and *Quercus nigra*. Other characteristic species include *Carpinus caroliniana, Carya glabra, Celtis laevigata, Fraxinus americana, Ilex opaca var. opaca, Ilex vomitoria, Liquidambar styraciflua, Magnolia grandiflora, Pinus glabra, Pinus taeda, Sabal minor*, and *Viburnum dentatum*. Other shrubs include *Callicarpa americana, Morella cerifera (= Myrica cerifera var. cerifera)*. and *Sambucus canadensis*. Woody vines are common and include *Ampelopsis arborea, Berchemia scandens, Bignonia capreolata, Campsis radicans*, and *Toxicodendron radicans*. The epiphytes *Pleopeltis polypodioides ssp. michauxiana* and *Tillandsia usneoides* may also be present.

ALLIANCE DISTRIBUTION

Range: Stands of this alliance are found in the south Atlantic and East Gulf coastal plains, ranging into the Florida peninsula, the Texas coastal prairies and marshes, and north into the Mississippi River Valley Alluvial Plain.
Nations: US
Subnations: AL, FL, GA, LA, MS, SC, TX
TNC Ecoregions: 31:C, 40:?, 42:C, 53:C, 54:P, 55:P, 56:C, 57:?

ALLIANCE SOURCES

References: Diamond 1993, Eyre 1980, Faber-Langendoen et al. 2017b*, White et al. 1983
Author of Concept: Faber-Langendoen et al. 2017b
Author of Description: M. Pyne, in Faber-Langendoen et al. (2013)

[CEGL004648] *Quercus virginiana - Celtis laevigata - Quercus pagoda / Sabal minor* Swamp Forest

Translated Name: **Live Oak - Sugarberry - Cherrybark Oak / Dwarf Palmetto Swamp Forest**
Common Name: **Natural Levee Live Oak Forest**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	Southeastern North American Flooded & Swamp Forest (1.B.3.Nb)
Macrogroup	Southern Coastal Plain Floodplain Forest (M031)
Group	Oak - Sweetgum Floodplain Forest (G034)
Alliance	*Quercus virginiana - Quercus pagoda - Quercus nigra* Coastal Plain Swamp Forest Alliance (A3634)

ELEMENT CONCEPT

Global Summary: This association is a hardwood forest dominated by *Quercus virginiana* and *Celtis laevigata*, occurring on natural levees in the bottomlands of the extreme lower Mississippi River alluvial valley, and along antecedent courses of the Mississippi River now occupied by bayous of southeastern Louisiana. Other characteristic species are *Sabal minor, Quercus pagoda, Acer rubrum, Fraxinus americana*, and *Liquidambar styraciflua*.

ENVIRONMENTAL DESCRIPTION

Jean Lafitte National Historical Park and Preserve Environment: This association is found primarily on Bayou des Familles natural levee. One location was recorded in an upland area adjacent to Bayou Barataria. These areas exhibit varying degrees of disturbance from past clearing, to pecan plantations, to rural development, all often involving hydrological alterations as well.

Global Environment: This association is found on natural levees in the bottomlands of the extreme lower Mississippi River alluvial valley, and along antecedent courses of the Mississippi River now occupied by bayous of southeastern Louisiana.

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: Our data and those of others (Denslow and Battaglia 2002) show that *Quercus virginiana* may occur in patches or as scattered individuals in the canopy of this community. Areas where *Quercus virginiana* are scattered are intermixed with areas where *Quercus virginiana* canopy is denser. These two expressions of stand structure are considered two subtypes of this association. Overall, the canopy of this community is characterized by *Quercus virginiana, Quercus nigra, Ulmus americana, Celtis laevigata*, and *Liquidambar styraciflua*. Other canopy components include *Fraxinus pennsylvanica, Carya illinoinensis, Acer rubrum, Acer negundo*, and *Gleditsia triacanthos*. The shrub layer is typically dominated by moderate to high cover of *Sabal minor*. Other common shrubs include *Ilex decidua* and *Crataegus viridis*. Herbaceous cover is often low except where the canopy has been opened by natural or anthropogenic disturbances. Vines such as *Toxicodendron radicans, Vitis rotundifolia, Parthenocissus quinquefolia*, and *Rubus trivialis* are commonly encountered. Stands dominated or codominated by *Quercus virginiana* tend to have a more closed canopy. The non-native tree *Triadica sebifera* is also commonly encountered at low cover especially in the more open subtype. This forest has suffered blowdowns from several intense hurricanes which might account for the openness of the canopy. It has also been impacted by logging and agribusiness. Research by Denslow and Battaglia (2002) indicate that *Quercus virginiana* may not be regenerating in this community at Jean Lafitte.

Global Vegetation: Stands are dominated by *Quercus virginiana* and *Celtis laevigata*. Other characteristic species are *Sabal minor, Quercus pagoda, Acer rubrum, Fraxinus americana*, and *Liquidambar styraciflua*.

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Celtis laevigata*, *Liquidambar styraciflua*, *Quercus nigra*, *Ulmus americana*
Tree canopy	Broad-leaved evergreen tree	*Quercus virginiana*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Ilex decidua*
Short shrub/sapling	Palm shrub	*Sabal minor*

CHARACTERISTIC SPECIES

Jean Lafitte National Historical Park and Preserve: *Celtis laevigata*, *Ilex decidua*, *Liquidambar styraciflua*, *Quercus nigra*, *Quercus virginiana*, *Sabal minor*, *Ulmus americana*

Global:

OTHER NOTEWORTHY SPECIES

Jean Lafitte National Historical Park and Preserve: Invasive/Exotic Plants: *Triadica sebifera* (High)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G2 (4-Dec-1999). This forest is found only on natural levees in the bottomlands of the lower reaches of rivers and bayous in Louisiana's coastal plain. Because these areas are higher and drier than the surrounding bottomlands, they are the first areas to be developed for agricultural, residential and industrial use. Less than 5% of these forests are estimated to remain in today's landscape, and many remaining examples are highly fragmented. Threats include clearing for agriculture, residential development, and overgrazing.

RELATED CONCEPTS

Global Similar Types:

- *Quercus virginiana - Quercus nigra - Liquidambar styraciflua / Ilex opaca var. opaca / Viburnum dentatum* Swamp Forest (CEGL007476)
- *Quercus virginiana - Quercus pagoda - Magnolia grandiflora / Cornus florida / Sanicula* sp. Swamp Forest (CEGL007469)
- *Quercus virginiana / Ilex vomitoria - Sabal minor / Carex cherokeensis - Malvaviscus arboreus var. drummondii* Forest (CEGL007830)
- *Ulmus crassifolia - Carya illinoinensis - Celtis laevigata / Chasmanthium sessiliflorum - Carex cherokeensis* Floodplain Forest (CEGL002388)

Global Related Concepts:

- *Quercus* association (Penfound and Hathaway 1938) =
- Hardwood Bottom (White et al. 1983) >
- High Ridge (Wall and Darwin 1999) ><
- Live Oak Forest (Smith 1996a) >
- Live Oak: 89 (Eyre 1980) >
- Middle Elevation (Denslow and Battaglia 2002) ><
- Upper Elevation (Denslow and Battaglia 2002) ><

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Jean Lafitte National Historical Park and Preserve Classification Comments: This vegetation was identified during a cluster analysis of 159 plots from Jean Lafitte National Historical Park and Preserve, Louisiana. It is described from 20 (7 closed subtype and 13 open subtype) plots that clustered together. The plots with high and low cover of *Quercus virginiana* tended to clump together in many smaller clusters intermixed within the larger community cluster. Though this community differs somewhat from the global description for this type, the dominant species and landscape position are a good fit, but Jean Lafitte plots lacked some of the global associated species such as *Quercus pagoda* and *Fraxinus americana*.
Global Classification Comments: Similar vegetation, lacking *Quercus pagoda*, occurring along the lower Brazos, San Bernard and Colorado rivers in Texas is classified as *Quercus virginiana / Ilex vomitoria - Sabal minor / Carex cherokeensis - Malvaviscus arboreus var. drummondii* Forest (CEGL007830). Also see *Ulmus crassifolia - Carya illinoinensis - Celtis laevigata / Chasmanthium sessiliflorum - Carex cherokeensis* Floodplain Forest (CEGL002388).

ELEMENT DISTRIBUTION

Jean Lafitte National Historical Park and Preserve Range: This association is found primarily on a natural levee along Bayou des Familles. One location was recorded in an upland area adjacent to Bayou Barataria.
Global Range: This association is found in Louisiana. Based on the ranges of the nominals, it is not likely, though possible, that this association occurs in Texas.
Nations: US
States/Provinces: LA
TNC Ecoregions: 31:C
USFS Ecoregions (1994/95): 232Ea:CC?, 232Eb:CCC
Federal Lands: NPS (Jean Lafitte)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Inventory Notes: Plot data were collected by a number of different observers. Data for this analysis and analytical assistance were provided by NPS.
Jean Lafitte National Historical Park and Preserve Plots: FH10a, FH11a, FH12a, FH14a, FH15a, FH16a, FH1a, FH2a, FH7a, Forest15, Forest2a, Forest4, Forest5a, Forest8a, Plot1PlantationTrl, Plot2PlantationTrl, Plot3PlantationTrl, Plot4PlantationTrl, Plot5nearTwinCanal, Plot7, JELA_AA_0045, JELA_AA_0057, JELA_AA_0096, JELA_AA_0097.
Jean Lafitte National Historical Park and Preserve Description Author(s): J. Teague
Global Description Author(s): L.M. Smith and P. Harcombe
References: Denslow and Battaglia 2002, Eyre 1980, LNHP 2009, Penfound and Hathaway 1938, Smith 1996a, Southeastern Ecology Working Group n.d.*, Wall and Darwin 1999, White et al. 1983

G759. SOUTHERN ASH - ELM - WILLOW FLOODPLAIN FOREST

Group Summary Description: This group is composed of deciduous floodplain or swamp forests found primarily in the coastal plains of the southeastern United States. These forests are typically dominated by some combination of *Fraxinus pennsylvanica, Populus deltoides, Salix caroliniana, Salix nigra*, and *Ulmus americana*. In addition, some examples contain or are codominated by *Acer negundo, Betula nigra, Liquidambar styraciflua*, and/or *Platanus occidentalis*. The composition and physiognomy of the shrub and herbaceous layers are quite variable due to the broad geographic area in which this group occurs, as well as the dynamics of the frequent disturbances. Common shrubs include *Cornus drummondii, Ilex vomitoria, Lindera benzoin, Smilax* spp., and *Toxicodendron radicans*. Sites are typically on sandbars, riverfronts, and levees of rivers and small streams, though some examples occur on the edges of lakes, and one alliance occurs primarily in the swales of Atlantic coastal dunes.

A3709 *Ulmus americana - Ulmus crassifolia - Celtis laevigata* West Gulf Coastal Plain Floodplain Forest Alliance

American Elm - Cedar Elm - Sugarberry West Gulf Coastal Plain Floodplain Forest Alliance
West Gulf Coastal Plain Elm - Sugarberry Floodplain Forest

ALLIANCE CONCEPT

Summary: This alliance unifies a suite of primarily temporarily flooded bottomland and floodplain forests from the West Gulf Coastal Plain of Arkansas, Louisiana, Oklahoma, and Texas as well as from adjacent ecoregions (Mississippi River Alluvial Plain, peripherally the East Gulf Coastal Plain). All of these associations contain *Ulmus americana* and/or *Ulmus crassifolia* as dominants or codominants. *Ulmus crassifolia* is found in the Mississippi River Alluvial Plain and the West Gulf Coastal Plain, ranging west into central Texas, but is occasionally found east of the Mississippi River. An additional frequent component of these forests is *Celtis laevigata*. Other species which may be found in examples of this alliance include *Carya illinoinensis, Diospyros virginiana, Fraxinus*

pennsylvanica, Gleditsia triacanthos, Maclura pomifera, Populus heterophylla, Quercus sinuata var. sinuata, Quercus texana, and *Ulmus rubra*. Some understory and ground layer components include *Bidens aristosa, Carex cherokeensis, Carex digitalis, Geum canadense, Glyceria striata, Leersia virginica, Sabal minor*, and *Trepocarpus aethusae*.

Classification Comments: Some examples of this alliance in the West Gulf Coastal Plain may intergrade with, and possibly be difficult to distinguish from, examples of *Fraxinus pennsylvanica - Platanus occidentalis - Acer saccharinum* Ozark-Ouachita Floodplain Forest Alliance (A3700), but examples of this latter alliance would be expected to have dominance shared among *Fraxinus pennsylvanica, Ulmus americana*, and *Acer saccharinum*, and to have less, if any, presence of *Ulmus crassifolia*. There is some uncertainty about the status of *Ulmus crassifolia - Celtis laevigata - (Ulmus rubra) / Carex digitalis - Geum canadense* Floodplain Forest (CEGL007950) and *Ulmus alata - Liquidambar styraciflua / Celtis laevigata / Trepocarpus aethusae* Calcareous Floodplain Forest (CEGL007951), both of old alliance A.283. They are very closely related and their species compositions have been affected to one degree of another by "high-grading," with CEGL007951 being the more "disturbed" of the two.

Similar Alliances:

- *Carya illinoinensis - Ulmus crassifolia - Celtis laevigata* Floodplain Forest Alliance (A3679)
- *Fraxinus pennsylvanica - Acer rubrum - Juniperus virginiana var. silicicola* Tidal Floodplain Forest Alliance (A3705) occurs on the Atlantic Coastal Plain and is tidal.
- *Fraxinus pennsylvanica - Platanus occidentalis - Acer saccharinum* Ozark-Ouachita Floodplain Forest Alliance (A3700)
- *Fraxinus pennsylvanica - Platanus occidentalis - Ulmus americana* Coastal Plain Floodplain Forest Alliance (A3707) occurs on the Atlantic Coastal Plain and is non-tidal.

Similar Alliance Comments: Stands of this alliance should be dominated or codominated by *Ulmus americana, Ulmus crassifolia*, and/or *Celtis laevigata*. This alliance (A3709) may have a shorter hydroperiod than *Fraxinus pennsylvanica - Platanus occidentalis - Ulmus americana* Coastal Plain Floodplain Forest Alliance (A3707), but this assumption should be reviewed.

Diagnostic Characteristics: These are floodplain and bottomland forests of the West Gulf Coastal Plain and adjacent regions dominated by some combination of *Carya illinoinensis, Celtis laevigata, Ulmus americana*, and/or *Ulmus crassifolia*. This combination of floristics and biogeography is diagnostic.

Related Concepts:

- *Celtis laevigata - Ulmus crassifolia - Fraxinus* spp. (Foti et al. 1994) **>** [Description says "MAP."]
- *Celtis laevigata - Ulmus crassifolia - Fraxinus* spp. P1B3c1V9b (Foti 1994b) **>**
- *Celtis laevigata* (Foti et al. 1994) **>**
- Cedar Elm - Hackberry / Justicia Wet-Mesic Stream Bottoms (Turner et al. 1999) **?**
- Sugarberry-Elm Series (Diamond 1993) **>** [Diamond type not restricted to coastal plains.]
- Sugarberry-Elm-Ash Forest (Foti 1994b) **>**

ALLIANCE DESCRIPTION

Environment: Component associations are found in a variety of habitats, including bottomlands in the Mississippi River Alluvial Plain and Gulf Coastal Plain, including along the southwestern periphery of the Upper West Gulf Coastal Plain ecoregion of eastern Texas. One component association is only known from ponds on Macon Ridge in the Mississippi River Alluvial Plain of northeastern Louisiana. Another is found In bottomlands along the Red River in Arkansas and probably adjacent areas of Oklahoma and Texas. The riparian mesic blackland woodlands occur as narrow communities found between ephemeral streams and dry-mesic and mesic blackland prairie. Temporarily high water tables as well as fire probably strongly influence the herbaceous community as well as woody species composition and structure.

Vegetation: Stands are dominated by some combination of *Celtis laevigata, Ulmus crassifolia*, and *Ulmus americana*. Other species which may be found in examples of this alliance include *Carya illinoinensis, Cercis canadensis var. canadensis, Diospyros virginiana, Fraxinus pennsylvanica, Gleditsia triacanthos, Maclura*

pomifera, Populus heterophylla, Quercus sinuata var. sinuata, Quercus texana, and *Ulmus rubra*. Vines may include *Ampelopsis arborea, Berchemia scandens, Campsis radicans, Parthenocissus quinquefolia, Toxicodendron radicans*, and *Vitis cinerea*. Some understory and ground layer components include *Arundinaria gigantea, Bidens aristosa, Boehmeria cylindrica, Carex cherokeensis, Carex digitalis, Geum canadense, Glyceria striata, Helianthus grosseserratus, Leersia oryzoides, Leersia virginica, Sabal minor*, and *Trepocarpus aethusae*. In bottomlands along the Red River in Arkansas and probably adjacent areas of Oklahoma and Texas, *Quercus sinuata* dominates along with *Ulmus crassifolia*. Other common species include *Acer saccharinum, Celtis laevigata, Quercus falcata, Quercus laurifolia, Quercus macrocarpa, Quercus phellos, Quercus shumardii*, and *Ulmus americana*. The codominant *Ulmus crassifolia* is found in the Mississippi River Alluvial Plain and the West Gulf Coastal Plain, ranging west into central Texas, but is occasionally found east of the Mississippi River.

Physiognomy and Structure: In bottomlands along the Red River in Arkansas and probably adjacent areas of Oklahoma and Texas, the structure of stands is an open forest or woodland with a ground layer dominated by grasses, sedges and *Sabal minor*.

Floristics: Stands are dominated by some combination of *Celtis laevigata, Ulmus crassifolia*, and *Ulmus americana*. Other species which may be found in examples of this alliance include *Carya illinoinensis, Cercis canadensis var. canadensis, Diospyros virginiana, Fraxinus pennsylvanica, Gleditsia triacanthos, Maclura pomifera, Populus heterophylla, Quercus sinuata var. sinuata, Quercus texana*, and *Ulmus rubra*. Vines may include *Ampelopsis arborea, Berchemia scandens, Campsis radicans, Parthenocissus quinquefolia, Toxicodendron radicans*, and *Vitis cinerea*. Some understory and ground layer components include *Arundinaria gigantea, Bidens aristosa, Boehmeria cylindrica, Carex cherokeensis, Carex digitalis, Geum canadense, Glyceria striata, Helianthus grosseserratus, Leersia oryzoides, Leersia virginica, Sabal minor*, and *Trepocarpus aethusae*. In bottomlands along the Red River in Arkansas and probably adjacent areas of Oklahoma and Texas, *Quercus sinuata* dominates along with *Ulmus crassifolia*. Other common species include *Acer saccharinum, Celtis laevigata, Quercus falcata, Quercus laurifolia, Quercus macrocarpa, Quercus phellos, Quercus shumardii*, and *Ulmus americana*. The codominant *Ulmus crassifolia* is found in the Mississippi River Alluvial Plain and the West Gulf Coastal Plain, ranging west into central Texas, but is occasionally found east of the Mississippi River.

Dynamics: In the riparian mesic blackland woodland communities, including native *Maclura pomifera* woodlands, succession of woody vegetation is rapid during periods without fire, forming almost impenetrable thickets of vines and shrubs. Temporarily high water tables probably strongly influence herbaceous composition and moderately influence woody species composition.

ALLIANCE DISTRIBUTION

Range: This alliance is found in the West Gulf Coastal Plain of Arkansas, Louisiana, Oklahoma, and Texas as well as from adjacent ecoregions (Mississippi River Alluvial Plain and peripherally the East Gulf Coastal Plain). One association is attributed to the East Gulf Coastal Plain of Alabama, Mississippi, and possibly Tennessee.

Nations: US

Subnations: AL, AR, LA, MS, OK?, TN, TX

TNC Ecoregions: 32:P, 40:C, 41:C, 42:C, 43:C, 53:P

ALLIANCE SOURCES

References: Diamond 1993, Faber-Langendoen et al. 2017b*, Foti 1994b, Foti et al. 1994, Hoagland 1998a, Turner et al. 1999

Author of Concept: Faber-Langendoen et al. 2017b

Author of Description: M. Pyne, in Faber-Langendoen et al. (2013)

[CEGL004619] *Quercus texana - Celtis laevigata - Ulmus (americana, crassifolia) - (Gleditsia triacanthos)* Floodplain Forest

Translated Name: **Nuttall Oak - Sugarberry - (American Elm, Cedar Elm) - (Honey-locust) Floodplain Forest**
Common Name: **Nuttall Oak - Sugarberry Bottomland Forest**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	Southeastern North American Flooded & Swamp Forest (1.B.3.Nb)
Macrogroup	Southern Coastal Plain Floodplain Forest (M031)
Group	Southern Ash - Elm - Willow Floodplain Forest (G759)
Alliance	*Ulmus americana - Ulmus crassifolia - Celtis laevigata* West Gulf Coastal Plain Floodplain Forest Alliance (A3709)

ELEMENT CONCEPT

Global Summary: These are forests of large bottomlands, found in the Mississippi River Alluvial Plain, the Upper West Gulf Coastal Plain, the Upper East Gulf Coastal Plain, and possibly the East Gulf Coastal Plain, in Mississippi, Arkansas, and possibly Louisiana and other adjacent states. The canopy contains a variable mixture of *Quercus texana, Celtis laevigata, Ulmus americana*, and *Ulmus crassifolia*. Some stands may contain *Gleditsia triacanthos* in the canopy or subcanopy, but this tree has very brittle wood, and many specimens have been lost to storm and wind damage. Other associated species may include *Fraxinus pennsylvanica* and *Liquidambar styraciflua*. These forests are slightly higher in elevation than those dominated by *Quercus lyrata* and *Quercus texana*. More information is needed on the composition and distribution of this type.

ENVIRONMENTAL DESCRIPTION

Jean Lafitte National Historical Park and Preserve Environment: At Jean Lafitte, these forests occupy a zone or band between the *Quercus virginiana*-dominated forests of the natural levee ridges and the lower wetter swamp forests dominated by *Acer rubrum, Fraxinus profunda*, and/or *Taxodium distichum*.
Global Environment: These are forests of large bottomlands, found in the Mississippi River Alluvial Plain, the Upper West Gulf Coastal Plain, the Upper East Gulf Coastal Plain, and possibly the East Gulf Coastal Plain, in Mississippi, Arkansas, and possibly other adjacent states. These forests are slightly higher in elevation than those dominated by *Quercus lyrata* and *Quercus texana*.

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: The canopy contains a variable mixture of *Quercus texana, Quercus nigra, Carya illinoinensis, Liquidambar styraciflua, Fraxinus pennsylvanica*, and *Celtis laevigata*. Some stands may have more *Carya illinoinensis* and *Liquidambar styraciflua* than *Quercus*. Other associated species may include *Acer rubrum* and *Ulmus americana*. Some stands may contain *Gleditsia triacanthos* in the canopy or subcanopy, but this tree has very brittle wood, and many specimens have been lost to storm and wind damage. The understory may contain *Acer rubrum, Celtis laevigata, Crataegus viridis, Fraxinus pennsylvanica, Quercus laurifolia, Quercus nigra*, and *Ulmus americana*.
Global Vegetation: The canopy contains a variable mixture of *Quercus texana, Celtis laevigata, Ulmus americana*, and *Ulmus crassifolia*. Some stands may contain *Gleditsia triacanthos* in the canopy or subcanopy, but this tree has very brittle wood, and many specimens have been lost to storm and wind damage. Other associated species may include *Fraxinus pennsylvanica* and *Liquidambar styraciflua*.

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Celtis laevigata*, *Fraxinus pennsylvanica*, *Liquidambar styraciflua*, *Quercus texana*, *Ulmus americana*

Global

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Celtis laevigata*, *Fraxinus pennsylvanica*, *Liquidambar styraciflua*, *Quercus texana*, *Ulmus americana*

CHARACTERISTIC SPECIES

Jean Lafitte National Historical Park and Preserve: *Celtis laevigata*, *Quercus texana*, *Ulmus americana*
Global: *Celtis laevigata*, *Quercus texana*, *Ulmus americana*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G4G5 (7-Sep-1999).

RELATED CONCEPTS

Global Similar Types:

- *Fraxinus pennsylvanica - Ulmus americana - (Quercus texana) / Bidens aristosa - Leersia virginica* Floodplain Forest (CEGL007987) D. Zollner (pers. comm. 2001) says these may be the same.

Global Related Concepts:

- Bottomland Hardwood Forest (Smith 1996a) >
- Sugarberry - American Elm - Green Ash: 93 (Eyre 1980) >

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak

ELEMENT DISTRIBUTION

Global Range: These forests of large bottomlands are found in the Mississippi River Alluvial Plain, the Upper West Gulf Coastal Plain, the Upper East Gulf Coastal Plain, and possibly the East Gulf Coastal Plain, in Mississippi, Arkansas, and possibly other adjacent states.
Nations: US
States/Provinces: AL, AR, LA?, MS, TN?, TX?
TNC Ecoregions: 31:C, 40:C, 41:P, 42:C, 43:C, 53:P
USFS Ecoregions (1994/95): 231Bh:CCC, 231Ea:CCC, 231Ec:CCC, 231Ed:CCP, 231F:C?, 232Bd:CCC, 232Bs:CCC, 232Eb:CCC, 232Fc:CPP, 232Fd:CPP, 234Aa:CCC, 234Ac:CCC, 234Ag:CCC, 234Ah:CCP, 234Ai:CC?, 234Ak:CC?, 234Al:CC?, 234Am:CCP, 234An:CCC
Federal Lands: NPS (Jean Lafitte, Natchez Trace); USFS (Delta, St. Francis)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Plots: JELA_AA_0001, JELA_AA_0044, JELA_AA_0050, JELA_AA_0059, JELA_AA_0060, JELA_AA_0074.
Jean Lafitte National Historical Park and Preserve Description Author(s): M. Pyne
Global Description Author(s): K. Ribbeck, T. Foti, M. Pyne
References: Eyre 1980, LNHP 2009, Martin and Smith 1991, Nordman et al. 2011, Smith 1996a, Southeastern Ecology Working Group n.d.*, Zollner pers. comm.

2. Shrub & Herb Vegetation

2.B.2. Temperate Grassland & Shrubland

2.B.2.Ne. SOUTHEASTERN NORTH AMERICAN GRASSLAND & SHRUBLAND

M307. Southeastern Ruderal Grassland & Shrubland

G583. SOUTHEASTERN RUDERAL GRASSLAND & SHRUBLAND

Group Summary Description: This group comprises vegetation that occurs on disturbed sites that were cleared and the soils disturbed (e.g., old fields, abandoned quarries, old homesteads, etc.). Stands may be composed of native or exotic species, or combinations of these. These are combinations of taxa for which no natural analog exists. In the southeastern Piedmont, the herbs and grasses that dominate old fields undergo a rapid turnover in the first three years after abandonment. By the third year, *Andropogon virginicus* often is the dominant plant. Before it achieves dominance, *Ambrosia artemisiifolia, Conyza canadensis, Digitaria sanguinalis*, and *Symphyotrichum pilosum* may be more prominent. Other perennial grasses may include *Andropogon gyrans, Andropogon ternarius*, and *Dichanthelium dichotomum*. Shrubs and vines appear in these communities, and some genera may form stands, including the native genera *Baccharis, Cornus, Prunus, Rubus*, and *Sophora secundiflora* (in Texas), as well as the exotics *Ligustrum, Pueraria*, and *Wisteria*. This variation is accommodated at the alliance level within this group, as in the absence of disturbance, small trees rapidly overtake them and become dominant.

A3321 *Andropogon virginicus - Ambrosia artemisiifolia - Conyza canadensis* Eastern Ruderal Grassland Alliance

Translated Name: **Broomsedge Bluestem - Annual Ragweed - Canadian Horseweed Eastern Ruderal Grassland Alliance**
Common Name: **Eastern Ruderal Grassland**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	Southeastern North American Grassland & Shrubland (2.B.2.Ne)
Macrogroup	Southeastern Ruderal Grassland & Shrubland (M307)
Group	Southeastern Ruderal Grassland & Shrubland (G583)

ELEMENT CONCEPT

Global Summary: This alliance encompasses a variety of herbaceous vegetation that occurs in the eastern United States on sites that were cleared and the soils disturbed (e.g., old fields, abandoned quarries, old homesteads). Stands are composed of combinations of native and/or exotic species for which no natural analog exists. These species

include *Ambrosia artemisiifolia, Andropogon virginicus var. virginicus, Conyza canadensis, Cynodon dactylon, Eremochloa ophiuroides, Eupatorium* spp., *Imperata cylindrica, Lolium arundinaceum, Lolium pratense, Paspalum notatum, Pennisetum glaucum, Solidago* spp., *Sorghum halepense, Stenotaphrum secundatum*, and *Urochloa ramosa*. Scattered shrubs may be present, including *Rhus copallinum*. In the southeastern Piedmont, the herbs and grasses that dominate old fields undergo a rapid turnover in the first three years after abandonment. By the third year, *Andropogon virginicus* often is the dominant plant. Before it achieves dominance, *Ambrosia artemisiifolia, Conyza canadensis, Digitaria sanguinalis*, and *Symphyotrichum pilosum* may be more prominent; other combinations of native and exotic species also may occur.

ENVIRONMENTAL DESCRIPTION

VEGETATION DESCRIPTION

Global Vegetation: Examples of this diverse alliance may be dominated by stands of, or combinations of, a variety of native and exotic grasses and forbs. *Andropogon virginicus var. virginicus* is often the dominant plant by the third year of succession in Piedmont old fields (Oosting 1942). Before it achieves dominance, *Ambrosia artemisiifolia, Conyza canadensis, Digitaria sanguinalis*, and *Symphyotrichum pilosum* may be more prominent. Other species that may be present include *Ambrosia artemisiifolia, Conyza canadensis, Cynodon dactylon, Eremochloa ophiuroides, Imperata cylindrica, Lolium arundinaceum, Lolium pratense, Paspalum notatum, Pennisetum glaucum, Sorghum halepense, Stenotaphrum secundatum*, and *Urochloa ramosa*. In the Piedmont of North Carolina, other (mostly native) herbaceous taxa may include *Antennaria plantaginifolia, Bulbostylis capillaris, Chamaecrista fasciculata, Chamaesyce nutans, Cyperus compressus, Diodia teres, Eupatorium capillifolium, Eupatorium compositifolium, Eupatorium serotinum, Fimbristylis autumnalis, Gamochaeta purpurea (= Gnaphalium purpureum), Helenium amarum (= Helenium tenuifolium), Hypericum drummondii, Hypericum gentianoides, Ipomoea lacunosa, Ipomoea pandurata, Juncus tenuis, Plantago aristata, Pseudognaphalium obtusifolium (= Gnaphalium obtusifolium), Solanum carolinense*, and *Solidago* spp. (Oosting 1942). Scattered shrubs may be present, including *Rhus copallinum*. In the southeastern Piedmont, the herbs and grasses that dominate old fields undergo a rapid turnover in the first three years after abandonment. There may be no clear dominant, and the sites may undergo year-to-year changes in composition and dominance as succession occurs (Oosting 1942).

Global Dynamics: In the southeastern Piedmont, the herbs and grasses that dominate old fields undergo a rapid turnover in the first three years after abandonment. By the third year, *Andropogon virginicus* often is the dominant plant. There may be no clear dominant, and the sites may undergo year-to-year changes in composition and dominance as succession occurs (Oosting 1942).

MOST ABUNDANT SPECIES

CHARACTERISTIC SPECIES

Global:

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (27-Sep-2013).

RELATED CONCEPTS

Global Related Concepts:

- Herblands of abandoned fields; *Andropogon virginicus, Eupatorium compositifolium* (Penfound 1967) <
- Herblands of abandoned fields; *Digitaria sanguinalis, Erigeron canadensis* (Penfound 1967) <
- Seral grasslands on abandoned fields; *Andropogon virginicus* (Penfound 1967) <

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Global Classification Comments: Stands of this alliance are composed of combinations of taxa for which no natural analog exists. One significant reference is Wright and Fridley (2010), from which more information can be obtained on regional variation in semi-natural vegetation in the eastern United States.

ELEMENT DISTRIBUTION

Global Range: This vegetation is found across the eastern United States, in the coastal plains and the unglaciated interior provinces.
Nations: US
States/Provinces: AL, AR, FL, GA, IL, IN, KY, LA, MD, MO, MS, NC, OK, SC, TN, TX, VA, WV
TNC Ecoregions: 31:C, 32:C, 38:C, 39:C, 40:C, 41:C, 42:C, 43:C, 44:C, 50:C, 51:P, 52:C, 53:C, 56:C, 57:C, 59:C
Federal Lands: NPS (Jean Lafitte, Natchez Trace)

ELEMENT SOURCES

Global Description Author(s): M. Pyne
References: Faber-Langendoen et al. 2017b*, Oosting 1942, Penfound 1967, Wright and Fridley 2010

A3322 *Rubus* spp. - *Prunus* spp. - *Cornus drummondii* Eastern Ruderal Shrubland Alliance

Blackberry species - Plum species - Roughleaf Dogwood Eastern Ruderal Shrubland Alliance
Eastern Ruderal Native Shrubland

ALLIANCE CONCEPT

Summary: This alliance encompasses a variety of semi-natural native shrub-dominated vegetation that occurs in the eastern United States on sites that were cleared and the soils disturbed (e.g., old fields, abandoned quarries, old homesteads). Stands are primarily composed of native species. A variety of *Rubus* species (the taxa depending on biogeography) may be dominant in stands of one association, but other combinations of native species also occur, including *Baccharis halimifolia, Cornus drummondii, Prunus angustifolia*, other *Prunus* spp., and *Smilax* spp. These are combinations of taxa for which no natural analog exists.
Classification Comments: These are combinations of semi-natural native shrub taxa for which no natural analog exists. One significant reference is Wright and Fridley (2010), from which more information can be obtained on regional variation in semi-natural vegetation in the eastern United States.
Diagnostic Characteristics: This alliance encompasses a variety of semi-natural native shrub-dominated vegetation that occurs on disturbed sites in the southeastern United States.

ALLIANCE DESCRIPTION

Vegetation: Stands are primarily composed of native shrub species. A variety of *Rubus* species (the taxa depending on biogeography) may be dominant in stands of one association, but other combinations of native species also occur, including *Baccharis halimifolia, Cornus drummondii, Prunus angustifolia*, other *Prunus* spp., and *Smilax* spp. These are combinations of taxa for which no natural analog exists.
Floristics: Stands are primarily composed of native shrub species. A variety of *Rubus* species (the taxa depending on biogeography) may be dominant in stands of one association, but other combinations of native species also occur, including *Baccharis halimifolia, Cornus drummondii, Prunus angustifolia*, other *Prunus* spp., and *Smilax* spp. These are combinations of taxa for which no natural analog exists.

ALLIANCE DISTRIBUTION

Range: This semi-natural native shrub-dominated vegetation is found across the southeastern United States from Virginia to Texas. It may be more widespread.
Nations: US
Subnations: AL, AR, GA, KY, LA, MS, NC, SC, TN, TX, VA
TNC Ecoregions: 31:C, 32:P, 38:C, 39:C, 40:C, 41:C, 42:C, 43:C, 44:C, 50:C, 51:C, 52:C, 53:C, 56:C, 57:C, 59:C, 61:C

ALLIANCE SOURCES

References: Faber-Langendoen et al. 2017b*, Penfound 1967, Wright and Fridley 2010
Author of Concept: Faber-Langendoen et al. 2017b
Author of Description: M. Pyne, in Faber-Langendoen et al. (2013)

[CEGL004657] *Baccharis halimifolia* Ruderal Shrubland

Translated Name: **Groundsel-tree Ruderal Shrubland**

Common Name: **Ruderal Groundsel-tree Shrubland**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	Southeastern North American Grassland & Shrubland (2.B.2.Ne)
Macrogroup	Southeastern Ruderal Grassland & Shrubland (M307)
Group	Southeastern Ruderal Grassland & Shrubland (G583)
Alliance	*Rubus* spp. - *Prunus* spp. - *Cornus drummondii* Eastern Ruderal Shrubland Alliance (A3322)

ELEMENT CONCEPT

Global Summary: As currently described, this vegetation includes successional shrublands dominated by *Baccharis halimifolia* on saturated soils both in the interior Coastal Plain of Louisiana and Arkansas and along the Gulf Coast of Texas. Coastal settings include shrublands dominated by *Baccharis halimifolia* that invade old fields and saline and non-saline prairies in the absence of fire. In these settings, *Spartina spartinae, Andropogon virginicus, Andropogon glomeratus, Setaria parviflora (= Setaria geniculata)*, and *Solidago sempervirens* are often present in the herb stratum. With periodic fire, this association will revert to *Spartina spartinae* Grassland (CEGL004608). Apparently, this association also includes vegetation of the interior Coastal Plain occurring in disturbed settings on saturated soils.

ENVIRONMENTAL DESCRIPTION

Jean Lafitte National Historical Park and Preserve Environment: This vegetation occurs on spoil banks at Jean Lafitte National Historical Park and Preserve.
Global Environment: This vegetation occurs on saturated saline and non-saline soils. It appears to occur on spoil banks at Jean Lafitte National Park.

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: Examples are dominated by *Baccharis halimifolia* with *Andropogon glomeratus, Andropogon virginicus, Solidago sempervirens*, and *Spartina spartinae*.
Global Vegetation: Coastal settings include shrublands dominated by *Baccharis halimifolia* that invade old fields and saline and non-saline prairies in the absence of fire. In these settings, *Spartina spartinae, Andropogon*

virginicus, Andropogon glomeratus, Setaria parviflora (= Setaria geniculata), and *Solidago sempervirens* are often present in the herb stratum.

Global Dynamics: In the Gulf Coast Prairies and Marshes of Texas, this vegetation will revert to *Spartina spartinae*-dominated grassland in the presence of periodic fire.

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Baccharis halimifolia*

Global

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Baccharis halimifolia*

CHARACTERISTIC SPECIES

Jean Lafitte National Historical Park and Preserve: *Baccharis halimifolia*
Global: *Baccharis halimifolia*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (12-Jun-2001). This is a successional community within grasslands of the Gulf Coastal Prairie. It likely existed in fire-protected patches, in a mosaic within the coastal prairie grassland matrix. As a result of fire suppression, it is thought to be much more widespread in today's landscape.

RELATED CONCEPTS

Global Similar Types:

- *Iva frutescens ssp. frutescens - Baccharis halimifolia / Spartina spartinae* Saline Shrubland (CEGL004616)

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Global Classification Comments: Along the coast of Texas, similar vegetation occurring in tidal situations is classified as the natural type *Iva frutescens ssp. frutescens - Baccharis halimifolia / Spartina spartinae* Saline Shrubland (CEGL004616).

ELEMENT DISTRIBUTION

Global Range: This association is found in Arkansas, Louisiana, Mississippi, and Texas.
Nations: US
States/Provinces: AR, LA, MS, TX
TNC Ecoregions: 31:C, 39:C, 40:C, 41:C, 42:C, 43:C
USFS Ecoregions (1994/95): 231Bi:CCC, 231Fb:CCC, 232Eb:CPP, 255Dc:CCC
Federal Lands: NPS (Jean Lafitte, Natchez Trace); USFWS (Anahuac, Aransas, Big Boggy, Brazoria, Matagorda Island, McFaddin, San Bernard)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Plots: None.
Global Description Author(s): Southeastern Ecology Group
References: Nordman et al. 2011, Southeastern Ecology Working Group n.d.*

[CEPP007085] *Sesbania drummondii* Ruderal Shrubland

Translated Name: **Poison-bean Ruderal Shrubland**
Common Name: **Ruderal Poison-bean Shrubland**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	Southeastern North American Grassland & Shrubland (2.B.2.Ne)
Macrogroup	Southeastern Ruderal Grassland & Shrubland (M307)
Group	Southeastern Ruderal Grassland & Shrubland (G583)
Alliance	*Rubus* spp. - *Prunus* spp. - *Cornus drummondii* Eastern Ruderal Shrubland Alliance (A3322)

ELEMENT CONCEPT

Global Summary: This vegetation consists of stands of *Sesbania drummondii*, with *Kosteletzkya virginica* and *Hibiscus moscheutos* which occur in disturbed wet flats, as in powerline rights-of-way, abandoned fields, and other cleared areas. These areas are flooded after floods or rain events, but may appear dry during some times of the year, allowing for the germination or reestablishment of these species.

ENVIRONMENTAL DESCRIPTION

Jean Lafitte National Historical Park and Preserve Environment: This vegetation occurs in disturbed wet flats, as in powerline rights-of-way, abandoned fields and other cleared areas.
Global Environment: This vegetation occurs in powerline rights-of-way, abandoned fields. and other cleared areas.

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: At Jean Lafitte, examples are dominated by *Sesbania drummondii*, with *Kosteletzkya virginica* and *Hibiscus moscheutos*. In addition, *Rumex verticillatus* is present.
Global Vegetation: This vegetation consists of stands of *Sesbania drummondii*, with *Kosteletzkya virginica* and *Hibiscus moscheutos*.

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Sesbania drummondii*

Global

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Hibiscus moscheutos*, *Kosteletzkya virginica*, *Sesbania drummondii*

CHARACTERISTIC SPECIES

Jean Lafitte National Historical Park and Preserve: *Sesbania drummondii*
Global: *Hibiscus moscheutos*, *Kosteletzkya virginica*, *Sesbania drummondii*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (ruderal) (6-Oct-2015).

RELATED CONCEPTS

CLASSIFICATION

Status: Provisional
Classification Confidence:
Global Classification Comments: *Sesbania drummondii* is restricted to freshwater environments, and grows well on both mineral and organic soils, and is common in marshes that periodically become dry. It may dominate shallow, temporary ponds in coastal prairies of Texas (Stutzenbaker 1999). Its habitat may also include swales, shallow lakes, depressions, and areas along streams (Jones 1982).

ELEMENT DISTRIBUTION

Jean Lafitte National Historical Park and Preserve Range: This vegetation is documented from one location under a powerline in the southwest corner of the park. The site appears to have been cleared of trees for powerline management.
Global Range: This vegetation is described from southeastern Louisiana in the Deltaic Plain. It could at least potentially occur throughout the southeastern United States. *Sesbania drummondii* occurs as a native plant from the western Florida panhandle west into coastal and interior Texas, and north in the interior to southern Arkansas.
Nations: US
States/Provinces: AL?, AR?, FL?, GA?, LA, MS?, TX?
TNC Ecoregions: 29:?, 30:P, 31:C, 32:?, 40:?, 41:P, 42:P, 53:?
USFS Ecoregions (1994/95): 232Eb:CCC
Federal Lands: NPS (Jean Lafitte)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Inventory Notes: This vegetation is documented from one location under a powerline in the southwest corner of the park. The site appears to have been cleared of trees for powerline management. There is one quickplot collected by Pyne and Strassman.
Jean Lafitte National Historical Park and Preserve Plots: None.
Jean Lafitte National Historical Park and Preserve Description Author(s): M. Pyne and A. Strassman
Global Description Author(s): M. Pyne and A. Strassman
References: Jones 1982, Southeastern Ecology Working Group n.d.*, Stutzenbaker 1999

2.C.4. Temperate to Polar Freshwater Marsh, Wet Meadow & Shrubland

2.C.4.NE. ATLANTIC & GULF COASTAL MARSH, WET MEADOW & SHRUBLAND

M066. Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh

G110. ATLANTIC & GULF COASTAL FRESH-OLIGOHALINE TIDAL MARSH

Group Summary Description: Vegetation of this fresh and oligohaline marsh group constitutes the primary vegetation between oceanward salt and brackish marshes and inland, non-tidally influenced vegetation from Newfoundland south to Florida and west to Texas along the Atlantic and Gulf coasts. These freshwater marshes are characterized by fresh to oligohaline waters which are driven by lunar and wind tides. The environment includes areas well inside the mouths of tidal creeks and rivers, where there is adequate riverflow and discharge to maintain fresh to oligohaline conditions, while still within tidal range. This group typically occurs as complexes of several associations characterized by a mixture of annual and perennial grasses, forbs, sedges, rushes, other grass-like plants, floating or submerged aquatics, shrubs, and scattered tree saplings. Dominance patterns change seasonally, yearly, and geographically. In addition to regional variability, freshwater tidal marshes may also exhibit floristic zonation based on age, water depth, tidal regime, and other factors, into a low and high marsh. This vegetation supports broad-leaved emergent plants such as *Nuphar advena, Nuphar orbiculata, Nuphar sagittifolia, Peltandra virginica, Pontederia cordata*, and *Sagittaria* spp.; annual and perennial grasses such as *Calamagrostis canadensis, Leersia oryzoides, Panicum hemitomon, Spartina cynosuroides, Spartina patens, Zizania aquatica, Zizaniopsis miliacea*; sedges and rushes such as *Carex* spp., *Cladium mariscus ssp. jamaicense, Eleocharis* spp., *Fuirena* spp., *Schoenoplectus pungens, Schoenoplectus tabernaemontani*; other grass-like plants and annual and perennial forbs such as *Acorus calamus, Amaranthus cannabinus, Ambrosia trifida, Bidens* spp., *Impatiens capensis, Hibiscus moscheutos, Kosteletzkya virginica, Polygonum* spp., *Sium suave, Typha* spp.; and scattered shrubs such as *Cephalanthus occidentalis* and *Morella cerifera*. While some association dominants are tolerant of brackish water, they are associated with plants restricted to oligohaline or freshwater. Irregular flooding and fire are both important forces in this group, and rising sea level is a particularly important driver of long-term trends.

A0806 *Morella cerifera - Rosa palustris* Tidal Freshwater Shrubland Alliance

Wax-myrtle - Swamp Rose Tidal Freshwater Shrubland Alliance

Wax-myrtle - Swamp Rose Tidal Freshwater Shrubland

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 (= Myrica cerifera var. cerifera)* is the characteristic dominant species, with *Rosa palustris* and *Toxicodendron radicans ssp. radicans* as characteristic and constant companion species. Other woody species include *Persea palustris, Magnolia virginiana, Salix caroliniana, Vaccinium formosum, Smilax walteri, Smilax walteri*, and saplings of *Acer rubrum, Pinus taeda, Taxodium distichum*, and *Liquidambar styraciflua*. Herbaceous composition is diverse and varied, with many species recruited from adjacent marshes and swamps. *Thelypteris palustris var. pubescens* is highly characteristic and appears to reach its nodal distribution in this landscape in this community. Other important species can include *Juncus roemerianus, Cladium mariscus ssp. jamaicense*, and *Decodon verticillatus*. *Murdannia keisak* is an aggressive alien weed in these communities. Farther south, in the South Atlantic Coastal Plain, this alliance occurs on flats adjacent to tidal reaches of rivers. Examples receive seepage from adjacent uplands, maintaining a saturated condition, and also may receive tidal inundation in very rare storm tide events. Scattered trees of *Pinus taeda* and *Sabal palmetto* may be present. *Morella cerifera* and *Toxicodendron radicans ssp. radicans* dominate the dense

shrub stratum, and *Baccharis angustifolia* can be a major component. *Spartina bakeri* is the dominant herb; other herbs include *Juncus roemerianus, Cladium mariscus ssp. jamaicense, Cynanchum angustifolium*, and *Ipomoea sagittata*. Occurrences can exceed 50 acres in size. This latter, more southerly example of this alliance is placed here for now; the hydrology is ambiguous.

Diagnostic Characteristics: 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* is the characteristic dominant species, with *Rosa palustris* and *Toxicodendron radicans ssp. radicans* as characteristic and constant companion species.

ALLIANCE DESCRIPTION

Environment: These tidally flooded shrublands of the middle Atlantic Coastal Plain occur in association with freshwater tidal marshes and tidally flooded forests. 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 (= Myrica cerifera var. cerifera)* is the characteristic dominant species, with *Rosa palustris* and *Toxicodendron radicans ssp. radicans* as characteristic and constant companion species. Other woody species include *Persea palustris, Magnolia virginiana, Salix caroliniana, Vaccinium formosum, Smilax walteri, Smilax walteri*, and saplings of *Acer rubrum, Pinus taeda, Taxodium distichum*, and *Liquidambar styraciflua*. Herbaceous composition is diverse and varied, with many species recruited from adjacent marshes and swamps. *Thelypteris palustris var. pubescens* is highly characteristic and appears to reach its nodal distribution in this landscape in this community. Other important species can include *Juncus roemerianus, Cladium mariscus ssp. jamaicense*, and *Decodon verticillatus*. *Murdannia keisak* is an aggressive alien weed in these communities. Farther south, in the South Atlantic Coastal Plain, scattered trees of *Pinus taeda* and *Sabal palmetto* may be present. *Morella cerifera* and *Toxicodendron radicans ssp. radicans* dominate the dense shrub stratum, and *Baccharis angustifolia* can be a major component. *Spartina bakeri* is the dominant herb; other herbs include *Juncus roemerianus, Cladium mariscus ssp. jamaicense, Cynanchum angustifolium*, and *Ipomoea sagittata*.

Floristics: *Morella cerifera (= Myrica cerifera var. cerifera)* is the characteristic dominant species, with *Rosa palustris* and *Toxicodendron radicans ssp. radicans* as characteristic and constant companion species. Other woody species include *Persea palustris, Magnolia virginiana, Salix caroliniana, Vaccinium formosum, Smilax walteri, Smilax walteri*, and saplings of *Acer rubrum, Pinus taeda, Taxodium distichum*, and *Liquidambar styraciflua*. Herbaceous composition is diverse and varied, with many species recruited from adjacent marshes and swamps. *Thelypteris palustris var. pubescens* is highly characteristic and appears to reach its nodal distribution in this landscape in this community. Other important species can include *Juncus roemerianus, Cladium mariscus ssp. jamaicense*, and *Decodon verticillatus*. *Murdannia keisak* is an aggressive alien weed in these communities. Farther south, in the South Atlantic Coastal Plain, scattered trees of *Pinus taeda* and *Sabal palmetto* may be present. *Morella cerifera* and *Toxicodendron radicans ssp. radicans* dominate the dense shrub stratum, and *Baccharis angustifolia* can be a major component. *Spartina bakeri* is the dominant herb; other herbs include *Juncus roemerianus, Cladium mariscus ssp. jamaicense, Cynanchum angustifolium*, and *Ipomoea sagittata*.

Dynamics: Examples are subject to mainly freshwater tides.

ALLIANCE DISTRIBUTION

Range: This alliance is found along the Atlantic Coast from New Jersey and Delaware south to Florida.

Nations: US

Subnations: DE, FL, GA, MD, NC, NJ, SC, VA

ALLIANCE SOURCES

References: Faber-Langendoen et al. 2017b*, Fleming 1998

Author of Concept: Faber-Langendoen et al. 2017b

Author of Description: G.P. Fleming and A.S. Weakley, in Faber-Langendoen et al. (2013)

[CEGL007093] *Ilex cassine - Morella cerifera / Woodwardia areolata - Sphagnum* sp. Flotant Shrub Swamp

Translated Name: **Dahoon - Wax-myrtle / Netted Chainfern - Peatmoss species Flotant Shrub Swamp**
Common Name: **Gulf Coast Dahoon - Wax-myrtle / Virginia Chainfern - Peatmoss Flotant Shrub Swamp**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	Atlantic & Gulf Coastal Marsh, Wet Meadow & Shrubland (2.C.4.Ne)
Macrogroup	Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh (M066)
Group	Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh (G110)
Alliance	*Morella cerifera - Rosa palustris* Tidal Freshwater Shrubland Alliance (A0806)

ELEMENT CONCEPT

Global Summary: This floating marsh of the Mississippi Deltaic Plain occurs on extensive floating peat mats. It is apparently restricted to one area of approximately 35 ha (88 acres), and has a ground layer dominated by *Sphagnum* sp., with *Panicum hemitomon* in more open areas, and abundant *Woodwardia areolata* in more shaded portions. The dominant woody plant is *Morella cerifera*, but there is substantial cover by taller individuals of *Ilex cassine, Persea palustris*, and *Acer rubrum*. Herbs that are present at low cover include *Andropogon glaucopsis, Andropogon glomeratus, Cyperus haspan, Eleocharis albida, Hydrocotyle ranunculoides, Panicum verrucosum, Polygonum hydropiperoides, Rhynchospora microcephala, Rubus trivialis, Sacciolepis striata, Sagittaria lancifolia, Solidago sempervirens, Thelypteris palustris, Triadenum virginicum (= Hypericum virginicum)*, and *Xyris laxifolia var. iridifolia*. This area differs from the physiognomy of the related *Morella cerifera - Panicum hemitomon* Floating Marsh (CEGL007834) by having much more cover by taller woody plants, being at least a shrubland with trees, if not a woodland in terms of its physiognomy. Flotant marshes are dynamic systems and may switch from herbaceous dominance to shrub dominance in a cyclic pattern. Since floating marshes do not experience the stress of high floodwaters, shrubs may more easily become established in flotant marshes than in marshes rooted in the underlying substrate and subjected to floods. However, as shrubs become established and increase in biomass, the marsh mat becomes heavier and sinks, increasing flooding levels and killing off the woody shrubs.

ENVIRONMENTAL DESCRIPTION

Jean Lafitte National Historical Park and Preserve Environment: This vegetation is established on a different landscape position than other areas at the preserve where shrubs and small trees establish in herbaceous marsh. It appears to be a low-nutrient system, distinct and different from most ecosystems at the preserve. It is suspected that the nutrient status is shaped both by the landscape position and the hydrology of this particular place. The woody plants that distinguish this location (*Persea palustris, Ilex cassine*) are rare to unusual in other associations at the preserve, yet they are common here, and the same is true for *Sphagnum* (J. Whitbeck pers. comm. 2015). The increase in shrub-dominated flotant marshes in the Barataria could be attributed in part to increase in *Triadica sebifera* and also in part to lack of fire (Battaglia et al. 2007, 2009). Flotant marshes are dynamic systems and may switch from herbaceous dominance to shrub dominance in a cyclic pattern (Battaglia et al. 2007). Since floating marshes do not experience the stress of high floodwaters, shrubs may more easily become established in flotant marshes than in marshes rooted in the underlying substrate and subjected to floods (Battaglia et al. 2007). However, as shrubs become established and increase in biomass, the marsh mat becomes heavier and sinks, increasing flooding levels and killing off the woody shrubs (Shirley and Battaglia 2008).

Global Environment: This is a floating marsh of the Mississippi Deltaic Plain. Flotant marshes are dynamic systems and may switch from herbaceous dominance to shrub dominance in a cyclic pattern (Battaglia et al. 2007). Since floating marshes do not experience the stress of high floodwaters, shrubs may more easily become established

in flotant marshes than in marshes rooted in the underlying substrate and subjected to floods (Battaglia et al. 2007). However, as shrubs become established and increase in biomass, the marsh mat becomes heavier and sinks, increasing flooding levels and killing off the woody shrubs (Shirley and Battaglia 2008).

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: This shrub-herb marsh vegetation has a ground layer dominated by *Sphagnum* sp., with *Panicum hemitomon* in more open areas, and abundant *Woodwardia areolata* in more shaded portions. The dominant woody plant is *Morella cerifera*, but there is substantial cover by taller individuals of *Ilex cassine, Persea palustris*, and *Acer rubrum*. Herbs that are present at low cover include *Andropogon glaucopsis, Andropogon glomeratus, Cyperus haspan, Eleocharis albida, Hydrocotyle ranunculoides, Panicum verrucosum, Polygonum hydropiperoides, Rhynchospora microcephala, Rubus trivialis, Sacciolepis striata, Sagittaria lancifolia, Solidago sempervirens, Thelypteris palustris, Triadenum virginicum (= Hypericum virginicum)*, and *Xyris laxifolia var. iridifolia*. This area differs from the physiognomy of the related *Morella cerifera - Panicum hemitomon* Flotant Shrub Swamp (CEGL007834) by having much more cover by taller woody plants, being at least a shrubland with trees, if not a woodland in terms of its physiognomy (NatureServe unpubl. data 2015).

Global Vegetation: This shrub-herb marsh vegetation has a ground layer dominated by *Sphagnum* moss, with *Panicum hemitomon* in more open areas, and abundant *Woodwardia areolata* in more shaded portions. The dominant woody plant is *Morella cerifera*, but there is substantial cover by taller individuals of *Ilex cassine, Persea palustris*, and *Acer rubrum*. Herbs that are present at low cover include *Andropogon glaucopsis, Andropogon glomeratus, Cyperus haspan, Eleocharis albida, Hydrocotyle ranunculoides, Panicum verrucosum, Polygonum hydropiperoides, Rhynchospora microcephala, Rubus trivialis, Sacciolepis striata, Sagittaria lancifolia, Solidago sempervirens, Thelypteris palustris, Triadenum virginicum (= Hypericum virginicum)*, and *Xyris laxifolia var. iridifolia*. This area differs from the physiognomy of the related *Morella cerifera - Panicum hemitomon* Flotant Marsh (CEGL007834) by having much more cover by taller woody plants, being at least a shrubland with trees, if not a woodland in terms of its physiognomy (NatureServe unpubl. data 2015).

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Persea palustris*
Short shrub/sapling	Broad-leaved evergreen shrub	*Morella cerifera*
Herb (field)	Graminoid	*Panicum hemitomon*
Herb (field)	Fern (Spore-bearing forb)	*Woodwardia areolata*
Nonvascular	Moss	*Sphagnum* sp.

Global

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved evergreen shrub	*Persea palustris*
Short shrub/sapling	Broad-leaved evergreen shrub	*Morella cerifera*
Herb (field)	Graminoid	*Panicum hemitomon*
Herb (field)	Fern (Spore-bearing forb)	*Woodwardia areolata*
Nonvascular	Moss	*Sphagnum* sp.

CHARACTERISTIC SPECIES

Jean Lafitte National Historical Park and Preserve: *Ilex cassine*, *Morella cerifera*, *Panicum hemitomon*, *Persea palustris*, *Sphagnum* sp., *Woodwardia areolata*
Global: *Ilex cassine*, *Morella cerifera*, *Panicum hemitomon*, *Persea palustris*, *Sphagnum* sp., *Woodwardia areolata*

OTHER NOTEWORTHY SPECIES

Global: Invasive/Exotic Plants: *Triadica sebifera* (High)

CONSERVATION STATUS RANK

Global Rank & Reasons: G1G2 (20-Oct-2015). The conservation status of this association needs to be reassessed. Threats to this system include altered hydrology and increases in salinity. The coast of Louisiana, including the fresh to oligohaline marshes, are being impacted by saltwater intrusion and inundation because the lack of sediment supply, eustatic sea-level rise and enhanced relative sea-level rise caused by the natural compaction of coastal sediments and the increased subsidence resulting from groundwater and oil and gas removal (USGS 2013b). Dredging canals that increase the connection between the fresh and oligohaline marshes and the saline waters of the Gulf of Mexico also work to increase salinity and loss of these marshes (Deegan et al. 1984). While fresh to oligohaline marsh species have been shown to adapt to rising water levels, increased salinity has been shown to reduce the growth and survival of these species (Howard and Mendelssohn 1999, Willis and Hester 2004, Couvillion and Beck 2013, Neubauer 2013). As salinity increases fresh marsh composition shifts to species more tolerant of higher salinity, causing a reduction in species richness. If the increase in salinity is accompanied by increased water levels, this can ultimately result in conversion of marsh to open saline waters. These marshes are also threatened by reduced freshwater inflow caused by upstream dams and water diversion. Invasive plant species such as *Triadica sebifera* are threats. Some invasive exotic mammals are threats, such as nutria (*Myocastor coypus*) and feral hogs (*Sus scrofa*). An increase in storm intensities and barriers to landward marsh migration could further exacerbate the impacts of subsidence and sea-level rise. Other threats include pollution entering the marsh from point and nonpoint sources.

This is a highly threatened system in coastal Louisiana and conversion of marsh to open water has been high in Louisiana (Couvillion et al. 2011, USGS 2013b, Williams 2013). Coastal Louisiana has the highest rates of relative sea-level rise (>9 mm/year) in the nation (Williams 2013). A global eustatic sea-level rise of 0.5 to 2.0 m by A.D. 2100 when coupled with subsidence and barriers to the landward migration of marshes could result in devastating impacts on the coastal marshes of Louisiana (Neubauer 2013, Williams 2013). "Louisiana has sustained more coastal wetland loss than all other states in the continental United States combined" (Glick et al. 2013). SLAMM models predict 42 to 99% marsh and swamp loss in southeastern Louisiana by 2100 if eustatic sea-level rise exceeds 0.75 m (Glick et al. 2013). Ecological collapse in the system tends to result from hydrological alteration, increase in salinity, subsidence and lack of sediments from the Mississippi River to maintain marshes, eustatic sea-level rise, and resulting rise in relative sea level. Ecosystem collapse is characterized by conversion of the tidal herbaceous or shrub vegetation to mesohaline marshes or open water resulting in a loss of species richness.

RELATED CONCEPTS

Global Similar Types:

- *Morella cerifera - Panicum hemitomon* Floating Marsh (CEGL007834) is strongly dominated by *Morella cerifera* with *Panicum hemitomon* as the only other species often present.
- *Morella cerifera / Typha domingensis - Sagittaria lancifolia - Eleocharis* spp. Tidal Marsh (CEGL007241)

CLASSIFICATION

Status: Provisional
Classification Confidence: 3 - Weak
Jean Lafitte National Historical Park and Preserve Other Comments: Julie Whitbeck (pers. comm. 2015) thinks it is nutrient-limited, *Sphagnum*-abundant, other evergreen trees that are not high-nutrient species; different processes, etc. She sees it as a "Different kind of system"; very little investigation in flotant... Possibly more off of Tarpaper, south side near Davis-Marrero; another place, seen *Sphagnum* near Bayou aux Carpes. Other Bay-Ilex place is not this.
Global Classification Comments: Two other marsh communities dominated by *Morella cerifera* have been identified for coastal Louisiana. *Morella cerifera - Panicum hemitomon* Floating Marsh (CEGL007834) is described as strongly dominated by *Morella cerifera* with *Panicum hemitomon* as the only other species often present. At Jean Lafitte, these two species often strongly codominate occurrences of CEGL007834. *Morella cerifera / Typha domingensis - Sagittaria lancifolia - Eleocharis* spp. Tidal Marsh (CEGL007241) is described to accommodate vegetation that is more floristically diverse than *Morella cerifera - Panicum hemitomon* Floating Marsh (CEGL007834). These communities appear to co-occur and intermingle in the marsh in the Louisiana Deltaic Plain and more information is needed to better understand the dynamics of these communities and whether they should be merged.

Nolfo-Clements (2006) identified a "wax-myrtle thicket" floating marsh community at Jean Lafitte dominated by *Morella cerifera* and *Sphagnum* spp. Associated species include *Thelypteris palustris, Woodwardia areolata, Rhynchospora microcephala, Decodon verticillatus, Xyris laxifolia var. iridifolia* (in clumps), *Eupatorium perfoliatum, Ageratina altissima, Pluchea foetida, Solidago fistulosa, Acer rubrum, Triadica sebifera, Panicum hemitomon*, and *Sagittaria lancifolia*.

ELEMENT DISTRIBUTION

Jean Lafitte National Historical Park and Preserve Range: This community is apparently restricted to one area of approximately 35 ha (88 acres), north of the radio towers west of Barataria Boulevard.
Global Range: As described, this community occurs in the Deltaic Plain of coastal Louisiana.
Nations: US
States/Provinces: LA
TNC Ecoregions: 31:C
USFS Ecoregions (1994/95): 232Eb:CCC
Federal Lands: NPS (Jean Lafitte)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Inventory Notes: This type was not initially identified in the plot data analysis due to a lack of data. It was identified in the field in 2015.
Jean Lafitte National Historical Park and Preserve Plots: BAT_21. BAT_22, JELA_AA_0002, JELA_AA_0080.
Jean Lafitte National Historical Park and Preserve Description Author(s): M. Pyne and J. Teague
Global Description Author(s): M. Pyne and J. Teague
References: Battaglia et al. 2007, Battaglia et al. 2009, Couvillion and Beck 2013, Couvillion et al. 2011, Deegan et al. 1984, Glick et al. 2013, Howard and Mendelssohn 1999, NatureServe Ecology - Southeastern U.S. unpubl.

data, Neubauer 2013, Nolfo-Clements 2006, Shirley and Battaglia 2008, Southeastern Ecology Working Group n.d.*, USGS 2013b, Whitbeck pers. comm., Williams 2013, Willis and Hester 2004

[CEGL007241] *Morella cerifera / Typha domingensis - Sagittaria lancifolia - Eleocharis* spp. Tidal Marsh

Translated Name: **Wax-myrtle / Southern Cattail - Bull-tongue Arrowhead - Spikerush species Tidal Marsh**
Common Name: **Wax-myrtle / Southern Cattail - Bull-tongue Arrowhead Shrub-Herb Marsh**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	Atlantic & Gulf Coastal Marsh, Wet Meadow & Shrubland (2.C.4.Ne)
Macrogroup	Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh (M066)
Group	Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh (G110)
Alliance	*Morella cerifera - Rosa palustris* Tidal Freshwater Shrubland Alliance (A0806)

ELEMENT CONCEPT

Global Summary: This shrub-herb marsh vegetation is located adjacent to estuarine and riverine tidal waters. It is characterized by moderate to high cover of *Morella cerifera* in combination with a variety of fresh to oligohaline marsh species. Scattered stunted trees of *Acer rubrum* and *Triadica sebifera* are frequently encountered. Marsh species frequently encountered with moderate cover include *Eleocharis* spp., *Sagittaria lancifolia, Polygonum hydropiperoides*, and *Thelypteris palustris*. The marsh is often mixed with no clear dominant. Other frequently encountered herbaceous species include *Andropogon glomeratus, Cyperus* spp., *Sacciolepis striata*, and *Kosteletzkya virginica*. A variety of other herbaceous species may be found infrequently and at low cover in this community. Common non-native species include *Triadica sebifera, Panicum repens, Alternanthera philoxeroides*, and *Salvinia minima*.

ENVIRONMENTAL DESCRIPTION

Jean Lafitte National Historical Park and Preserve Environment: This shrub-herb marsh vegetation is located adjacent to estuarine and riverine tidal waters, but the occurrences where it is documented are mostly mapped as palustrine semipermanently flooded and not identified as tidal (NPS 2005). Though tidal influence has not been documented, it might be present, especially from wind tides. In some occurrences this shrub-herb marsh community is separated from open water by expansive herb marshes. All locations are impacted by levees and ditches that are presumably disrupting the flow of water. Some examples of this community may occur as a floating mat of vegetation (flotant). Shirley and Battaglia (2006) documented a concomitant increase in the amount of scrub-shrub habitat at Barataria and decrease in herbaceous marsh from 1955-1998. The increase in shrub-dominated flotant marshes in the Barataria could be attributed in part to increase in *Triadica sebifera* and also in part to lack of fire (Battaglia et al. 2007, 2009). Flotant marshes are dynamic systems and may switch from herbaceous dominance to shrub dominance in a cyclic pattern (Battaglia et al. 2007). Since floating marshes do not experience the stress of high floodwaters, shrubs may more easily become established in flotant marshes than in marshes rooted in the underlying substrate and subjected to floods (Battaglia et al. 2007). However, as shrubs become established and increase in biomass, the marsh mat becomes heavier and sinks, increasing flooding levels and killing off the woody shrubs (Shirley and Battaglia 2008).

Global Environment: This shrub-herb marsh vegetation is located adjacent to estuarine and riverine tidal waters, but the occurrences where it is documented are mostly mapped as palustrine semipermanently flooded and not identified as tidal (NPS 2005). Though tidal influence has not been documented, it might be present, especially from wind tides. In some occurrences this shrub-herb marsh community is separated from open water by expansive herb

marshes. All locations are impacted by levees and ditches that are presumably disrupting the flow of water. Some examples of this community may occur as a floating mat of vegetation (flotant). Shirley and Battaglia (2006) documented a concomitant increase in the amount of scrub-shrub habitat at Barataria and decrease in herbaceous marsh from 1955-1998. The increase in shrub-dominated flotant marshes in the Barataria could be attributed in part to increase in *Triadica sebifera* and also in part to lack of fire (Battaglia et al. 2007, 2009). Flotant marshes are dynamic systems and may switch from herbaceous dominance to shrub dominance in a cyclic pattern (Battaglia et al. 2007). Since floating marshes do not experience the stress of high floodwaters, shrubs may more easily become established in flotant marshes than in marshes rooted in the underlying substrate and subjected to floods (Battaglia et al. 2007). However, as shrubs become established and increase in biomass, the marsh mat becomes heavier and sinks, increasing flooding levels and killing off the woody shrubs (Shirley and Battaglia 2008).

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: This shrub-herb marsh vegetation is characterized by moderate to high cover of *Morella cerifera* in combination with a variety of fresh to oligohaline marsh species. Scattered stunted trees of *Acer rubrum* and *Triadica sebifera* are frequently encountered. Marsh species frequently encountered with moderate cover include *Eleocharis* spp., *Sagittaria lancifolia, Polygonum hydropiperoides*, and *Thelypteris palustris*. The marsh is often mixed with no clear dominant. Other frequently encountered herbaceous species include *Andropogon glomeratus, Cyperus* spp., *Sacciolepis striata*, and *Kosteletzkya virginica*. Other species less frequently encountered that may have moderate cover include *Typha domingensis, Woodwardia areolata, Hydrocotyle* spp., *Sacciolepis striata, Decodon verticillatus, Spartina patens, Panicum hemitomon*, and *Sphagnum* spp. A variety of other herbaceous species may be found infrequently and at low cover in this community. Common non-native species include *Triadica sebifera, Panicum repens, Alternanthera philoxeroides*, and *Salvinia minima*.

Global Vegetation: This shrub-herb marsh vegetation is characterized by moderate to high cover of *Morella cerifera* in combination with a variety of fresh to oligohaline marsh species. Scattered stunted trees of *Acer rubrum* and *Triadica sebifera* are frequently encountered. Marsh species frequently encountered with moderate cover include *Eleocharis* spp., *Sagittaria lancifolia, Polygonum hydropiperoides*, and *Thelypteris palustris*. The marsh is often mixed with no clear dominant. Other frequently encountered herbaceous species include *Andropogon glomeratus, Cyperus* spp., *Sacciolepis striata*, and *Kosteletzkya virginica*. Other species less frequently encountered that may have moderate cover include *Typha domingensis, Woodwardia areolata, Hydrocotyle* spp., *Sacciolepis striata, Decodon verticillatus, Spartina patens, Panicum hemitomon*, and *Sphagnum* spp. A variety of other herbaceous species may be found infrequently and at low cover in this community. Common non-native species include *Triadica sebifera, Panicum repens, Alternanthera philoxeroides*, and *Salvinia minima*.

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Morella cerifera*
Herb (field)	Flowering forb	*Polygonum hydropiperoides*, *Sagittaria lancifolia*
Herb (field)	Graminoid	*Eleocharis* spp., *Typha domingensis*
Herb (field)	Fern (Spore-bearing forb)	*Thelypteris palustris*

Global

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Morella cerifera*
Herb (field)	Flowering forb	*Polygonum hydropiperoides*, *Sagittaria lancifolia*
Herb (field)	Graminoid	*Eleocharis* spp., *Typha domingensis*
Herb (field)	Fern (Spore-bearing forb)	*Thelypteris palustris*

CHARACTERISTIC SPECIES

Jean Lafitte National Historical Park and Preserve: *Decodon verticillatus*, *Eleocharis* spp., *Hydrocotyle* spp., *Morella cerifera*, *Polygonum hydropiperoides*, *Sagittaria lancifolia*, *Sphagnum* spp., *Thelypteris palustris*, *Typha domingensis*
Global: *Decodon verticillatus*, *Eleocharis* spp., *Hydrocotyle* spp., *Morella cerifera*, *Polygonum hydropiperoides*, *Sagittaria lancifolia*, *Sphagnum* spp., *Thelypteris palustris*, *Typha domingensis*

OTHER NOTEWORTHY SPECIES

Jean Lafitte National Historical Park and Preserve: Invasive/Exotic Plants: *Alternanthera philoxeroides* (Medium), *Panicum repens* (High/Medium), *Salvinia minima* (), *Triadica sebifera* (High)
Global: Invasive/Exotic Plants: *Alternanthera philoxeroides* (Medium), *Panicum repens* (High/Medium), *Salvinia minima* (), *Triadica sebifera* (High)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (6-Oct-2014). Conservation status of this association needs to be assessed. Threats to this system include altered hydrology and increases in salinity. The coast of Louisiana, including the fresh to oligohaline marshes, are being impacted by saltwater intrusion and inundation because the lack of sediment supply, eustatic sea-level rise and enhanced relative sea-level rise caused by the natural compaction of coastal sediments and the increased subsidence resulting from groundwater and oil and gas removal (USGS 2013b). Dredging canals that increase the connection between the fresh and oligohaline marshes and the saline waters of the Gulf also work to increase salinity and loss of these marshes (Deegan et al. 1984). While fresh to oligohaline marsh species have been shown to adapt to rising water levels, increased salinity has been shown to reduce the growth and survival of these species (Howard and Mendelssohn 1999, Willis and Hester 2004, Couvillon and Beck 2013, Neubauer 2013). As salinity increases fresh marsh composition shifts to species more tolerant of higher salinity, causing a reduction in species richness. If the increase in salinity is accompanied by increased water levels, this can ultimately result in conversion of marsh to open saline waters. These marshes are also threatened by reduced freshwater inflow caused by upstream dams and water diversion. Invasive plant species such as *Triadica sebifera* are threats. Some invasive exotic mammals are threats, such as nutria (*Myocastor coypus*) and feral hogs (*Sus scrofa*). An increase in storm intensities and barriers to landward marsh migration could further exacerbate the impacts of subsidence and sea-level rise. Other threats include pollution entering the marsh from point and nonpoint sources.

This is a highly threatened system in coastal Louisiana and conversion of marsh to open water has been high in Louisiana (Couvillion et al. 2011, USGS 2013b, Williams 2013). Coastal Louisiana has the highest rates of relative sea-level rise (>9 mm/year) in the nation (Williams 2013). A global eustatic sea-level rise of 0.5 to 2.0 m by A.D. 2100 when coupled with subsidence and barriers to the landward migration of marshes could result in devastating impacts on the coastal marshes of Louisiana (Neubauer 2013, Williams 2013). "Louisiana has sustained more coastal wetland loss than all other states in the continental United States combined" (Glick et al. 2013). SLAMM models predict 42 to 99% marsh and swamp loss in southeastern Louisiana by 2100 if eustatic sea-level rise exceeds 0.75 m (Glick et al. 2013). Ecological collapse in the system tends to result from hydrological alteration, increase in salinity, subsidence and lack of sediments from the Mississippi River to maintain marshes,

eustatic sea-level rise, and resulting rise in relative sea level. Ecosystem collapse is characterized by conversion of the tidal herbaceous or shrub vegetation to mesohaline marshes or open water resulting in a loss of species richness.

RELATED CONCEPTS

Global Similar Types:

- *Ilex cassine - Morella cerifera / Woodwardia areolata - Sphagnum sp.* Flotant Shrub Swamp (CEGL007093)

Global Related Concepts:

- *Myrica* shrub marshes (Sasser et al. 1996) ><
- Freshwater Marsh (Smith 1996a) >
- Wax-myrtle Thicket Community (Nolfo-Clements 2006) ><

CLASSIFICATION

Status: Provisional

Classification Confidence: 3 - Weak

Jean Lafitte National Historical Park and Preserve Classification Comments: This community was identified during a cluster analysis of 159 plots from Jean Lafitte National Historical Park and Preserve, Louisiana. It is described from 13 plots that clustered together (Homoteneity (0.642); Bray-Curtis Similarity (0.447)) within a larger cluster that includes *Taxodium distichum / Morella cerifera / Thelypteris palustris* Woodland (CEGL007065). The species in this community are shared with and sometimes are codominant in other communities at Jean Lafitte, but the combination of species and environmental setting seems to support description of this community as a separate type. This community represents a diverse set of occurrences with seasonal and aspect dominance that differs between sites. For classification purposes, more weight is given to perennial woody shrub *Morella cerifera* even though total herbaceous cover is often higher than woody cover, and some plots clustered with marsh vegetation. Scattered stunted *Taxodium distichum* is only occasionally found in this community, and when encountered, it is present at very low cover, whereas it is frequently found in moderate cover (10-25%) in *Taxodium distichum / Morella cerifera / Thelypteris palustris* Woodland (CEGL007065). These two communities are also distinguished by the abundance and dominance of *Morella cerifera* (closer to 50% cover in CEGL007241 and 10-25% in CEGL007065).

Two marsh communities dominated by *Morella cerifera* have been identified for coastal Louisiana. This community, *Morella cerifera / Typha domingensis - Sagittaria lancifolia - Eleocharis* spp. Marsh (CEGL007241), is described to accommodate vegetation that is more floristically diverse than *Morella cerifera - Panicum hemitomon* Flotant Marsh Herbaceous Vegetation (CEGL007834). *Morella cerifera - Panicum hemitomon* Flotant Marsh Herbaceous Vegetation (CEGL007834) is described as strongly dominated by *Morella cerifera* with *Panicum hemitomon* as the only other species often present. The two communities separated in a cluster analysis of 159 plots from Jean Lafitte National Historical Park and Preserve, Louisiana.

Nolfo-Clements (2006) identified a "wax-myrtle thicket" floating marsh community at Jean Lafitte dominated by *Morella cerifera* and *Sphagnum* spp. Associated species include *Thelypteris palustris, Woodwardia areolata, Rhynchospora microcephala, Decodon verticillatus, Xyris laxifolia var. iridifolia* (in clumps), *Eupatorium perfoliatum, Ageratina altissima, Pluchea foetida, Solidago fistulosa, Acer rubrum, Triadica sebifera, Panicum hemitomon*, and *Sagittaria lancifolia*. CEGL007241 has variable cover of *Sphagnum* spp., therefore a more broadly defined type than Nolfo-Clements' "wax-myrtle thicket" community.

Global Classification Comments: This community was identified during a cluster analysis of 159 plots from Jean Lafitte National Historical Park and Preserve, Louisiana. It is described from 13 plots that clustered together (Homoteneity (0.642); Bray-Curtis Similarity (0.447)) within a larger cluster that includes *Taxodium distichum / Morella cerifera / Thelypteris palustris* Tidal Woodland (CEGL007065). Two of these 13 plots (BAT_21, BAT_22) have been reassigned to a new type, *Ilex cassine - Morella cerifera / Woodwardia virginica - Sphagnum* sp. Flotant

Shrub Swamp [Park Special] (CEPS009726). The species in this community are shared with and sometimes are codominant in other communities at Jean Lafitte, but the combination of species and environmental setting seems to support description of this community as a separate type. This community represents a diverse set of occurrences with seasonal and aspect dominance that differs between sites. For classification purposes, more weight is given to perennial woody shrub *Morella cerifera* even though total herbaceous cover is often higher than woody cover, and some plots clustered with marsh vegetation. Scattered stunted *Taxodium distichum* is only occasionally found in this community, and when encountered, it is present at very low cover, whereas it is frequently found in moderate cover (10-25%) in *Taxodium distichum / Morella cerifera / Thelypteris palustris* Tidal Woodland (CEGL007065). These two communities are also distinguished by the abundance and dominance of *Morella cerifera* (closer to 50% cover in CEGL007241 and 10-25% in CEGL007065).

Two marsh communities dominated by *Morella cerifera* have been identified for coastal Louisiana. This community, *Morella cerifera / Typha domingensis - Sagittaria lancifolia - Eleocharis* spp. Tidal Marsh (CEGL007241), is described to accommodate vegetation that is more floristically diverse than *Morella cerifera - Panicum hemitomon* Floating Marsh (CEGL007834), which is described as strongly dominated by *Morella cerifera* with *Panicum hemitomon* as the only other species often present. The two communities separated in a cluster analysis of 159 plots from Jean Lafitte National Historical Park and Preserve, Louisiana. However, these communities appear to co-occur and intermingle in the marsh at Jean Lafitte and more information is needed to better understand whether these communities should be merged.

Nolfo-Clements (2006) identified a "wax-myrtle thicket" floating marsh community at Jean Lafitte dominated by *Morella cerifera* and *Sphagnum* spp. Associated species include *Thelypteris palustris, Woodwardia areolata, Rhynchospora microcephala, Decodon verticillatus, Xyris laxifolia var. iridifolia* (in clumps), *Eupatorium perfoliatum, Ageratina altissima, Pluchea foetida, Solidago fistulosa, Acer rubrum, Triadica sebifera, Panicum hemitomon*, and *Sagittaria lancifolia*. CEGL007241 has variable cover of *Sphagnum* spp., therefore a more broadly defined type than Nolfo-Clements' "wax-myrtle thicket" community.

ELEMENT DISTRIBUTION

Jean Lafitte National Historical Park and Preserve Range: This community is found interspersed with wooded, shrub-herb and herbaceous marshes adjacent to bayous canals and lakes.
Global Range: This community is described from Jean Lafitte National Historical Park and Preserve. Other examples are expected to occur along the coast of Louisiana.
Nations: US
States/Provinces: LA
TNC Ecoregions: 31:C, 42:C
USFS Ecoregions (1994/95): 232Eb:CCC
Federal Lands: NPS (Jean Lafitte)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Inventory Notes: Plot data were collected by a number of different observers. Data for this analysis and analytical assistance were provided by NPS.
Jean Lafitte National Historical Park and Preserve Plots: FL15a, MA10a, MA24a, MA2a, MA31a, SC1a, SC2a, SC4a, SC9a, SCR1a, Scrub2a, JELA_AA_0054.
Jean Lafitte National Historical Park and Preserve Description Author(s): J. Teague
Global Description Author(s): J. Teague
References: Battaglia et al. 2007, Battaglia et al. 2009, Couvillion and Beck 2013, Couvillion et al. 2011, Deegan et al. 1984, Glick et al. 2013, Howard and Mendelssohn 1999, NPS 2005, Neubauer 2013, Nolfo-Clements 2006, Sasser et al. 1996, Shirley and Battaglia 2006, Shirley and Battaglia 2008, Smith 1996a, Southeastern Ecology Working Group n.d.*, USGS 2013b, Williams 2013, Willis and Hester 2004

A3578 *Panicum hemitomon* Floating Marsh Alliance

Maidencane Floating Marsh Alliance

Maidencane Floating Marsh

ALLIANCE CONCEPT

Summary: These flotant marshes are dominated by *Panicum hemitomon* or *Morella cerifera*. These marshes are primarily freshwater, and may be tidal in some areas. This is a very common fresh marsh type of the Chenier and Deltaic plains of Louisiana and the upper coast of Texas. Spikerush marshes, dominated by *Eleocharis baldwinii* and *Hydrocotyle* spp., are also included here. The shrub-dominated version of this marsh apparently arises from woody plant succession in the *Panicum hemitomon*-dominated marshes in the absence of fire. As the shrubs develop and mature, they weigh down the floating peat mat, submerging it and eventually killing the shrubs.

Classification Comments: The marsh dominated by *Morella cerifera* with *Panicum hemitomon* is included here, as it is part of the same larger landscape of the Mississippi Deltaic Plain, and is very close floristically to the *Panicum hemitomon*-dominated marshes. Spikerush marshes, dominated by *Eleocharis baldwinii* and *Hydrocotyle* spp., are also included here. This vegetation has been recognized in Louisiana in the Deltaic Plain, and is apparently increasing in area.

Diagnostic Characteristics: These flotant marshes are dominated by *Panicum hemitomon* or *Morella cerifera*. They are primarily freshwater, and may be tidal in some areas. This is a very common fresh marsh type of the Chenier and Deltaic plains of Louisiana and the upper coast of Texas.

Rationale for Nominal Species or Physiognomic Features: *Panicum hemitomon* is dominant and characteristic of this vegetation.

Related Concepts:

- Basin Marsh (FNAI 1992a) ><
- Depression Meadow (Nelson 1986) ><
- Flatwoods Pond (Smith 1996a) ><
- Flatwoods Pond (Smith 1996b) ><
- Fresh Marsh (Smith 1999) ><
- IIE1f. Coastal Plain Small Depression Pond Complex (Allard 1990) ><
- Small Depression Pond (Schafale and Weakley 1990) ><

ALLIANCE DESCRIPTION

Environment: These are floating marshes of the Mississippi Deltaic Plain occurring on extensive floating peat mats. The shrub-dominated version of this marsh apparently arises from woody plant succession in the *Panicum hemitomon*-dominated marshes in the absence of fire (Sasser et al. 1996). As the shrubs develop and mature, they weigh down the floating peat mat, submerging it and eventually killing the shrubs.

Vegetation: Stands of this alliance are dominated by *Panicum hemitomon*, a coarse perennial grass standing about a meter tall. Some stands also contain *Morella cerifera*. Members of the genera *Eleocharis, Rhynchospora, Xyris, Juncus, Carex, Typha, Hydrocotyle, Cladium* and *Ludwigia* may also be present. Spikerush marsh (included here) is codominated by *Eleocharis baldwinii* and *Hydrocotyle* spp., mainly *Hydrocotyle ranunculoides* and *Hydrocotyle umbellata*; *Bidens laevis* is a frequent codominant. Species richness in this marsh type is moderate. Some other commonly occurring species include *Typha* spp., *Sagittaria lancifolia, Eleocharis* spp., *Panicum hemitomon, Sagittaria latifolia, Ludwigia* spp., *Decodon verticillatus, Rhynchospora colorata (= Dichromena colorata), Sacciolepis striata, Zizaniopsis miliacea*, and others.

Physiognomy and Structure: *Panicum hemitomon* is a coarse perennial grass standing about a meter tall. Some stands also contain the evergreen shrub *Morella cerifera*. Spikerush marsh (included here) is codominated by *Eleocharis baldwinii* and *Hydrocotyle* spp.

Floristics: Stands of this alliance are dominated by *Panicum hemitomon*, a coarse perennial grass standing about a meter tall. Some stands also contain *Morella cerifera*. Members of the genera *Eleocharis, Rhynchospora, Xyris,*

Juncus, Carex, Typha, Hydrocotyle, Cladium and *Ludwigia* may also be present. Spikerush marsh (included here) is codominated by *Eleocharis baldwinii* and *Hydrocotyle* spp., mainly *Hydrocotyle ranunculoides* and *Hydrocotyle umbellata*; *Bidens laevis* is a frequent codominant. Species richness in this marsh type is moderate. Some other commonly occurring species include *Typha* spp., *Sagittaria lancifolia, Eleocharis* spp., *Panicum hemitomon, Sagittaria latifolia, Ludwigia* spp., *Decodon verticillatus, Rhynchospora colorata (= Dichromena colorata), Sacciolepis striata, Zizaniopsis miliacea*, and others.

Dynamics: These marshes are maintained in herbaceous condition by burning in the fall, when unburned they develop a shrub layer of *Morella cerifera*. This shrub community may revert to herbaceous condition after the shrub layer develops enough mass to weigh down the floating mat causing submergence and eventual shrub mortality (Sasser et al. 1996). Localized examples of his association, north of Lake Pontchartrain in Louisiana dominated by *Panicum hemitomon* and *Orontium aquaticum*, are surrounded by *Taxodium* spp. forests, and widely scattered *Taxodium ascendens* occurs in these examples. These marshes, located further inland, are less influenced by the current deltaic processes and may reflect a condition of this association prior to deltaic subsidence and subsequent flotant formation. Fresh Spikerush Marsh vegetation, included here, appears to represent degraded Fresh Maidencane Marsh. It is postulated that Fresh Maidencane Marsh may convert to Fresh Spikerush Marsh as a consequence of intense herbivory (by nutria [or muskrat?]), changes in hydrology, changes in water quality, certain fire regimes or other factors.

ALLIANCE DISTRIBUTION

Range: This is a common marsh type of the Chenier and Deltaic plains of Louisiana and the upper coast of Texas.
Nations: US
Subnations: LA, TX

ALLIANCE SOURCES

References: Allard 1990, FNAI 1992a, Faber-Langendoen et al. 2017b*, Nelson 1986, Sasser et al. 1996, Schafale and Weakley 1990, Smith 1996a, Smith 1996b, Smith 1999, Visser and Sasser 1998, Visser et al. 1998
Author of Concept: Faber-Langendoen et al. 2017b
Author of Description: C. Nordman, in Faber-Langendoen et al. (2013)

[CEGL007834] *Morella cerifera - Panicum hemitomon* Floating Marsh

Translated Name: **Wax-myrtle - Maidencane Floating Marsh**
Common Name: **Gulf Coast Wax-myrtle - Maidencane Floating Marsh**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	Atlantic & Gulf Coastal Marsh, Wet Meadow & Shrubland (2.C.4.Ne)
Macrogroup	Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh (M066)
Group	Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh (G110)
Alliance	*Panicum hemitomon* Floating Marsh Alliance (A3578)

ELEMENT CONCEPT

Global Summary: This is a floating marsh of the Mississippi Deltaic Plain occurring on extensive floating peat mats. *Morella cerifera (= Myrica cerifera var. cerifera)* dominates and may be the only species present other than *Panicum hemitomon*. Flotant marshes are dynamic systems and may switch from herbaceous dominance to shrub dominance in a cyclic pattern. Since floating marshes do not experience the stress of high floodwaters, shrubs may more easily become established in flotant marshes than in marshes rooted in the underlying substrate and subjected

to floods. However, as shrubs become established and increase in biomass, the marsh mat becomes heavier and sinks, increasing flooding levels and killing off the woody shrubs.

ENVIRONMENTAL DESCRIPTION

Jean Lafitte National Historical Park and Preserve Environment: This shrub-herb marsh vegetation is located adjacent to estuarine and riverine tidal waters, but the occurrences where it is documented are mostly mapped as palustrine semipermanently flooded and not identified as tidal (NPS 2005). Though tidal influence has not been documented, it might be present, especially from wind tides. In some occurrences this shrub-herb marsh community is separated from open water by expansive herb marshes. All locations are impacted by levees and ditches that are presumably disrupting the flow of water. Some examples of this community may occur as a floating mat of vegetation (flotant). Shirley and Battaglia (2006) documented a concomitant increase in the amount of scrub-shrub habitat at Barataria and decrease in herbaceous marsh from 1955-1998. The increase in shrub-dominated flotant marshes in the Barataria could be attributed in part to increase in *Triadica sebifera* and also in part to lack of fire (Battaglia et al. 2007, 2009). Flotant marshes are dynamic systems and may switch from herbaceous dominance to shrub dominance in a cyclic pattern (Battaglia et al. 2007). Since floating marshes do not experience the stress of high floodwaters, shrubs may more easily become established in flotant marshes than in marshes rooted in the underlying substrate and subjected to floods (Battaglia et al. 2007). However, as shrubs become established and increase in biomass, the marsh mat becomes heavier and sinks, increasing flooding levels and killing off the woody shrubs (Shirley and Battaglia 2008).

Global Environment: This is a floating marsh of the Mississippi Deltaic Plain. Flotant marshes are dynamic systems and may switch from herbaceous dominance to shrub dominance in a cyclic pattern (Battaglia et al. 2007). Since floating marshes do not experience the stress of high floodwaters, shrubs may more easily become established in flotant marshes than in marshes rooted in the underlying substrate and subjected to floods (Battaglia et al. 2007). However, as shrubs become established and increase in biomass, the marsh mat becomes heavier and sinks, increasing flooding levels and killing off the woody shrubs (Shirley and Battaglia 2008).

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: This shrub-herb marsh vegetation is characterized by moderate to high cover of *Morella cerifera* and *Panicum hemitomon*, with frequent low cover of *Ilex cassine, Andropogon glomeratus, Eleocharis* spp., *Hydrocotyle* spp., *Sagittaria lancifolia, Solidago sempervirens, Thelypteris palustris, Woodwardia areolata, Sphagnum* spp., and the non-native tree *Triadica sebifera*. Other species that may be encountered infrequently at low cover include *Hypericum mutilum, Eupatorium capillifolium, Rhynchospora corniculata, Cyperus* spp., *Rubus trivialis, Kosteletzkya virginica, Polygonum hydropiperoides, Acer rubrum, Sacciolepis striata, Xyris laxifolia var. iridifolia, Carex* spp., *Zizaniopsis miliacea, Lythrum lineare, Lemna obscura, Typha domingensis, Phragmites australis ssp. berlandieri*, and the non-native species *Panicum repens* and *Alternanthera philoxeroides*.

Global Vegetation: *Morella cerifera (= Myrica cerifera var. cerifera)* dominates and may be the only species present other than *Panicum hemitomon*.

Global Dynamics: This shrub marsh apparently arises from closely related *Panicum hemitomon* marshes [see *Panicum hemitomon* Marsh (CEGL004665)] in the absence of fire (Sasser et al. 1996). As the shrubs develop and mature, they weigh down the floating peat mat, submerging it and eventually killing the shrubs.

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Morella cerifera*
Herb (field)	Graminoid	*Panicum hemitomon*

Global

Stratum	Lifeform	Species
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Morella cerifera*
Herb (field)	Graminoid	*Panicum hemitomon*

CHARACTERISTIC SPECIES

Jean Lafitte National Historical Park and Preserve: *Morella cerifera*, *Panicum hemitomon*, *Sphagnum* spp., *Thelypteris palustris*
Global: *Morella cerifera*, *Panicum hemitomon*

OTHER NOTEWORTHY SPECIES

Jean Lafitte National Historical Park and Preserve: Invasive/Exotic Plants: *Alternanthera philoxeroides* (Medium), *Panicum repens* (High/Medium), *Triadica sebifera* (High)
Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G2G3 (3-Sep-2002). Conservation status of this association needs to be reassessed. Threats to this system include altered hydrology and increases in salinity. The coast of Louisiana, including the fresh to oligohaline marshes, are being impacted by saltwater intrusion and inundation because the lack of sediment supply, eustatic sea-level rise and enhanced relative sea-level rise caused by the natural compaction of coastal sediments and the increased subsidence resulting from groundwater and oil and gas removal (USGS 2013b). Dredging canals that increase the connection between the fresh and oligohaline marshes and the saline waters of the Gulf also work to increase salinity and loss of these marshes (Deegan et al. 1984). While fresh to oligohaline marsh species have been shown to adapt to rising water levels, increased salinity has been shown to reduce the growth and survival of these species (Howard and Mendelssohn 1999, Willis and Hester 2004, Couvillon and Beck 2013, Neubauer 2013). As salinity increases fresh marsh composition shifts to species more tolerant of higher salinity, causing a reduction in species richness. If the increase in salinity is accompanied by increased water levels, this can ultimately result in conversion of marsh to open saline waters. These marshes are also threatened by reduced freshwater inflow caused by upstream dams and water diversion. Invasive plant species such as *Triadica sebifera* are threats. Some invasive exotic mammals are threats, such as nutria (*Myocastor coypus*) and feral hogs (*Sus scrofa*). An increase in storm intensities and barriers to landward marsh migration could further exacerbate the impacts of subsidence and sea-level rise. Other threats include pollution entering the marsh from point and nonpoint sources.

This is a highly threatened system in coastal Louisiana and conversion of marsh to open water has been high in Louisiana (Couvillion et al. 2011, USGS 2013b, Williams 2013). Coastal Louisiana has the highest rates of relative sea-level rise (>9 mm/year) in the nation (Williams 2013). A global eustatic sea-level rise of 0.5 to 2.0 m by A.D. 2100 when coupled with subsidence and barriers to the landward migration of marshes could result in devastating impacts on the coastal marshes of Louisiana (Neubauer 2013, Williams 2013). "Louisiana has sustained more coastal wetland loss than all other states in the continental United States combined" (Glick et al. 2013). SLAMM models predict 42 to 99% marsh and swamp loss in southeastern Louisiana by 2100 if eustatic sea-level rise exceeds 0.75 m (Glick et al. 2013). Ecological collapse in the system tends to result from hydrological alteration, increase in salinity, subsidence and lack of sediments from the Mississippi River to maintain marshes, eustatic sea-level rise, and resulting rise in relative sea level. Ecosystem collapse is characterized by conversion of the tidal herbaceous or shrub vegetation to mesohaline marshes or open water resulting in a loss of species richness.

RELATED CONCEPTS

Global Similar Types:

- *Ilex cassine - Morella cerifera / Woodwardia areolata - Sphagnum sp.* Flotant Shrub Swamp (CEGL007093)
- *Panicum hemitomon* Marsh (CEGL004665) herbaceous-dominated marsh, maintained, in part, by burning.

Global Related Concepts:

- *Myrica* shrub marshes (Sasser et al. 1996) =
- Freshwater Marsh (Smith 1996a) >
- Wax-myrtle Thicket Community (Nolfo-Clements 2006) ><

CLASSIFICATION

Status: Standard

Classification Confidence: 3 - Weak

Jean Lafitte National Historical Park and Preserve Classification Comments: This community was identified during a cluster analysis of 159 plots from Jean Lafitte National Historical Park and Preserve, Louisiana. It is described from 9 plots that clustered together (Homoteneity (0.679); Bray-Curtis Similarity (0.542)) within a larger cluster that includes *Panicum hemitomon* Semipermanently Flooded Herbaceous Vegetation (CEGL004665). The species in this community are shared with and sometimes are codominant in other communities at Jean Lafitte, but the combination of species and environmental setting seems to support description of this community as a separate type. Two marsh communities dominated by *Morella cerifera* have been identified for coastal Louisiana. *Morella cerifera - Panicum hemitomon* Flotant Marsh Herbaceous Vegetation (CEGL007834) is described as strongly dominated by *Morella cerifera* with *Panicum hemitomon* as the only other species often present. At Jean Lafitte, these two species often strongly codominate occurrences of CEGL007834. *Morella cerifera / Typha domingensis - Sagittaria lancifolia - Eleocharis* spp. Marsh (CEGL007241) is described to accommodate vegetation that is more floristically diverse than *Morella cerifera - Panicum hemitomon* Flotant Marsh Herbaceous Vegetation (CEGL007834). The two communities separated in a cluster analysis of 159 plots from Jean Lafitte National Historical Park and Preserve, Louisiana. However, these communities appear to co-occur and intermingle in the marsh at Jean Lafitte and more information is needed to better understand the dynamics of these communities and if should be merged.

Nolfo-Clements(2006) identified a "wax-myrtle thicket" floating marsh community at Jean Lafitte dominated by *Morella cerifera* and *Sphagnum* spp. Associated species include *Thelypteris palustris, Woodwardia areolata, Rhynchospora microcephala, Decodon verticillatus, Xyris laxifolia var. iridifolia* (in clumps), *Eupatorium perfoliatum, Ageratina altissima, Pluchea foetida, Solidago fistulosa, Acer rubrum, Triadica sebifera, Panicum hemitomon*, and *Sagittaria lancifolia*. CEGL007241 has variable cover of *Sphagnum* spp., therefore a more broadly defined type than Nolfo-Clements' "wax-myrtle thicket" community.

Jean Lafitte National Historical Park and Preserve Other Comments: Julie Whitbeck (pers. comm. 2015) thinks it is nutrient-limited, *Sphagnum*-abundant, other evergreen trees that are not high-nutrient species; different processes, etc. "Different kind of system"; very little investigation in flotant... Possibly more off of Tarpaper, south side near Davis-Marrero; another place, seen *Sphagnum* near Bayou aux Carpes. Other Bay-Ilex place is not this.

Global Classification Comments: Two marsh communities dominated by *Morella cerifera* have been identified for coastal Louisiana. *Morella cerifera - Panicum hemitomon* Floating Marsh (CEGL007834) is described as strongly dominated by *Morella cerifera* with *Panicum hemitomon* as the only other species often present. At Jean Lafitte, these two species often strongly codominate occurrences of CEGL007834. *Morella cerifera / Typha domingensis - Sagittaria lancifolia - Eleocharis* spp. Tidal Marsh (CEGL007241) is described to accommodate vegetation that is more floristically diverse than *Morella cerifera - Panicum hemitomon* Floating Marsh (CEGL007834). These communities appear to co-occur and intermingle in the marsh in the Louisiana Deltaic Plain and more information is needed to better understand the dynamics of these communities and if should be merged.

Nolfo-Clements(2006) identified a "wax-myrtle thicket" floating marsh community at Jean Lafitte dominated by *Morella cerifera* and *Sphagnum* spp. Associated species include *Thelypteris palustris, Woodwardia areolata, Rhynchospora microcephala, Decodon verticillatus, Xyris laxifolia var. iridifolia* (in clumps), *Eupatorium perfoliatum, Ageratina altissima, Pluchea foetida, Solidago fistulosa, Acer rubrum, Triadica sebifera, Panicum*

hemitomon, and *Sagittaria lancifolia*. CEGL007241 has variable cover of *Sphagnum* spp., therefore a more broadly defined type than Nolfo-Clements' "wax-myrtle thicket" community.

ELEMENT DISTRIBUTION

Jean Lafitte National Historical Park and Preserve Range: This community is found interspersed with wooded, shrub-herb and herbaceous marshes adjacent to bayous, canals and lakes.
Global Range: As described, this community occurs in the Deltaic Plain of coastal Louisiana.
Nations: US
States/Provinces: LA
TNC Ecoregions: 31:C
USFS Ecoregions (1994/95): 232Eb:CCC
Federal Lands: NPS (Jean Lafitte)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Inventory Notes: Plot data were collected by a number of different observers. Data for this analysis and analytical assistance were provided by NPS.
Jean Lafitte National Historical Park and Preserve Plots: MA16a, MA33a, MA9a, SC13a, SC18xa, SC20a, SC7a, SC8a, Scrub6a, JELA_AA_0002, JELA_AA_0080.
Jean Lafitte National Historical Park and Preserve Description Author(s): J. Teague
Global Description Author(s): R.E. Evans and J. Teague
References: Battaglia et al. 2007, Battaglia et al. 2009, Couvillion and Beck 2013, Couvillion et al. 2011, Deegan et al. 1984, Glick et al. 2013, Howard and Mendelssohn 1999, LNHP 2009, NPS 2005, Neubauer 2013, Nolfo-Clements 2006, Sasser et al. 1996, Sasser et al. 1996*, Shirley and Battaglia 2006, Shirley and Battaglia 2008, Smith 1996a, Southeastern Ecology Working Group n.d., USGS 2013b, Williams 2013, Willis and Hester 2004

[CEGL004665] *Panicum hemitomon* Marsh

Translated Name: **Maidencane Marsh**
Common Name: **Deltaic & Chenier Plains Maidencane Marsh**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	Atlantic & Gulf Coastal Marsh, Wet Meadow & Shrubland (2.C.4.Ne)
Macrogroup	Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh (M066)
Group	Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh (G110)
Alliance	*Panicum hemitomon* Floating Marsh Alliance (A3578)

ELEMENT CONCEPT

Global Summary: This association is a very common fresh marsh type of the Chenier and Deltaic plains of Louisiana and the upper coast of Texas. This type is broadly defined to include several manifestations related to geographic location, associated vegetation, and degree of subsidence. However, all examples are strongly dominated by *Panicum hemitomon*. Much of the variability currently reflected in this type is exhibited between examples found in the Chenier and Deltaic plains. The Deltaic Plain expressions are largely floating marsh ("thick mat flotant"), while very little flotant is present in the Chenier Plain. Commonly occurring species in the Chenier Plain of Louisiana include *Sagittaria lancifolia, Eleocharis* spp., *Typha* spp., *Cladium mariscus ssp. jamaicense (= Cladium jamaicense), Ludwigia* spp., *Schoenoplectus californicus (= Scirpus californicus), Crinum americanum, Zizaniopsis miliacea*, and *Cephalanthus occidentalis*, while in the Deltaic Plain common associates include *Leersia oryzoides*,

and sometimes *Sagittaria lancifolia*, along with *Thelypteris palustris, Osmunda regalis, Vigna luteola, Ipomoea sagittata, Polygonum sagittatum*, and *Conoclinium coelestinum (= Eupatorium coelestinum)*.

ENVIRONMENTAL DESCRIPTION

Jean Lafitte National Historical Park and Preserve Environment: This freshwater herbaceous marsh vegetation is located adjacent to estuarine and riverine tidal waters, but the occurrences where it is documented are mostly mapped as palustrine semipermanently flooded and not identified as tidal (NPS 2005). Though tidal influence has not been documented, it might be present, especially from wind tides. All locations are impacted by levees and ditches that are presumably disrupting the flow of water. Some examples of this community may occur as a floating mat of vegetation (flotant).

Global Environment: This fresh marsh type occurs in the Chenier and Deltaic plains of Louisiana and the upper coast of Texas, as well as in localized areas north of Lake Pontchartrain. These more inland marshes are less influenced by the current deltaic processes and may reflect a condition of this association prior to deltaic subsidence and subsequent flotant formation.

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: This herbaceous freshwater marsh is dominated by *Panicum hemitomon*. Other constant species occurring at low cover in the small plot sample at Jean Lafitte include *Morella cerifera, Eleocharis* spp., *Sagittaria lancifolia, Thelypteris palustris, Typha domingensis*, and the non-native grass *Panicum repens*. Other species that may be frequently encountered at low cover include *Andropogon glomeratus, Hydrocotyle* spp., *Polygonum hydropiperoides*, and *Zizaniopsis miliacea*. Species occurring infrequently include *Kosteletzkya virginica, Eleocharis cellulosa, Cyperus* spp., *Spartina patens*, and the non-native floating aquatic *Salvinia minima*.

Global Vegetation: Species richness in this flotant marsh type is relatively high. All examples are strongly dominated by *Panicum hemitomon*. Commonly occurring species in the Chenier Plain of Louisiana include *Sagittaria lancifolia, Eleocharis* spp., *Typha* spp., *Cladium mariscus ssp. jamaicense (= Cladium jamaicense), Ludwigia* spp., *Schoenoplectus californicus (= Scirpus californicus), Crinum americanum, Zizaniopsis miliacea*, and *Cephalanthus occidentalis*, while in the Deltaic Plain common associates include *Leersia oryzoides*, and sometimes *Sagittaria lancifolia*, along with *Thelypteris palustris, Osmunda regalis, Vigna luteola, Ipomoea sagittata, Polygonum sagittatum*, and *Conoclinium coelestinum (= Eupatorium coelestinum)* (Sasser et al. 1996). Of interest, a few species more commonly associated with acidic, moist to wet pine flatwood communities are found in some flotant examples of the Deltaic Plain, including *Asclepias rubra, Calopogon tuberosus, Platanthera nivea (= Habenaria nivea), Pteroglossaspis ecristata, Osmunda cinnamomea, Osmunda regalis*, and *Xyris caroliniana* (Sasser et al. 1996). This association also includes localized freshwater marshes north of Lake Pontchartrain in Louisiana dominated by *Panicum hemitomon* and *Orontium aquaticum*. These marshes are surrounded by *Taxodium* spp. forests, and widely scattered *Taxodium ascendens* occurs in these examples. These marshes, located further inland, are less influenced by the current deltaic processes and may reflect a condition of this association prior to deltaic subsidence and subsequent flotant formation. In Texas, other components of flotant marsh dominated by *Panicum hemitomon* include *Eleocharis quadrangulata, Erechtites hieraciifolia, Galium tinctorium, Habenaria repens, Hydrocotyle verticillata, Leersia hexandra, Sacciolepis striata*, and *Thalia dealbata*. Invasive species noted in this community include *Ludwigia grandiflora (= Ludwigia uruguayensis)*.

Global Dynamics: Many of these mashes are maintained in herbaceous condition by burning in the fall, when unburned they develop a shrub layer of *Morella cerifera*. This shrub community may revert to herbaceous condition after the shrub layer develops enough mass to weigh down the floating mat causing submergence and eventual shrub mortality (Sasser et al. 1996). Localized examples of his association, north of Lake Pontchartrain in Louisiana dominated by *Panicum hemitomon* and *Orontium aquaticum*, are surrounded by *Taxodium* spp. forests, and widely scattered *Taxodium ascendens* occurs in these examples. These marshes, located further inland, are less influenced by the current deltaic processes and may reflect a condition of this association prior to deltaic subsidence and subsequent flotant formation.

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Panicum hemitomon*

Global

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Panicum hemitomon*

CHARACTERISTIC SPECIES

Jean Lafitte National Historical Park and Preserve: *Panicum hemitomon*
Global: *Panicum hemitomon*

OTHER NOTEWORTHY SPECIES

Jean Lafitte National Historical Park and Preserve: Invasive/Exotic Plants: *Panicum repens* (High/Medium), *Salvinia minima* ()
Global: Vulnerable Plants: *Pteroglossaspis ecristata* (G2G3); **Invasive/Exotic Plants**: *Ludwigia grandiflora* (High), *Triadica sebifera* (High)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (2-Dec-1999). This association is restricted to the Coastal Plain of Louisiana and Texas. In Louisiana, it is the most common type of fresh marsh. It is broadly defined to include several manifestations related to geographic location and the associated vegetation and degree of subsidence. Processes that threaten its persistence vary across its range. In the Deltaic Plain, this type is threatened by dredging channels and associated salt-water intrusion. Throughout its range, this community and associated coastal wetlands are threatened by commercial, industrial and residential development. The degree of uncertainty in the rank reflects the need for further study to clarify the long-term decline, area of occupancy and global range of this association. Conservation status of this association needs to be reassessed. Threats to this system include altered hydrology and increases in salinity. The coast of Louisiana including the fresh to oligohaline marshes are being impacted by saltwater intrusion and inundation because the lack of sediment supply, eustatic sea-level rise and enhanced relative sea-level rise caused by the natural compaction of coastal sediments and the increased subsidence resulting from groundwater and oil and gas removal (USGS 2013b). Dredging canals that increase the connection between the fresh and oligohaline marshes and the saline waters of the Gulf also work to increase salinity and loss of these marshes (Deegan et al. 1984). While fresh to oligohaline marsh species have been shown to adapt to rising water levels, increased salinity has been shown to reduce the growth and survival of these species (Howard and Mendelssohn 1999, Willis and Hester 2004, Couvillon and Beck 2013, Neubauer 2013). As salinity increases fresh marsh composition shifts to species more tolerant of higher salinity causing a reduction in species richness. If the increase in salinity is accompanied by increased water levels, this can ultimately result in conversion of marsh to open saline waters. These marshes are also threatened by reduced freshwater inflow caused by upstream dams and water diversion. Invasive plant species such as *Triadica sebifera* are threats. Some invasive exotic mammals are threats, such as nutria (*Myocastor coypus*) and feral hogs (*Sus scrofa*). An increase in storm intensities and barriers to landward marsh migration could further exacerbate the impacts of subsidence and sea-level rise. Other threats include pollution entering the marsh from point and nonpoint sources.

This is a highly threatened system in coastal Louisiana and conversion of marsh to open water has been high in Louisiana (Couvillion et al. 2011, USGS 2013b, Williams 2013). Coastal Louisiana has the highest rates of relative sea-level rise (>9 mm/year) in the nation (Williams 2013). A global eustatic sea-level rise of 0.5 to 2.0 m by A.D. 2100 when coupled with subsidence and barriers to the landward migration of marshes could result in

devastating impacts on the coastal marshes of Louisiana (Neubauer 2013, Williams 2013). "Louisiana has sustained more coastal wetland loss than all other states in the continental United States combined" (Glick et al. 2013). SLAMM models predict 42 to 99% marsh and swamp loss in southeastern Louisiana by 2100 if eustatic sea-level rise exceeds 0.75 m (Glick et al. 2013). Ecological collapse in the system tends to result from hydrological alteration, increase in salinity, subsidence and lack of sediments from the Mississippi River to maintain marshes, eustatic sea-level rise, and resulting rise in relative sea level. Ecosystem collapse is characterized by conversion of the tidal herbaceous or shrub vegetation to mesohaline marshes or open water resulting in a loss of species richness.

RELATED CONCEPTS

Global Similar Types:

- *Eleocharis baldwinii - Hydrocotyle (ranunculoides, umbellata)* Tidal Marsh (CEGL007893)
- *Morella cerifera - Panicum hemitomon* Floating Marsh (CEGL007834) develops in the absence of fire.
- *Sagittaria lancifolia - Typha spp. - Ludwigia spp.* Tidal Marsh (CEGL007894)

Global Related Concepts:

- *Panicum* thick mat marshes (Sasser et al. 1996) =
- Freshwater Marsh (Smith 1996a) >

CLASSIFICATION

Status: Standard

Classification Confidence: 3 - Weak

Jean Lafitte National Historical Park and Preserve Classification Comments: This vegetation was identified during a cluster analysis of 159 plots from Jean Lafitte National Historical Park and Preserve, Louisiana. It is described from four plots that clustered together (Homoteneity (0.800); Bray-Curtis Similarity (0.613)) within a larger cluster that includes *Morella cerifera - Panicum hemitomon* Flotant Marsh Herbaceous Vegetation (CEGL007834).

Global Classification Comments: This association (CEGL004665) was merged with former CEGL007892, assuming the latter's name, *Panicum hemitomon* Semipermanently Flooded Herbaceous Vegetation. This type is broadly defined to include several manifestations related to geographic location and the associated vegetation and degree of subsidence. Marshes located further inland are less influenced by the current deltaic processes and may reflect a condition of this association prior to deltaic subsidence and subsequent flotant formation. Arguably, the Chenier Plain type should be classified as distinct from the Deltaic Plain type based on associated species and functional differences (flotant vs. not). Inclusional patches of *Morella cerifera*-dominated shrubland (*Morella cerifera - Panicum hemitomon* Floating Marsh (CEGL007834)) up to many acres in size are common in the Deltaic Plain. Visser and Sasser (1998) did not recognize a "Flotant Marsh Shrubland." The Cajun name for *Panicum hemitomon* is "Paille Fine," pronounced "pie feen." Note: This CEGL004665 is placed in a seasonally flooded formation even though the element name reflects that it is semipermanently flooded. More information is needed to better separate the fresh to oligohaline marshes along the coast of Louisiana into associations. This vegetation may be floating and non-floating and share many species [see Similar Associations]. These marshes appear to undergo seasonal shifts in vegetation composition. In addition, subsidence, sea-level rise, and hydrologic changes are likely causing shifts in species composition, adding to the difficulty in classifying this vegetation.

ELEMENT DISTRIBUTION

Jean Lafitte National Historical Park and Preserve Range: This community is found interspersed with shrub-herb and herbaceous marshes adjacent to bayous, canals and lakes.

Global Range: This association is restricted to Louisiana and Texas.

Nations: US

States/Provinces: LA, TX

TNC Ecoregions: 31:C, 42:C

USFS Ecoregions (1994/95): 231Fb:CCC, 232Eb:CCC, 234Aa:CCC

Federal Lands: NPS (Jean Lafitte); USFWS (McFaddin)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Inventory Notes: Plot data were collected by a number of different observers. Data for this analysis and analytical assistance were provided by NPS.
Jean Lafitte National Historical Park and Preserve Plots: MA12, MA13, MA25, SC5, JELA_AA_0026, JELA_AA_0081.
Jean Lafitte National Historical Park and Preserve Description Author(s): J. Teague
Global Description Author(s): R.E. Evans
References: Couvillion and Beck 2013, Couvillion et al. 2011, Deegan et al. 1984, Glick et al. 2013, Howard and Mendelssohn 1999, LNHP 2009, NPS 2005, NatureServe n.d., Neubauer 2013, Sasser et al. 1996, Smith 1996a, Southeastern Ecology Working Group n.d.*, USGS 2013b, Visser and Sasser 1998, Williams 2013, Willis and Hester 2004

A1987 *Sagittaria lancifolia* Gulf Coast Tidal Freshwater Marsh Alliance

Bull-tongue Arrowhead Gulf Coast Tidal Freshwater Marsh Alliance
Gulf Coast Arrowhead Tidal Freshwater Marsh

ALLIANCE CONCEPT

Summary: These Gulf Coast *Sagittaria lancifolia* marshes contain other wetland plants. They occur in the marshlands of southern Louisiana and coastal Alabama and Texas. They may also contain *Colocasia esculenta* (exotic), *Glottidium vesicarium, Ludwigia* spp., *Lythrum lineare, Phragmites australis ssp. berlandieri, Sagittaria latifolia, Sagittaria platyphylla, Solidago sempervirens, Typha* spp., and *Vigna luteola*.
Classification Comments: This alliance is limited to the marshlands of southern Louisiana, the Texas coast, and Mobile Bay, Alabama.
Diagnostic Characteristics: These Gulf Coast *Sagittaria lancifolia* marshes, which contain other wetland plants, occur in the marshlands of southern Louisiana, and coastal Alabama and Texas.
Related Concepts:

- Fresh Bulltongue (Visser et al. 2000) =
- Intermediate Marsh (Smith 1999) ><

ALLIANCE DESCRIPTION

Environment: These are tidal fresh to oligohaline marshes.
Vegetation: These marshes are primarily dominated by *Sagittaria lancifolia*, but may also contain *Colocasia esculenta* (exotic), *Glottidium vesicarium, Ludwigia* spp., *Lythrum lineare, Phragmites australis, Sagittaria latifolia, Sagittaria platyphylla, Solidago sempervirens, Typha* spp., and *Vigna luteola*.
Physiognomy and Structure: These are tidal fresh to oligohaline marshes dominated by a mixture of broad-leaved monocots (e.g., *Sagittaria* spp.) with other wetland forbs and possibly shrubs (at low cover).
Floristics: These marshes are primarily dominated by *Sagittaria lancifolia*, but may also contain *Colocasia esculenta* (exotic), *Glottidium vesicarium, Ludwigia* spp., *Lythrum lineare, Phragmites australis, Sagittaria latifolia, Sagittaria platyphylla, Solidago sempervirens, Typha* spp., and *Vigna luteola*.
Dynamics: These marshes occur in shallow freshwater with little variation in water level.

ALLIANCE DISTRIBUTION

Range: As far as presently known, these Gulf Coast *Sagittaria lancifolia* marshes are limited to the marshlands of southern Louisiana, the Texas coast, and Mobile Bay, Alabama. They could be possible in Mississippi, but have not been documented from there.
Nations: US
Subnations: AL, LA, TX

ALLIANCE SOURCES

References: Faber-Langendoen et al. 2017b*, Odum et al. 1984, Smith 1999, Visser and Sasser 1998, Visser et al. 1998, Visser et al. 2000
Author of Concept: Faber-Langendoen et al. 2017b
Author of Description: C. Nordman, in Faber-Langendoen et al. (2013)

[CEGL007886] *Eleocharis rostellata - Sagittaria lancifolia Oligohaline* Tidal Marsh

Translated Name: **Beaked Spikerush - Bull-tongue Arrowhead Oligohaline Tidal Marsh**
Common Name: **Louisiana Deltaic Plain Intermediate Oligohaline Spikerush Marsh**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	Atlantic & Gulf Coastal Marsh, Wet Meadow & Shrubland (2.C.4.Ne)
Macrogroup	Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh (M066)
Group	Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh (G110)
Alliance	*Sagittaria lancifolia* Gulf Coast Tidal Freshwater Marsh Alliance (A1987)

ELEMENT CONCEPT

Global Summary: This community is an intermediate marsh type of the Deltaic Plain of coastal Louisiana. The type is dominated by *Eleocharis rostellata, Eleocharis cellulosa, Eleocharis* sp., and *Sagittaria lancifolia*, but numerous other species are present. Species richness in this marsh type is moderate. Additional common species include *Typha* spp., *Ludwigia* spp., *Morella cerifera (= Myrica cerifera), Spartina patens, Hydrocotyle* spp., *Leersia* spp., *Thelypteris palustris, Schoenoplectus americanus (= Scirpus americanus)*, and others.

ENVIRONMENTAL DESCRIPTION

Jean Lafitte National Historical Park and Preserve Environment: This freshwater to oligohaline herbaceous marsh vegetation is located adjacent to estuarine and riverine tidal waters, but the occurrences where it is documented are mostly mapped as palustrine semipermanently flooded and not identified as tidal (NPS 2005). Though tidal influence has not been documented, it might be present, especially from wind tides. All locations are impacted by levees and ditches that are presumably disrupting the flow of water. Some examples of this community may occur as a floating mat of vegetation (flotant).
Global Environment: This freshwater to oligohaline herbaceous marsh vegetation is located adjacent to estuarine and riverine tidal waters along coastal Louisiana.

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: This herbaceous freshwater to oligohaline marsh is dominated by *Eleocharis rostellata*, usually with codominance by *Sagittaria lancifolia*. Other species that frequently occur at moderate cover include *Leersia hexandra* and *Spartina patens*. Other constant species present at low cover include *Typha domingensis, Polygonum hydropiperoides*, and *Andropogon glomeratus*. Frequent species that occur at low cover include *Cyperus* spp., *Hydrocotyle* spp., *Kosteletzkya virginica, Morella cerifera, Sacciolepis striata, Salvinia minima*, and *Thelypteris palustris*.
Global Vegetation: The type is dominated by *Eleocharis rostellata, Eleocharis cellulosa, Eleocharis* sp., and *Sagittaria lancifolia*, but numerous other species are present. Species richness in this marsh type is moderate. Additional common species include *Typha* spp., *Ludwigia* spp., *Morella cerifera (= Myrica cerifera), Spartina patens, Hydrocotyle* spp., *Leersia* spp., *Thelypteris palustris, Schoenoplectus americanus (= Scirpus americanus)*, and others.

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Eleocharis* spp.

Global

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Sagittaria lancifolia*
Herb (field)	Graminoid	*Eleocharis cellulosa*, *Eleocharis rostellata*

CHARACTERISTIC SPECIES

Jean Lafitte National Historical Park and Preserve: *Eleocharis* spp., *Sagittaria lancifolia*
Global: *Eleocharis rostellata*, *Sagittaria lancifolia*

OTHER NOTEWORTHY SPECIES

Global: Invasive/Exotic Plants: *Triadica sebifera* (High)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (3-Sep-2002). Conservation status of this association needs to be reassessed. More information is needed on the rarity, fragility, and threat status of this marsh community before the exact conservation rank and status can be determined. Further research is needed to clarify these data gaps. Threats to this system include altered hydrology and increases in salinity. The coast of Louisiana including the fresh to oligohaline marshes are being impacted by saltwater intrusion and inundation because the lack of sediment supply, eustatic sea-level rise and enhanced relative sea-level rise caused by the natural compaction of coastal sediments and the increased subsidence resulting from groundwater and oil and gas removal (USGS 2013b). Dredging canals that increase the connection between the fresh and oligohaline marshes and the saline waters of the Gulf also work to increase salinity and loss of these marshes (Deegan et al. 1984). While fresh to oligohaline marsh species have been shown to adapt to rising water levels, increased salinity has been shown to reduce the growth and survival of these species (Howard and Mendelssohn 1999, Willis and Hester 2004, Couvillon and Beck 2013, Neubauer 2013). As salinity increases fresh marsh composition shifts to species more tolerant of higher salinity causing a reduction in species richness. If the increase in salinity is accompanied by increased water levels, this can ultimately result in conversion of marsh to open saline waters. These marshes are also threatened by reduced freshwater inflow caused by upstream dams and water diversion. Invasive plant species such as *Triadica sebifera* are threats. Some invasive exotic mammals are threats, such as nutria (*Myocastor coypus*) and feral hogs (*Sus scrofa*). An increase in storm intensities and barriers to landward marsh migration could further exacerbate the impacts of subsidence and sea-level rise. Other threats include pollution entering the marsh from point and nonpoint sources.

This is a highly threatened system in coastal Louisiana and conversion of marsh to open water has been high in Louisiana (Couvillion et al. 2011, USGS 2013b, Williams 2013). Coastal Louisiana has the highest rates of relative sea-level rise (>9 mm/year) in the nation (Williams 2013). A global eustatic sea-level rise of 0.5 to 2.0 m by A.D. 2100 when coupled with subsidence and barriers to the landward migration of marshes could result in devastating impacts on the coastal marshes of Louisiana (Neubauer 2013, Williams 2013). "Louisiana has sustained more coastal wetland loss than all other states in the continental United States combined" (Glick et al. 2013). SLAMM models predict 42 to 99% marsh and swamp loss in southeastern Louisiana by 2100 if eustatic sea-level rise exceeds 0.75 m (Glick et al. 2013). Ecological collapse in the system tends to result from hydrological alteration, increase in salinity, subsidence and lack of sediments from the Mississippi River to maintain marshes,

eustatic sea-level rise, and resulting rise in relative sea level. Ecosystem collapse is characterized by conversion of the tidal herbaceous or shrub vegetation to mesohaline marshes or open water resulting in a loss of species richness.

RELATED CONCEPTS

Global Similar Types:

- *Eleocharis baldwinii - Hydrocotyle (ranunculoides, umbellata)* Tidal Marsh (CEGL007893) is a thin-mat fresh marsh.
- *Sagittaria lancifolia - Typha spp. - Ludwigia spp.* Tidal Marsh (CEGL007894) is a thick-mat fresh marsh of the Chenier and Deltaic plains of Louisiana.
- *Sagittaria lancifolia* Mississippi River Deltaic Plain Tidal Marsh (CEGL007889) is an oligohaline marsh strongly dominated by Sagittaria lancifolia with Eleocharis macrostachya, not Eleocharis rostellata.

Global Related Concepts:

- *Eleocharis* thin mat marsh (Sasser et al. 1996) **?**
- Intermediate Marsh (Smith 1996a) **>**
- Oligohaline Spikerush Marsh (Visser and Sasser 1998) **=**
- Thin-mat community (Nolfo-Clements 2006) **?**

CLASSIFICATION

Status: Standard

Classification Confidence: 3 - Weak

Jean Lafitte National Historical Park and Preserve Classification Comments: Vegetation dominated or codominated by *Eleocharis* spp. separated into two types during cluster analysis of 159 plots. One of these two types was attributed to this existing USNVC intermediate salinity association (CEGL007886). A new park special was created for the other, Virginia Saltmarsh Mallow - Anglestem Primrose-willow / Bright Green Spikerush Thin Floating Mat Vegetation (CEPP007081). Questions about species identifications for *Eleocharis* could be confounding the classification of this community. Finer discernment of this type could be provided by species level information for the dominant genus *Eleocharis*. This community differs somewhat from the global description for this type, but given the limited data available for the current analysis, it is classified as this type because of the broad similarities in species composition, landscape position, and ecological processes. This vegetation is described from 7 plots that formed a pretty tight cluster. Within the group of 7 plots, Homoteneity is 0.774 and Bray-Curtis Similarity is 0.575.

Global Classification Comments: This vegetation was not recognized by Visser et al. (1998) in their analysis of 1968 marsh data for the same area. In Louisiana, it has only been documented in the Deltaic Plain, and therefore is probably not present in Texas. *Eleocharis rostellata* is reported on the "Excluded List" for Louisiana by the Atlas of the Vascular Flora of Louisiana by R. Dale Thomas and Charles Allen (Thomas and Allen 1993) because no confirmed specimen was seen in the state's herbaria. However, C. Sasser reports with some conviction that this is indeed the species found in oligohaline wiregrass marshes of Louisiana. This positive determination of abundant *Eleocharis rostellata* at Jean Lafitte has been confirmed (2015) by Lowell Urbatsch, Chris Reid, and Milo Pyne (L. Urbatsch pers. comm. 2015). More information is needed to better separate the fresh to oligohaline marshes along the coast of Louisiana into associations. This vegetation may be floating and non-floating and share many species [see Similar Associations]. These marshes appear to undergo seasonal shifts in vegetation composition. In addition, subsidence, sea-level rise, and hydrologic changes are likely causing shifts in species composition, adding to the difficulty in classifying this vegetation. In particular, the floristic differences between *Eleocharis rostellata - Sagittaria lancifolia* Oligohaline Tidal Marsh (CEGL007886) and *Eleocharis baldwinii - Hydrocotyle (ranunculoides, umbellata)* Tidal Marsh (CEGL007893) need further clarification.

ELEMENT DISTRIBUTION

Jean Lafitte National Historical Park and Preserve Range: This community occurs interspersed with other wooded, shrub-herb and herbaceous marshes adjacent to bayous, canals and lakes.

Global Range: This community is an intermediate marsh type of the Deltaic Plain of coastal Louisiana. It is probably not present in Texas.
Nations: US
States/Provinces: LA
TNC Ecoregions: 31:C
USFS Ecoregions (1994/95): 232Eb:CCC
Federal Lands: NPS (Jean Lafitte)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Inventory Notes: Plot data were collected by a number of different observers. Data for this analysis and analytical assistance were provided by NPS.
Jean Lafitte National Historical Park and Preserve Plots: MA30a, MA32a, MA34a, MA39a, Marsh10a, Marsh7_1, SC15a, JELA_AA_0009, JELA_AA_0010, JELA_AA_0015, JELA_AA_0020, JELA_AA_0033, JELA_AA_0053.
Jean Lafitte National Historical Park and Preserve Description Author(s): J. Teague and M. Pyne
Global Description Author(s): L.M. Smith and J. Teague
References: Couvillion and Beck 2013, Couvillion et al. 2011, Deegan et al. 1984, Glick et al. 2013, Howard and Mendelssohn 1999, LNHP 2009, NPS 2005, Neubauer 2013, Nolfo-Clements 2006, Sasser et al. 1996, Smith 1996a, Smith 1999, Southeastern Ecology Working Group n.d.*, Thomas and Allen 1993, USGS 2013b, Visser and Sasser 1998, Visser et al. 1998, Williams 2013, Willis and Hester 2004

[CEGL007891] *Phragmites australis* ssp. *berlandieri - (Sagittaria platyphylla, Vigna luteola)* Tidal Marsh

Translated Name: **Subtropical Common Reed - (Delta Arrowhead, Hairy-pod Cowpea) Tidal Marsh**
Common Name: **Gulf Coast Oligohaline Roseau Cane - Arrowhead Marsh**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	Atlantic & Gulf Coastal Marsh, Wet Meadow & Shrubland (2.C.4.Ne)
Macrogroup	Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh (M066)
Group	Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh (G110)
Alliance	*Sagittaria lancifolia* Gulf Coast Tidal Freshwater Marsh Alliance (A1987)

ELEMENT CONCEPT

Global Summary: This reed marsh community is broadly defined to encompass several expressions that may eventually warrant separation into distinct types. In the extreme lower Mississippi River delta, it is a common 'fresh' marsh type subject to regular influence of saltwater. It also covers a relatively uncommon brackish marsh vegetation of the middle and upper coast of Texas. Currently, no occurrences are known from the Chenier Plain of Louisiana. The type is strongly dominated by *Phragmites australis ssp. berlandieri*. Species richness in this marsh type is very low. Other species present may include *Sagittaria platyphylla, Spartina alterniflora, Schoenoplectus americanus (= Scirpus americanus), Vigna luteola, Typha* spp., and others. In the upper Texas coast, this community is typically in brackish situations, forming small patches within the marsh. In the middle Texas coast, this community forms even smaller patches fringing mainland bayshores. In some Louisiana examples, *Colocasia esculenta*, an invasive exotic, may have a strong presence.

ENVIRONMENTAL DESCRIPTION

Global Environment: This community is currently broadly described to include vegetation found in oligohaline marshes of the lower Mississippi delta, and brackish marshes of the upper and middle Texas coast.

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: Stands are strongly dominated by *Phragmites australis ssp. berlandieri*. Species richness in this marsh type is very low. Other species present may include *Sagittaria lancifolia, Spartina alterniflora, Schoenoplectus americanus (= Scirpus americanus), Vigna luteola, Typha* spp., and others.

Global Vegetation: This community is strongly dominated by *Phragmites australis ssp. berlandieri*. Species richness in this marsh type is very low. Other species present may include *Sagittaria platyphylla, Spartina alterniflora, Schoenoplectus americanus (= Scirpus americanus), Vigna luteola, Typha* spp., and others. In some Louisiana examples, *Colocasia esculenta*, an invasive exotic, may have a strong presence.

Global Dynamics: The naturalness of *Phragmites australis ssp. berlandieri* ("roseau cane") has been the subject of some debate, but it was at one time thought to be native in Louisiana and Texas. Accounts of the earliest settlers in Louisiana contain references to "reed marshes" in coastal . Evidence suggests that along the Gulf Coast of Louisiana and Texas, there are genotypes that differ greatly from both the native genotype found in natural, stable communities of the northern United States, as well as the one found in invasive communities of the eastern and southeastern United States. There are clear morphological differences that distinguish these taxa (and genotypes) from one another. Current research indicates that *Phragmites australis ssp. berlandieri* is apparently conspecific with *Phragmites karka*, a taxon which is also found in Australia and islands in the Pacific Ocean.

Based on observations of this nature by individuals familiar with the coastal marshes of Louisiana and Texas, apparently stable, natural communities dominated by *Phragmites australis* (ssp. *berlandieri*) are present. Evidence suggests that a new, more invasive genotype of *Phragmites australis* (ssp. *australis*, Haplotype M) was introduced to the U.S. from the Old World (Metzler and Rosza 1987, Swearingen and Saltonstall 2012) and that along the Gulf Coast of Louisiana and Texas, the genotype found in invasive communities differs from the genotype found in natural, stable communities (Hauber pers. comm. 1992, cited in Marks et al. 1994).

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Phragmites australis* ssp. *berlandieri*

Global

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Colocasia esculenta*
Herb (field)	Graminoid	*Phragmites australis* ssp. *berlandieri*

CHARACTERISTIC SPECIES

Global: Phragmites australis ssp. berlandieri, Sagittaria platyphylla, Vigna luteola

OTHER NOTEWORTHY SPECIES

Global: Invasive/Exotic Plants: *Colocasia esculenta* (Medium/Low)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (21-Oct-2015). As currently described, this element includes natural stands of *Phragmites australis ssp. berlandieri* that do not exhibit invasive characteristics. It is presumed that these stands

contain a possibly native, non-invasive genotype of this species. As such, this community is a relatively common marsh type in the lower Mississippi delta and a relatively uncommon marsh type in the upper and middle Texas coast.

RELATED CONCEPTS

Global Similar Types:

- *Phragmites australis ssp. australis* Tidal Ruderal Marsh (CEGL004187)

Global Related Concepts:

- Deltaic Roseau Cane Marsh (Visser and Sasser 1998) **?**
- Freshwater Marsh (Smith 1996a) **>**

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Global Classification Comments: The naturalness of *Phragmites australis ssp. berlandieri* ("roseau cane") has been the subject of some debate, but it was at one time thought to be native in Louisiana and Texas. Accounts of the earliest settlers in Louisiana contain references to "reed marshes" in coastal. Evidence suggests that along the Gulf Coast of Louisiana and Texas, there are genotypes that differ greatly from both the native genotype found in natural, stable communities of the northern United States, as well as the one found in invasive communities of the eastern and southeastern United States. There are clear morphological differences that distinguish these taxa (and genotypes) from one another. Current research indicates that *Phragmites australis ssp. berlandieri* is apparently conspecific with *Phragmites karka*, a taxon which is also found in Australia and islands in the Pacific Ocean. Another hypothesis is that this "Gulf Coast type" of *Phragmites* is the result of hybridization between an African species, *Phragmites mauritianus* and *Phragmites australis* (Lambertini et al. 2012), and its presence in the southeastern United States may be due to an early introduction from Africa.

Not recognized by Visser et al. (1998) in their analysis of 1968 marsh data for the same area. In Louisiana, present only in the Deltaic Plain.

ELEMENT DISTRIBUTION

Jean Lafitte National Historical Park and Preserve Range: Examples of this vegetation are scattered across the preserve, both within extensive herbaceous marshes, or on the margins of waterways. Some stands are below minimum mapping unit size.
Global Range: The community is found in Louisiana and Texas.
Nations: US
States/Provinces: LA, TX
TNC Ecoregions: 31:C
USFS Ecoregions (1994/95): 231Fb:CCC, 232Eb:CCC, 255Dc:CCC
Federal Lands: NPS (Jean Lafitte); USFWS (Anahuac, Aransas, Big Boggy, Brazoria, McFaddin, San Bernard)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Plots: JELA_AA_0016, JELA_AA_0093, JELA_AA_0098, JELA_AA_0099, JELA_AA_0100, JELA_AA_0101.
Jean Lafitte National Historical Park and Preserve Description Author(s): M. Pyne and J. Teague
Global Description Author(s): J. Teague and M. Pyne
References: LNHP 2009, Lambertini et al. 2012, Marks et al. 1994, Metzler and Rosza 1982, Smith 1996a, Smith 1999, Southeastern Ecology Working Group n.d.*, Swearingen and Saltonstall 2012, Visser and Sasser 1998, Visser et al. 1998

[CEGL007889] *Sagittaria lancifolia* Mississippi River Deltaic Plain Tidal Marsh

Translated Name: **Bull-tongue Arrowhead Mississippi River Deltaic Plain Tidal Marsh**
Common Name: **Mississippi River Deltaic Plain Arrowhead Intermediate Marsh**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	Atlantic & Gulf Coastal Marsh, Wet Meadow & Shrubland (2.C.4.Ne)
Macrogroup	Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh (M066)
Group	Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh (G110)
Alliance	*Sagittaria lancifolia* Gulf Coast Tidal Freshwater Marsh Alliance (A1987)

ELEMENT CONCEPT

Global Summary: This is a common intermediate marsh type of the Deltaic Plain of coastal Louisiana. It is strongly dominated by *Sagittaria lancifolia*, but numerous other species are present. Species richness in this marsh type is moderate. Additional common species include *Vigna luteola, Polygonum* spp., *Ipomoea sagittata, Eleocharis* spp., *Spartina patens, Ludwigia* spp., *Typha* spp., *Echinochloa* spp., Cyperaceae, *Schoenoplectus americanus (= Scirpus americanus), Baccharis halimifolia, Leersia* spp., *Amaranthus australis*, and others. This type may be distinguished from Fresh Bulltongue Marsh of the Deltaic Plain by the typical presence of *Bacopa monnieri*, absence of *Thelypteris palustris, Osmunda regalis, Morella cerifera (= Myrica cerifera)*, and *Hydrocotyle* spp., and slightly higher species richness.

ENVIRONMENTAL DESCRIPTION

Jean Lafitte National Historical Park and Preserve Environment: Documentation and description of this community at Jean Lafitte are based on one plot located near Bayou Segnette Waterway and Kenta Canal. It may occur as a floating mat of vegetation (flotant). This herbaceous marsh vegetation is located adjacent to estuarine and riverine tidal waters, but the occurrence where it is documented is mapped as palustrine semipermanently flooded and not identified as tidal (NPS 2005). Though tidal influence has not been documented, it might be present, especially from wind tides. This community is impacted by levees and ditches that are presumably disrupting the flow of water.

Global Environment: This community may be found interspersed with other fresh to oligohaline marshes along the coast of Louisiana.

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: Documentation and description of this community at Jean Lafitte are based on one plot strongly dominated by *Sagittaria lancifolia*. Other species with moderate cover include *Eleocharis macrostachya, Eleocharis cellulosa, Polygonum punctatum, Symphyotrichum subulatum*, and the non-native *Alternanthera philoxeroides*. Other species with low cover include *Kosteletzkya virginica, Lythrum lineare, Sacciolepis striata, Hydrocotyle umbellata, Phyla lanceolata, Vigna luteola, Ludwigia octovalvis, Schoenoplectus americanus, Schoenoplectus tabernaemontani, Cuscuta indecora, Echinochloa crus-galli*, and *Sesbania herbacea*. In contrast to Louisiana Deltaic Plain Intermediate Oligohaline Spikerush Marsh (CEGL007886), this type has *Eleocharis macrostachya* and not *Eleocharis rostellata*. In addition, *Thelypteris palustris* is either absent or rarely present and at very low cover, and *Alternanthera philoxeroides* is more likely to be evident in this association (CEGL007889) than in CEGL007886.

Global Vegetation: Stands of this association are strongly dominated by *Sagittaria lancifolia*, but numerous other species are present. Additional common species include *Vigna luteola, Polygonum* spp., *Ipomoea sagittata, Eleocharis macrostachya, Spartina patens, Ludwigia* spp., *Typha* spp., *Echinochloa* spp., Cyperaceae, *Schoenoplectus americanus (= Scirpus americanus), Baccharis halimifolia, Leersia* spp., *Amaranthus australis*, and

others. Visser et al. (1998) report this type is strongly dominated by *Sagittaria lancifolia* in the spring, but in the fall, *Sagittaria lancifolia* co-occurs with *Bacopa monnieri* and *Cyperus* spp. This type may be distinguished from Fresh Bulltongue Marsh of the Deltaic Plain by the typical presence of *Bacopa monnieri*, absence of *Thelypteris palustris, Osmunda regalis, Morella cerifera*, and *Hydrocotyle* spp., and slightly higher species richness (Visser et al. 1998).

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Sagittaria lancifolia*

Global

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Sagittaria lancifolia*

CHARACTERISTIC SPECIES

Jean Lafitte National Historical Park and Preserve: *Sagittaria lancifolia*
Global: *Sagittaria lancifolia*

OTHER NOTEWORTHY SPECIES

Jean Lafitte National Historical Park and Preserve: Invasive/Exotic Plants: *Alternanthera philoxeroides* (Medium)
Global: Invasive/Exotic Plants: *Triadica sebifera* (High)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (3-Sep-2002). More information is needed on the rarity, fragility, and threat status of this marsh community before the exact conservation rank and status can be determined. Further research is needed to clarify these data gaps. Conservation status of this association needs to be reassessed. Threats to this system include altered hydrology and increases in salinity. The coast of Louisiana including the fresh to oligohaline marshes are being impacted by saltwater intrusion and inundation because the lack of sediment supply, eustatic sea-level rise and enhanced relative sea-level rise caused by the natural compaction of coastal sediments and the increased subsidence resulting from groundwater and oil and gas removal (USGS 2013b). Dredging canals that increase the connection between the fresh and oligohaline marshes and the saline waters of the Gulf also work to increase salinity and loss of these marshes (Deegan et al. 1984). While fresh to oligohaline marsh species have been shown to adapt to rising water levels, increased salinity has been shown to reduce the growth and survival of these species (Howard and Mendelssohn 1999, Willis and Hester 2004, Couvillon and Beck 2013, Neubauer 2013). As salinity increases fresh marsh composition shifts to species more tolerant of higher salinity causing a reduction in species richness. If the increase in salinity is accompanied by increased water levels, this can ultimately result in conversion of marsh to open saline waters. These marshes are also threatened by reduced freshwater inflow caused by upstream dams and water diversion. Invasive plant species such as *Triadica sebifera* are threats. Some invasive exotic mammals are threats, such as nutria (*Myocastor coypus*) and feral hogs (*Sus scrofa*). An increase in storm intensities and barriers to landward marsh migration could further exacerbate the impacts of subsidence and sea-level rise. Other threats include pollution entering the marsh from point and nonpoint sources.

This is a highly threatened system in coastal Louisiana and conversion of marsh to open water has been high in Louisiana (Couvillion et al. 2011, USGS 2013b, Williams 2013). Coastal Louisiana has the highest rates of relative sea-level rise (>9 mm/year) in the nation (Williams 2013). A global eustatic sea-level rise of 0.5 to 2.0 m by A.D. 2100 when coupled with subsidence and barriers to the landward migration of marshes could result in devastating impacts on the coastal marshes of Louisiana (Neubauer 2013, Williams 2013). "Louisiana has sustained

more coastal wetland loss than all other states in the continental United States combined" (Glick et al. 2013). SLAMM models predict 42 to 99% marsh and swamp loss in southeastern Louisiana by 2100 if eustatic sea-level rise exceeds 0.75 m (Glick et al. 2013). Ecological collapse in the system tends to result from hydrological alteration, increase in salinity, subsidence and lack of sediments from the Mississippi River to maintain marshes, eustatic sea-level rise, and resulting rise in relative sea level. Ecosystem collapse is characterized by conversion of the tidal herbaceous or shrub vegetation to mesohaline marshes or open water resulting in a loss of species richness.

RELATED CONCEPTS

Global Similar Types:

- *Eleocharis baldwinii - Hydrocotyle (ranunculoides, umbellata)* Tidal Marsh (CEGL007893) is a thin-mat fresh marsh.
- *Eleocharis rostellata - Sagittaria lancifolia Oligohaline* Tidal Marsh (CEGL007886)
- *Sagittaria lancifolia - Glottidium vesicarium - Solidago sempervirens - Lythrum lineare* Tidal Marsh (CEGL008447)
- *Sagittaria lancifolia - Typha spp. - Ludwigia spp.* Tidal Marsh (CEGL007894) is a similar marsh of freshwater.

Global Related Concepts:

- *Sagittaria lancifolia* Association (Nolfo-Clements 2006) **?**
- Intermediate Marsh (Smith 1996a) **>**
- Oligohaline Bulltongue Marsh (Visser and Sasser 1998) **?**
- Oligohaline Mix (Visser et al. 1998) **=**

CLASSIFICATION

Status: Standard

Classification Confidence: 3 - Weak

Jean Lafitte National Historical Park and Preserve Classification Comments: This vegetation was identified during a cluster analysis of 159 plots from Jean Lafitte National Historical Park and Preserve, Louisiana. It is described from one plot. Questions about species identifications for *Eleocharis* could be confounding the classification of this community. This community differs somewhat from the global description for this type, but given the limited data available for the current analysis, it is classified as this type because of the broad similarities in species composition, landscape position, and ecological processes.

Global Classification Comments: Visser et al. (1998) described two vegetation types dominated by *Sagittaria lancifolia* in the marshes of the Mississippi River delta: Fresh Bulltongue Marsh of the Deltaic Plain (CEGL00007894) and Oligohaline Mix (CEGL007889). Fresh Bulltongue Marsh of the Deltaic Plain is reported as distinguished from Oligohaline Mix by the typical absence of *Bacopa monnieri*, presence of *Thelypteris palustris, Osmunda regalis, Morella cerifera (= Myrica cerifera)*, and *Hydrocotyle* spp., and slightly lower species richness (Visser et al. 1998). Both communities were first described by Visser et al. (1998) based on their analysis of marsh data collected in 1968 in coastal Louisiana. This vegetation was not recorded for the Chenier Plain of Louisiana and is therefore thought to be unlikely in Texas. Nolfo-Clements (2006) identified a *Sagittaria lancifolia* association as the most common "thick-mat" community at Jean Lafitte National Historical Park and Preserve. A frequent codominant is *Leersia hexandra*, and common associates include *Alternanthera philoxeroides, Hydrocotyle* spp., *Polygonum punctatum, Phyla lanceolata, Eleocharis fallax, Eleocharis cellulosa, Eleocharis montana*, plus occasional patches of *Juncus* spp., *Schoenoplectus californicus*, and *Schoenoplectus tabernaemontani*. Species observed in the fall include *Andropogon glomeratus, Echinochloa crus-galli, Echinochloa walteri, Panicum* spp., *Paspalum minus, Paspalum urvillei, Sacciolepis striata, Setaria* spp., *Symphyotrichum subulatum, Conoclinium coelestinum, Cirsium horridulum, Eupatorium capillifolium, Iva annua, Pluchea odorata, Sesbania* spp., and *Ludwigia* spp. Species observed in the spring and early summer include *Kosteletzkya virginica, Hibiscus moscheutos ssp. lasiocarpos, Iris giganticaerulea*, and *Hymenocallis caroliniana*. More information is needed to better separate the fresh to oligohaline marshes along the coast of Louisiana into associations. This vegetation may be floating and

non-floating and share many species [see Similar Associations]. These marshes appear to undergo seasonal shifts in vegetation composition. In addition, subsidence, sea-level rise, and hydrologic changes are likely causing shifts in species composition, adding to the difficulty in classifying this vegetation.

ELEMENT DISTRIBUTION

Jean Lafitte National Historical Park and Preserve Range: Documentation and description of this community at Jean Lafitte are based on one plot located near Bayou Segnette Waterway and Kenta Canal, but based on work by Nolfo-Clements (2006), it is expected to occur more widely.
Global Range: This community is an intermediate marsh type of the Deltaic Plain of coastal Louisiana.
Nations: US
States/Provinces: LA
TNC Ecoregions: 31:C
USFS Ecoregions (1994/95): 231:C, 232Eb:CCC
Federal Lands: NPS (Jean Lafitte)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Inventory Notes: Plot data were collected by a number of different observers. Data for this analysis and analytical assistance were provided by NPS.
Jean Lafitte National Historical Park and Preserve Plots: Marsh6, JELA_AA_0008, JELA_AA_0013, JELA_AA_0014, JELA_AA_0018, JELA_AA_0021, JELA_AA_0023, JELA_AA_0036, JELA_AA_0041, JELA_AA_0046, JELA_AA_0047, JELA_AA_0048, JELA_AA_0051, JELA_AA_0071.
Jean Lafitte National Historical Park and Preserve Description Author(s): J. Teague and M. Pyne
Global Description Author(s): L.M. Smith and J. Teague
References: Couvillion and Beck 2013, Couvillion et al. 2011, Deegan et al. 1984, Glick et al. 2013, Howard and Mendelssohn 1999, LNHP 2009, NPS 2005, Neubauer 2013, Nolfo-Clements 2006, Smith 1996a, Smith 1999, Southeastern Ecology Working Group n.d.*, USGS 2013b, Visser and Sasser 1998, Visser et al. 1998, Williams 2013, Willis and Hester 2004

A3580 *Schoenoplectus californicus* Gulf Coast Tidal Freshwater Marsh Alliance

California Bulrush Gulf Coast Tidal Freshwater Marsh Alliance
Gulf Coast California Bulrush Tidal Freshwater Marsh

ALLIANCE CONCEPT

Summary: These are tidal marshes dominated by *Schoenoplectus californicus (= Scirpus californicus)*, which are found in tidally influenced freshwater to oligohaline marshes along the Gulf Coast of the United States. Additional common species may include *Bidens laevis*, members of the family Cyperaceae, *Ludwigia* spp., *Nymphaea odorata, Panicum hemitomon, Phragmites australis, Pluchea* spp., *Setaria* spp., *Spartina patens, Typha domingensis, Typha latifolia*, and others.
Classification Comments: Old alliance A.2004 was a tropical and subtropical tidal marsh alliance. This new alliance is in the warm temperate climatic zone.
Diagnostic Characteristics: These Gulf Coast area tidal freshwater marshes are dominated or codominated by *Schoenoplectus californicus*. This vegetation includes freshwater marshes which only receive storm tides, not normal daily tides.
Related Concepts:

- Oligohaline Bullwhip (Visser et al. 2000) **?**

ALLIANCE DESCRIPTION

Environment: This vegetation occurs in coastal marshes that receive enough fresh water to maintain low salinity levels. It is also found along the upper reaches of coastal bays, and in ditches, sloughs and artificial impoundments, usually in near-coast areas.

Vegetation: These tidal marshes are dominated by *Schoenoplectus californicus (= Scirpus californicus)*. Additional common species may include *Bidens laevis*, members of the family Cyperaceae, *Ludwigia* spp., *Nymphaea odorata, Panicum hemitomon, Phragmites australis, Pluchea* spp., *Setaria* spp., *Spartina patens, Typha domingensis, Typha latifolia*, and others.

Floristics: These tidal marshes are dominated by *Schoenoplectus californicus (= Scirpus californicus)*. Additional common species may include *Bidens laevis*, members of the family Cyperaceae, *Ludwigia* spp., *Nymphaea odorata, Panicum hemitomon, Phragmites australis, Pluchea* spp., *Setaria* spp., *Spartina patens, Typha domingensis, Typha latifolia*, and others.

Dynamics: This includes some oligohaline marshes which are influenced by daily tides and freshwater marshes which only receive storm tides, not normal daily tides.

ALLIANCE DISTRIBUTION

Range: This vegetation is found in the Gulf Coast area from Florida to Texas, but mainly in Louisiana including the Chenier Plain, Deltaic Plain, and Mississippi Sound.

Nations: US

Subnations: AL, FL, LA, TX

ALLIANCE SOURCES

References: Faber-Langendoen et al. 2017b*, Visser et al. 2000

Author of Concept: Faber-Langendoen et al. 2017b

Author of Description: C. Nordman, in Faber-Langendoen et al. (2013)

[CEGL003985] *Schoenoplectus californicus* Tidal Marsh

Translated Name: **California Bulrush Tidal Marsh**

Common Name: **Gulf Coast California Bulrush Freshwater Marsh**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	Atlantic & Gulf Coastal Marsh, Wet Meadow & Shrubland (2.C.4.Ne)
Macrogroup	Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh (M066)
Group	Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh (G110)
Alliance	*Schoenoplectus californicus* Gulf Coast Tidal Freshwater Marsh Alliance (A3580)

ELEMENT CONCEPT

Global Summary: This association is found in tidally influenced oligohaline marshes along the Gulf Coast. It is one of two currently recognized Oligohaline Mixture Marsh types mainly in the Chenier Plain of coastal Louisiana, but is also present in the Deltaic Plain to a limited degree, and apparently the Mississippi Sound region extending into northwestern Florida. The type is dominated or codominated by *Schoenoplectus californicus (= Scirpus californicus)*; *Echinochloa* sp. is typically present as a codominant in Louisiana. Species richness in the type is moderate. Additional common species include *Spartina patens*, Cyperaceae, *Typha domingensis, Typha latifolia, Ludwigia* spp., *Pluchea* spp., *Phragmites australis, Setaria* spp., *Nymphaea odorata, Panicum hemitomon, Bidens laevis*, and others.

ENVIRONMENTAL DESCRIPTION

Jean Lafitte National Historical Park and Preserve Environment: This oligohaline herbaceous marsh vegetation is located adjacent to estuarine and riverine tidal waters. Though tidal influence has not been documented for these occurrences, it might be present, especially from wind tides. All locations were impacted by levees and ditches that are presumably disrupting the flow of water.

Global Environment: This association is found in coastal marshes that receive enough fresh water to maintain low salinity levels. It is also found along the upper reaches of coastal bays.

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: Stands are dominated or codominated by *Schoenoplectus californicus (= Scirpus californicus)*; *Echinochloa walteri* may also be present.

Global Vegetation: The community is dominated or codominated by *Schoenoplectus californicus (= Scirpus californicus)*; *Echinochloa* sp. is typically present as a codominant in Louisiana. Species richness in the type is moderate. Additional common species include *Spartina patens*, Cyperaceae, *Typha domingensis, Typha latifolia, Ludwigia* spp., *Pluchea* spp., *Phragmites australis, Setaria* spp., *Nymphaea odorata, Panicum hemitomon, Bidens laevis*, and others.

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Schoenoplectus californicus*

Global

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Schoenoplectus californicus*

CHARACTERISTIC SPECIES

Jean Lafitte National Historical Park and Preserve: *Schoenoplectus californicus*

Global: *Schoenoplectus californicus*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G4G5 (28-Jul-1998). This is a widespread tidal marsh community, ranging throughout the Gulf Coast of the United States and presumably the Neotropics. Occurrences are typically small along the Gulf Coast of the United States.

RELATED CONCEPTS

Global Similar Types:

- *Schoenoplectus americanus - (Spartina patens) - Typha spp.* Salt Marsh (CEGL008476)
- *Schoenoplectus californicus* Gulf Coast Tidal Marsh (CEGL008464) are non-tidal wetland communities dominated by *Schoenoplectus californicus.*

Global Related Concepts:

- Intermediate Marsh (Smith 1996a) >
- Oligohaline Mixture Marsh, Bullwhip Variant (Visser and Sasser 1998) =

CLASSIFICATION

Status: Standard
Classification Confidence: 2 - Moderate

ELEMENT DISTRIBUTION

Global Range: This association is found in Alabama, Florida, Louisiana, and Texas. It is presumably common and widespread in the Neotropics.
Nations: US
States/Provinces: AL, FL, LA, TX
TNC Ecoregions: 31:C, 53:C, 54:C, 55:?
USFS Ecoregions (1994/95): 231Fb:CCC, 232Bs:CCC, 232Dd:CCC, 232Eb:CCC, 255Dc:PPP, 315E:CC, 411A:CC
Federal Lands: NPS (Jean Lafitte); USFWS (McFaddin)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Plots: JELA_AA_0072.
Jean Lafitte National Historical Park and Preserve Description Author(s): M. Pyne
Global Description Author(s): A.S. Weakley
References: LNHP 2009, Smith 1996a, Smith 1999, Southeastern Ecology Working Group n.d.*, Visser and Sasser 1998, Visser et al. 1998

A3581 *Stuckenia pectinata - Zannichellia palustris - Ceratophyllum demersum* Freshwater Subtidal Marsh Alliance

Sago Pondweed - Horned Pondweed - Coon's-tail Freshwater Subtidal Marsh Alliance
Mixed Freshwater Subtidal Marsh

ALLIANCE CONCEPT

Summary: This alliance represents tidal marsh vegetation containing a predominance of aquatic vascular plants such as *Ceratophyllum demersum, Stuckenia pectinata (= Potamogeton pectinatus)*, and *Zannichellia palustris*. Other species include *Elodea nuttallii, Heteranthera dubia, Potamogeton perfoliatus, Utricularia macrorhiza, Vallisneria americana*, and occasionally *Ruppia maritima* as salinity begins to increase. Additional species include *Lemna* spp., *Spirodela polyrrhiza, Utricularia purpurea*, and *Wolffiella gladiata*. Communities in this alliance occur in shallow subtidal fresh to oligohaline water and sediments exposed only at extreme low tide in maritime coastal areas from Virginia north to Connecticut and in Louisiana and possibly Texas. This alliance occurs in lunar-tidal and wind-tidally flooded submergent wetlands of fresh to oligohaline rivershores, river basin guts and large pools. This community also occurs in Lake Pontchartrain, Louisiana.
Classification Comments: All the subtidal aquatic freshwater to oligohaline vegetation is put here. Aquatic vegetation with higher salinities should be classified with seagrass bed vegetation. Rangewide distribution of this alliance is incompletely understood, partly because of the difficulty of describing submerged aquatic types and partly the need for further review of existing literature on this vegetation.
Diagnostic Characteristics: This alliance occurs in shallow subtidal fresh to oligohaline water and sediments exposed only at extreme low tide. It includes lunar-tidal and wind-tidally flooded submergent wetlands of fresh to oligohaline rivershores, river basin guts and large pools. This community even occurs in Lake Pontchartrain, Louisiana. It supports a predominance of vascular aquatic plants such as *Ceratophyllum demersum, Stuckenia pectinata*, and *Zannichellia palustris*.
Related Concepts:

- Coastal Plain Semipermanent Impoundment (Schafale and Weakley 1990) ><
- Estuarine Subtidal: Fresh / Brackish Flats (Swain and Kearsley 2001) **?**

- Open water/aquatic bed veg., natural impoundment pond (Ambrose 1990a) **?**

ALLIANCE DESCRIPTION

Environment: Stands are often found in sheltered bays of lakes and streams. These are lunar-tidally and wind-tidally flooded floating/submergent wetlands of fresh to oligohaline rivershores, river basin guts and large pools.
Vegetation: This tidal marsh vegetation contains a predominance of aquatic vascular plants such as *Ceratophyllum demersum, Stuckenia pectinata (= Potamogeton pectinatus)*, and *Zannichellia palustris*. Other species include *Elodea nuttallii, Heteranthera dubia, Potamogeton perfoliatus, Utricularia macrorhiza, Vallisneria americana*, and occasionally *Ruppia maritima* as salinity begins to increase. Additional species include *Lemna* spp., *Spirodela polyrrhiza, Utricularia purpurea*, and *Wolffiella gladiata*.
Floristics: This tidal marsh vegetation contains a predominance of aquatic vascular plants such as *Ceratophyllum demersum, Stuckenia pectinata (= Potamogeton pectinatus)*, and *Zannichellia palustris*. Other species include *Elodea nuttallii, Heteranthera dubia, Potamogeton perfoliatus, Utricularia macrorhiza, Vallisneria americana*, and occasionally *Ruppia maritima* as salinity begins to increase. Additional species include *Lemna* spp., *Spirodela polyrrhiza, Utricularia purpurea*, and *Wolffiella gladiata*.
Dynamics: These fresh/brackish subtidal aquatic beds grade into fresh types and into brackish and saline/brackish types.

ALLIANCE DISTRIBUTION

Range: This vegetation is known from the mid-Atlantic and Gulf coast regions, from Massachusetts south to Texas; it is found in coastal areas in subtidal freshwater situations.
Nations: US
Subnations: CT, DC, DE, LA, MA, MD, NJ, NY, TX, VA

ALLIANCE SOURCES

References: Ambrose 1990a, Faber-Langendoen et al. 1996, Faber-Langendoen et al. 2017b*, Fleetwood 1973, Fleming 1998, Penfound 1952, Schafale and Weakley 1990, Smith, L. pers. comm., Sneddon et al. 1996, Swain and Kearsley 2001, Wharton 1978
Author of Concept: Faber-Langendoen et al. 2017b
Author of Description: C. Nordman, in Faber-Langendoen et al. (2013)

[CEGL007689] *Potamogeton perfoliatus - (Stuckenia pectinata, Zannichellia palustris)* Tidal Marsh

Translated Name: **Claspingleaf Pondweed - (Sago Pondweed, Horned Pondweed) Tidal Marsh**
Common Name: **Gulf Coast Submersed Aquatic Vegetation**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	Atlantic & Gulf Coastal Marsh, Wet Meadow & Shrubland (2.C.4.Ne)
Macrogroup	Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh (M066)
Group	Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh (G110)
Alliance	*Stuckenia pectinata - Zannichellia palustris - Ceratophyllum demersum* Freshwater Subtidal Marsh Alliance (A3581)

ELEMENT CONCEPT

Global Summary: This broadly defined type represents submersed aquatic vegetation dominated by *Potamogeton perfoliatus*. Other components may include the native species *Cabomba caroliniana, Ceratophyllum demersum, Heteranthera dubia, Najas guadalupensis, Potamogeton pusillus, Vallisneria americana*, and *Zannichellia palustris*,

and the exotics *Egeria densa, Hydrilla verticillata*, and *Myriophyllum spicatum*. This community occurs in Lake Pontchartrain, Louisiana, and possibly Texas. The composition of this community varies with changes in salinity and may be replaced by other aquatic communities in extreme cases.

ENVIRONMENTAL DESCRIPTION

Global Environment: This submersed aquatic vegetation community is thought to occur in tidal oligohaline environments. Increases and decreases in salinity may cause a compositional shift to other tidal aquatic communities.

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: Examples contain the native species *Cabomba caroliniana, Ceratophyllum demersum, Heteranthera dubia, Najas guadalupensis, Potamogeton pusillus, Vallisneria americana*, and *Zannichellia palustris*, and the exotics *Egeria densa, Hydrilla verticillata*, and *Myriophyllum spicatum* (Poirrier et al. 2010).

Global Vegetation: As currently described, this community encompasses submersed aquatic vegetation dominated by *Potamogeton perfoliatus*. Other components may include *Ruppia maritima* (as salinity increases), *Vallisneria americana* (as salinity decreases), and *Zannichellia palustris* (in areas with extremely low salinity). In Louisiana, examples may contain *Cabomba caroliniana, Ceratophyllum demersum, Hydrilla verticillata, Myriophyllum heterophyllum, Najas guadalupensis*, and others.

Global Dynamics: The composition of this community varies with changes in salinity and may be replaced by other aquatic communities in extreme cases. Prolonged drought in Lake Pontchartrain may have caused the elimination of *Potamogeton perfoliatus* (M. Poirrier pers. comm.).

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Floating aquatic	Aquatic herb	*Cabomba caroliniana*, *Heteranthera dubia*
Submerged aquatic	Aquatic herb	*Ceratophyllum demersum*, *Najas guadalupensis*, *Potamogeton pusillus*, *Vallisneria americana*, *Zannichellia palustris*

Global

Stratum	Lifeform	Species
Submerged aquatic	Aquatic herb	*Potamogeton perfoliatus*, *Ruppia maritima*, *Vallisneria americana*, *Zannichellia palustris*

CHARACTERISTIC SPECIES

Global: *Potamogeton perfoliatus*

OTHER NOTEWORTHY SPECIES

Jean Lafitte National Historical Park and Preserve: Invasive/Exotic Plants: *Egeria densa* (High/Medium), *Hydrilla verticillata* (High/Medium), *Myriophyllum spicatum* (High)

Global: Invasive/Exotic Plants: *Egeria densa* (High/Medium), *Hydrilla verticillata* (High/Medium), *Myriophyllum spicatum* (High)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (26-Jan-1998). This association is currently known only from Lake Pontchartrain, Louisiana. Further research is necessary to determine, with confidence, the full range and other characteristics of this community. The conservation status of this community is currently unknown.

RELATED CONCEPTS

Global Similar Types:

- *Ruppia maritima* Louisianian Zone Aquatic Vegetation (CEGL004450)
- *Vallisneria americana* Estuarine Bayou Aquatic Vegetation (CEGL004634)

Global Related Concepts:

- Submergent Vascular Vegetation (Estuarine) (Smith 1996a) >

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Global Classification Comments: This vegetation is present in tidal waters of Lake Pontchartrain, Louisiana (232Ec) (L. Smith pers. comm.). More information is needed. *Stuckenia pectinata* is not a component of this community in Lake Pontchartrain (L. Smith pers. comm.).

ELEMENT DISTRIBUTION

Global Range: This community is currently described from Lake Pontchartrain, Louisiana. It or similar vegetation may also occur along the middle and upper Texas coast.
Nations: US
States/Provinces: LA, TX?
TNC Ecoregions: 31:C
USFS Ecoregions (1994/95): 231Fb:PPP, 232Eb:CCC, 232Ec:CCC, 255Dc:PPP
Federal Lands: NPS (Jean Lafitte); USFWS (Anahuac?, Aransas?, Big Boggy?, Brazoria?, McFaddin?, San Bernard?)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Plots: None.
Jean Lafitte National Historical Park and Preserve Description Author(s): M. Pyne
Global Description Author(s): J. Teague and M. Pyne
References: LNHP 2009, Poirrier et al. 2010, Poirrier pers. comm., Smith 1996a, Smith, L. pers. comm., Southeastern Ecology Working Group n.d.*

A4015 *Typha domingensis - Eleocharis rostellata* Gulf Coastal Plain Oligohaline Tidal Marsh Alliance

Southern Cattail - Beaked Spikerush Gulf Coastal Plain Oligohaline Tidal Marsh Alliance
Gulf Coastal Plain Oligohaline Tidal Marsh

ALLIANCE CONCEPT

Summary: This provisional alliance comprises two poorly described oligohaline tidal marsh associations of the Gulf Coastal Plain. *Eleocharis rostellata* and *Typha domingensis* are two characteristic species, with *Rhynchospora colorata* and *Rhynchospora microcarpa*. This type typically consists of nearly pure stands of *Typha domingensis*, in deeply flooded tidal estuarine waters, with the substrate rarely exposed. This alliance also includes a tidal marsh community dominated by *Eleocharis rostellata, Rhynchospora colorata*, and *Rhynchospora microcarpa* which occupies small-scale openings in *Juncus roemerianus* marshes along the northern Gulf of Mexico. Infrequent tidal flooding and calcareous conditions are key environmental characteristics of this community, which is known from

Panhandle Florida and southern coastal Baldwin County, Alabama. More information is needed on both of these component alliances.

Classification Comments: Much more data are needed to classify this alliance and its component associations.

Diagnostic Characteristics: These are oligohaline tidal marshes of the Gulf Coastal Plain; the presence of *Typha domingensis* and *Eleocharis rostellata* is diagnostic.

Rationale for Nominal Species or Physiognomic Features: *Eleocharis rostellata* and *Typha domingensis* are two characteristic species.

Related Concepts:

Cattail Community Type (Odum et al. 1984) **?**

ALLIANCE DESCRIPTION

Environment: This alliance contains oligohaline tidal marsh communities. Infrequent tidal flooding and calcareous conditions are key environmental characteristics of this community, which is known from Panhandle Florida and southern coastal Baldwin County, Alabama.

Vegetation: *Eleocharis rostellata* and *Typha domingensis* are two characteristic species, with *Rhynchospora colorata* and *Rhynchospora microcarpa*. This alliance includes oligohaline tidal marsh communities from Florida, Alabama, Mississippi, and Texas which are dominated by *Typha domingensis*. This type typically consists of nearly pure stands of *Typha domingensis*, in deeply flooded tidal estuarine waters, with the substrate rarely exposed. This alliance also includes a tidal marsh community dominated by *Eleocharis rostellata, Rhynchospora colorata*, and *Rhynchospora microcarpa* which occupies small-scale openings in *Juncus roemerianus* marshes along the northern Gulf of Mexico.

Physiognomy and Structure: *Eleocharis rostellata* and *Typha domingensis* are two characteristic species. Stands are dominated by mixtures of low-statured graminoids, or by *Typha*.

Floristics: *Eleocharis rostellata* and *Typha domingensis* are two characteristic species, with *Rhynchospora colorata* and *Rhynchospora microcarpa*. This alliance includes oligohaline tidal marsh communities from Florida, Alabama, Mississippi, and Texas which are dominated by *Typha domingensis*. This type typically consists of nearly pure stands of *Typha domingensis*, in deeply flooded tidal estuarine waters, with the substrate rarely exposed. This alliance also includes a tidal marsh community dominated by *Eleocharis rostellata, Rhynchospora colorata*, and *Rhynchospora microcarpa* which occupies small-scale openings in *Juncus roemerianus* marshes along the northern Gulf of Mexico.

ALLIANCE DISTRIBUTION

Range: This alliance occurs on the Gulf Coastal Plain from Florida to Texas. It is currently documented from Alabama, Florida, and Texas. It probably occurs in Mississippi and its status in Louisiana is unknown.

Nations: US

Subnations: AL, FL, MS?, TX

Alliance Sources

References: Faber-Langendoen et al. 2017b*, Odum et al. 1984

Author of Concept: Faber-Langendoen et al. 2017b

Author of Description: L. Sneddon, in Faber-Langendoen et al. (2013)

[CEGL007888] ***Spartina patens - Vigna luteola*** **Mississippi River Deltaic Plain Tidal Marsh**
Translated Name: **Saltmeadow Cordgrass - Hairy-pod Cowpea Mississippi River Deltaic Plain Tidal Marsh**
Common Name: **Mississippi River Deltaic Plain Saltmeadow Cordgrass - Cowpea Intermediate Marsh**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	Atlantic & Gulf Coastal Marsh, Wet Meadow & Shrubland (2.C.4.Ne)
Macrogroup	Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh (M066)
Group	Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh (G110)
Alliance	*Typha domingensis - Eleocharis rostellata* Gulf Coastal Plain Oligohaline Tidal Marsh Alliance (A4015)

ELEMENT CONCEPT

Global Summary: A common intermediate marsh type of the Deltaic Plain of coastal Louisiana. The type is dominated by *Spartina patens* with *Vigna luteola* as a frequent codominant. Numerous other species are present. Species richness is relatively high in the type. Additional common species include *Schoenoplectus americanus (= Scirpus americanus), Ipomoea sagittata, Sagittaria lancifolia*, Cyperaceae, *Polygonum* spp., *Baccharis halimifolia, Juncus roemerianus, Bacopa monnieri*, and others. It may be mostly a floating marsh type ("flotant").

ENVIRONMENTAL DESCRIPTION

Jean Lafitte National Historical Park and Preserve Environment: This oligohaline herbaceous marsh vegetation is located adjacent to estuarine and riverine tidal waters. Though tidal influence has not been documented, it might be present, especially from wind tides. All locations are impacted by levees and ditches that are presumably disrupting the flow of water. Some examples of this community may occur as a floating mat of vegetation (flotant).

Global Environment: This vegetation is a common intermediate marsh type of the Deltaic Plain of coastal Louisiana.

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: Documentation and description of this community at Jean Lafitte are based on three plots dominated by *Spartina patens*. Other constant species that occur at low cover include *Andropogon glomeratus, Eleocharis* spp., *Ipomoea sagittata, Morella cerifera, Polygonum hydropiperoides, Sagittaria lancifolia*, and *Thelypteris palustris*. Other less constant species include *Cyperus* spp., *Hydrocotyle* spp., *Lythrum lineare, Solidago sempervirens, Symphyotrichum subulatum, Vigna luteola*, and the non-native *Alternanthera philoxeroides*.

Global Vegetation: The type is dominated by *Spartina patens* with *Vigna luteola* as a frequent codominant. Numerous other species are present. Species richness is relatively high in the type. Additional common species include *Schoenoplectus americanus (= Scirpus americanus), Ipomoea sagittata, Sagittaria lancifolia*, Cyperaceae, *Polygonum* spp., *Baccharis halimifolia, Juncus roemerianus, Bacopa monnieri*, and others.

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Eleocharis* spp., *Spartina patens*

Global

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Vigna luteola*
Herb (field)	Graminoid	*Spartina patens*

CHARACTERISTIC SPECIES

Jean Lafitte National Historical Park and Preserve: *Eleocharis* spp., *Spartina patens*
Global: *Spartina patens*, *Vigna luteola*

OTHER NOTEWORTHY SPECIES

Jean Lafitte National Historical Park and Preserve: Invasive/Exotic Plants: *Alternanthera philoxeroides* (Medium)
Global: Invasive/Exotic Plants: *Triadica sebifera* (High)

CONSERVATION STATUS RANK

Global Rank & Reasons: G3G4 (3-Sep-2002). More information is needed on the rarity, fragility, and threat status of this marsh community before the exact conservation rank and status can be determined. Further research is needed to clarify these data gaps. Conservation status of this association needs to be reassessed. Threats to this system include altered hydrology and increases in salinity. The coast of Louisiana including the fresh to oligohaline marshes are being impacted by saltwater intrusion and inundation because the lack of sediment supply, eustatic sea-level rise and enhanced relative sea-level rise caused by the natural compaction of coastal sediments and the increased subsidence resulting from groundwater and oil and gas removal (USGS 2013b). Dredging canals that increase the connection between the fresh and oligohaline marshes and the saline waters of the Gulf also work to increase salinity and loss of these marshes (Deegan et al. 1984). While fresh to oligohaline marsh species have been shown to adapt to rising water levels, increased salinity has been shown to reduce the growth and survival of these species (Howard and Mendelssohn 1999, Willis and Hester 2004, Couvillon and Beck 2013, Neubauer 2013). As salinity increases fresh marsh composition shifts to species more tolerant of higher salinity causing a reduction in species richness. If the increase in salinity is accompanied by increased water levels, this can ultimately result in conversion of marsh to open saline waters. These marshes are also threatened by reduced freshwater inflow caused by upstream dams and water diversion. Invasive plant species such as *Triadica sebifera* are threats. Some invasive exotic mammals are threats, such as nutria (*Myocastor coypus*) and feral hogs (*Sus scrofa*). An increase in storm intensities and barriers to landward marsh migration could further exacerbate the impacts of subsidence and sea-level rise. Other threats include pollution entering the marsh from point and nonpoint sources.

This is a highly threatened system in coastal Louisiana and conversion of marsh to open water has been high in Louisiana (Couvillion et al. 2011, USGS 2013b, Williams 2013). Coastal Louisiana has the highest rates of relative sea-level rise (>9 mm/year) in the nation (Williams 2013). A global eustatic sea-level rise of 0.5 to 2.0 m by A.D. 2100 when coupled with subsidence and barriers to the landward migration of marshes could result in devastating impacts on the coastal marshes of Louisiana (Neubauer 2013, Williams 2013). "Louisiana has sustained more coastal wetland loss than all other states in the continental United States combined" (Glick et al. 2013). SLAMM models predict 42 to 99% marsh and swamp loss in southeastern Louisiana by 2100 if eustatic sea-level rise exceeds 0.75 m (Glick et al. 2013). Ecological collapse in the system tends to result from hydrological alteration, increase in salinity, subsidence and lack of sediments from the Mississippi River to maintain marshes, eustatic sea-level rise, and resulting rise in relative sea level. Ecosystem collapse is characterized by conversion of the tidal herbaceous or shrub vegetation to mesohaline marshes or open water resulting in a loss of species richness.

RELATED CONCEPTS

Global Related Concepts:
Spartina patens thick-mat association (Nolfo-Clements 2006) **?**
Deltaic Plain Oligohaline Wiregrass Marsh (Visser and Sasser 1998) =
Intermediate Marsh (Smith 1996a) >

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Jean Lafitte National Historical Park and Preserve Classification Comments: This vegetation was identified during a cluster analysis of 159 plots from Jean Lafitte National Historical Park and Preserve, Louisiana. It is described from three plots that loosely clustered together. Within the group of three plots, Homoteneity is 0.800 and Bray-Curtis Similarity is 0.555. Questions about species identifications for *Eleocharis* could be confounding the classification of this community. This community differs somewhat from the global description for this type, but given the limited data available for the current analysis, it is classified as this type because of the broad similarities in species composition, landscape position, and ecological processes.
Global Classification Comments: Sasser (pers. comm.) recommends maintaining the oligohaline wiregrass marshes of the Chenier Plain and Deltaic Plain as separate types. Nolfo-Clements (2006) identified a thick-mat community dominated by *Spartina patens* with few other species. More information is needed to better separate the fresh to oligohaline marshes along the coast of Louisiana into associations. This vegetation may be floating and non-floating and share many species [see Similar Associations]. These marshes appear to undergo seasonal shifts in vegetation composition. In addition, subsidence, sea-level rise, and hydrologic changes are likely causing shifts in species composition, adding to the difficulty in classifying this vegetation.

ELEMENT DISTRIBUTION

Jean Lafitte National Historical Park and Preserve Range: The vegetation is documented from the marsh located east of the towns of Barataria and Jean Lafitte.
Global Range: This community is an intermediate marsh type of the Deltaic Plain of coastal Louisiana.
Nations: US
States/Provinces: LA
TNC Ecoregions: 31:C
USFS Ecoregions (1994/95): 232Eb:CCC
Federal Lands: NPS (Jean Lafitte)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Inventory Notes: Plot data were collected by a number of different observers. Data for this analysis and analytical assistance were provided by NPS.
Jean Lafitte National Historical Park and Preserve Plots: Marshwt1, Scrub18, Scrub20, JELA_AA_0011, JELA_AA_0012, JELA_AA_0028, JELA_AA_0038.
Jean Lafitte National Historical Park and Preserve Description Author(s): J. Teague
Global Description Author(s): L.M. Smith
References: Couvillion and Beck 2013, Couvillion et al. 2011, Deegan et al. 1984, Glick et al. 2013, Howard and Mendelssohn 1999, LNHP 2009, Neubauer 2013, Nolfo-Clements 2006, Smith 1996a, Smith 1999, Southeastern Ecology Working Group n.d.*, USGS 2013b, Visser and Sasser 1998, Visser et al. 1998, Williams 2013, Willis and Hester 2004

[CEGL007235] ***Typha domingensis - Sacciolepis striata - Sagittaria lancifolia*** **Marsh**
Translated Name: **Southern Cattail - American Cupscale - Bull-tongue Arrowhead Marsh**
Common Name: **Southern Cattail - American Cupscale - Bull-tongue Arrowhead Louisiana Freshwater Marsh**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	Atlantic & Gulf Coastal Marsh, Wet Meadow & Shrubland (2.C.4.Ne)
Macrogroup	Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh (M066)
Group	Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh (G110)
Alliance	*Typha domingensis - Eleocharis rostellata* Gulf Coastal Plain Oligohaline Tidal Marsh Alliance (A4015)

ELEMENT CONCEPT

Global Summary: This herbaceous freshwater to oligohaline marsh is located adjacent to estuarine and riverine tidal waters in the Mississippi River delta. It is dominated or codominated by *Typha domingensis*. Other constant species include *Hydrocotyle* spp. and *Sagittaria lancifolia*. Species that may codominate along with *Typha domingensis* include *Eleocharis* spp., *Polygonum hydropiperoides, Sacciolepis striata*, and *Hydrocotyle* spp. Frequently encountered species that occur at low cover include *Cyperus* spp., *Kosteletzkya virginica, Lythrum lineare, Thelypteris palustris*, and the non-native *Alternanthera philoxeroides*. Many other species are encountered less frequently, such as *Andropogon glomeratus, Eleocharis cellulosa, Ipomoea sagittata, Lemna obscura, Morella cerifera, Panicum hemitomon, Salvinia minima, Schoenoplectus robustus, Symphyotrichum subulatum*, and *Vigna luteola*.

ENVIRONMENTAL DESCRIPTION

Jean Lafitte National Historical Park and Preserve Environment: This oligohaline herbaceous marsh vegetation is located adjacent to estuarine and riverine tidal waters, but the occurrences where it was documented are mostly mapped as palustrine semipermanently flooded and not identified as tidal (NPS 2005). Though tidal influence has not been documented for these occurrences, it might be present, especially from wind tides. All locations were impacted by levees and ditches that are presumably disrupting the flow of water. Some examples of this community may occur as a floating mat of vegetation (flotant).

Global Environment: This oligohaline herbaceous marsh vegetation is located adjacent to estuarine and riverine tidal waters, but the occurrences where it was documented are mostly mapped as palustrine semipermanently flooded and not identified as tidal (NPS 2005). Though tidal influence has not been documented for these occurrences, it might be present, especially from wind tides. All locations were impacted by levees and ditches that are presumably disrupting the flow of water. Some examples of this community may occur as a floating mat of vegetation (flotant).

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: This herbaceous freshwater to oligohaline marsh is dominated or codominated by *Typha domingensis*. Other constant species include *Hydrocotyle* spp. and *Sagittaria lancifolia*. Species that may codominate along with *Typha domingensis* include *Eleocharis* spp., *Polygonum hydropiperoides (= Persicaria hydropiperoides), Sacciolepis striata*, and *Hydrocotyle* spp. Frequently encountered species that occur at low cover include *Cyperus* spp., *Kosteletzkya virginica, Lythrum lineare, Thelypteris palustris*, and the non-native *Alternanthera philoxeroides*. Many other species are encountered less frequently, such as *Andropogon glomeratus, Eleocharis cellulosa, Ipomoea sagittata, Lemna obscura, Morella*

cerifera, Panicum hemitomon, Salvinia minima, Schoenoplectus robustus, Symphyotrichum subulatum, and *Vigna luteola*.

Global Vegetation: This herbaceous freshwater to oligohaline marsh is dominated or codominated by *Typha domingensis*. Other constant species include *Hydrocotyle* spp. and *Sagittaria lancifolia*. Species that may codominate along with *Typha domingensis* include *Eleocharis* spp., *Polygonum hydropiperoides, Sacciolepis striata*, and *Hydrocotyle* spp. Frequently encountered species that occur at low cover include *Cyperus* spp., *Kosteletzkya virginica, Lythrum lineare, Thelypteris palustris*, and the non-native *Alternanthera philoxeroides*. Many other species are encountered less frequently, such as *Andropogon glomeratus, Eleocharis cellulosa, Ipomoea sagittata, Lemna obscura, Morella cerifera, Panicum hemitomon, Salvinia minima, Schoenoplectus robustus, Symphyotrichum subulatum*, and *Vigna luteola*.

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Polygonum hydropiperoides*
Herb (field)	Graminoid	*Eleocharis* spp., *Typha domingensis*

Global

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Polygonum hydropiperoides*
Herb (field)	Graminoid	*Eleocharis* spp., *Typha domingensis*

CHARACTERISTIC SPECIES

Jean Lafitte National Historical Park and Preserve: *Eleocharis* spp., *Polygonum hydropiperoides*, *Typha domingensis*

Global: *Eleocharis* spp., *Polygonum hydropiperoides*, *Typha domingensis*

OTHER NOTEWORTHY SPECIES

Jean Lafitte National Historical Park and Preserve: Invasive/Exotic Plants: *Alternanthera philoxeroides* (Medium)

Global: Invasive/Exotic Plants: *Alternanthera philoxeroides* (Medium), *Triadica sebifera* (High)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (6-Oct-2014). Conservation status of this association needs to be assessed. Threats to this system include altered hydrology and increases in salinity. The coast of Louisiana including the fresh to oligohaline marshes are being impacted by saltwater intrusion and inundation because the lack of sediment supply, eustatic sea-level rise and enhanced relative sea-level rise caused by the natural compaction of coastal sediments and the increased subsidence resulting from groundwater and oil and gas removal (USGS 2013b). Dredging canals that increase the connection between the fresh and oligohaline marshes and the saline waters of the Gulf also work to increase salinity and loss of these marshes (Deegan et al. 1984). While fresh to oligohaline marsh species have been shown to adapt to rising water levels, increased salinity has been shown to reduce the growth and survival of these species (Howard and Mendelssohn 1999, Willis and Hester 2004, Couvillon and Beck 2013, Neubauer 2013). As salinity increases fresh marsh composition shifts to species more tolerant of higher salinity causing a reduction in species richness. If the increase in salinity is accompanied by increased water levels, this can ultimately result in conversion of marsh to open saline waters. These marshes are also threatened by reduced freshwater inflow caused by upstream dams and water diversion. Invasive plant species such as *Triadica sebifera* are threats. Some invasive

exotic mammals are threats, such as nutria (*Myocastor coypus*) and feral hogs (*Sus scrofa*). An increase in storm intensities and barriers to landward marsh migration could further exacerbate the impacts of subsidence and sea-level rise. Other threats include pollution entering the marsh from point and nonpoint sources.

This is a highly threatened system in coastal Louisiana and conversion of marsh to open water has been high in Louisiana (Couvillion et al. 2011, USGS 2013b, Williams 2013). Coastal Louisiana has the highest rates of relative sea-level rise (>9 mm/year) in the nation (Williams 2013). A global eustatic sea-level rise of 0.5 to 2.0 m by A.D. 2100 when coupled with subsidence and barriers to the landward migration of marshes could result in devastating impacts on the coastal marshes of Louisiana (Neubauer 2013, Williams 2013). "Louisiana has sustained more coastal wetland loss than all other states in the continental United States combined" (Glick et al. 2013). SLAMM models predict 42 to 99% marsh and swamp loss in southeastern Louisiana by 2100 if eustatic sea-level rise exceeds 0.75 m (Glick et al. 2013). Ecological collapse in the system tends to result from hydrological alteration, increase in salinity, subsidence and lack of sediments from the Mississippi River to maintain marshes, eustatic sea-level rise, and resulting rise in relative sea level. Ecosystem collapse is characterized by conversion of the tidal herbaceous or shrub vegetation to mesohaline marshes or open water resulting in a loss of species richness.

RELATED CONCEPTS

Global Related Concepts:

Typha spp. Thick-mat Marsh Association (Nolfo-Clements 2006) <

CLASSIFICATION

Status: Provisional

Classification Confidence: 3 - Weak

Jean Lafitte National Historical Park and Preserve Classification Comments: This vegetation was identified during a cluster analysis of 159 plots from Jean Lafitte National Historical Park and Preserve, Louisiana. It is described from 13 plots that loosely clustered together along with other plots classified as *Typha domingensis* Tidal Herbaceous Vegetation (CEGL008456), *Eleocharis baldwinii - Hydrocotyle (ranunculoides, umbellata)* Herbaceous Vegetation (CEGL007893), and other wooded and shrub-herb marshes where *Typha domingensis* had significant cover. Within the group of 13 plots, Homoteneity is 0.744 and Bray-Curtis Similarity is 0.559. This vegetation is distinguished from *Typha domingensis* Tidal Herbaceous Vegetation (CEGL008456) by the presence of significant cover of other freshwater to oligohaline species (e.g., *Eleocharis* spp., *Polygonum hydropiperoides*, and *Sagittaria lancifolia*), in addition to the high cover of *Typha domingensis*. It is possible that the one plot of *Typha domingensis* Tidal Herbaceous Vegetation (CEGL008456) was just an anomaly and the type is not present at Jean Lafitte. Nolfo-Clements (2006) identified a thick-mat community dominated by *Typha* spp. with few other species and also identified *Typha* spp. as an overstory in her *Sagittaria lancifolia* thick-mat association. Many of the species in this community are shared with other communities at Jean Lafitte, but the combination of species and environmental setting seems to support description of this community as a separate type. This community represents a diverse set of occurrences with seasonal and aspect dominance that differs between sites. Questions about species identifications for *Eleocharis* could be confounding the classification of this community. More information is needed to better separate the fresh to oligohaline marshes along the coast of Louisiana into associations. This vegetation may be floating and non-floating and share many species [see Similar Associations]. These marshes appear to undergo seasonal shifts in vegetation composition. In addition, subsidence, sea-level rise, and hydrologic changes are likely causing shifts in species composition, adding to the difficulty in classifying this vegetation.

Global Classification Comments: This vegetation was identified during a cluster analysis of 159 plots from Jean Lafitte National Historical Park and Preserve, Louisiana. It is described from 13 plots that loosely clustered together along with other plots classified as *Typha domingensis* Tidal Marsh (CEGL008456), *Eleocharis baldwinii - Hydrocotyle (ranunculoides, umbellata)* Tidal Marsh (CEGL007893), and other wooded and shrub-herb marshes where *Typha domingensis* had significant cover. Within the group of 13 plots, Homoteneity is 0.744 and Bray-Curtis Similarity is 0.559. This vegetation is distinguished from *Typha domingensis* Tidal Marsh (CEGL008456) by the presence of significant cover of other freshwater to oligohaline species (e.g., *Eleocharis* spp., *Polygonum*

hydropiperoides, and *Sagittaria lancifolia*) in addition to the high cover of *Typha domingensis*. Nolfo-Clements (2006) identified a thick-mat community at Jean Lafitte dominated by *Typha* spp. with few other species and also identified *Typha* spp. as an overstory in her *Sagittaria lancifolia* thick-mat association. Many of the species in this community are shared with other communities at Jean Lafitte, but the combination of species and environmental setting seems to support description of this community as a separate type. This community represents a diverse set of occurrences with seasonal and aspect dominance that differs between sites. Questions about species identifications for *Eleocharis* could be confounding the classification of this community. More information is needed to better separate the fresh to oligohaline marshes along the coast of Louisiana into associations. This vegetation may be floating and non-floating and share many species [see Similar Associations]. These marshes appear to undergo seasonal shifts in vegetation composition. In addition, subsidence, sea-level rise, and hydrologic changes are likely causing shifts in species composition, adding to the difficulty in classifying this vegetation.

ELEMENT DISTRIBUTION

Jean Lafitte National Historical Park and Preserve Range: This community is found interspersed with other marshes adjacent to Lake Salvador and the Intracoastal Waterway/Bayou Barataria.
Global Range: This community is described from Jean Lafitte National Historical Park and Preserve. Other examples are expected to occur along the coast of Louisiana.
Nations: US
States/Provinces: LA
TNC Ecoregions: 31:C, 42:C
USFS Ecoregions (1994/95): 232Eb:CCC
Federal Lands: NPS (Jean Lafitte)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Inventory Notes: Plot data were collected by a number of different observers. Data for this analysis and analytical assistance were provided by NPS.
Jean Lafitte National Historical Park and Preserve Plots: FH18, MA11, MA14, MA15, MA20, MA21, MA27, MA28, MA37, MA4, MA7, Mar2, SC14, JELA_AA_0019, JELA_AA_0024, JELA_AA_0025, JELA_AA_0030, JELA_AA_0034, JELA_AA_0035.
Jean Lafitte National Historical Park and Preserve Description Author(s): J. Teague
Global Description Author(s): J. Teague
References: Couvillion and Beck 2013, Couvillion et al. 2011, Deegan et al. 1984, Glick et al. 2013, Howard and Mendelssohn 1999, NPS 2005, Neubauer 2013, Nolfo-Clements 2006, Southeastern Ecology Working Group n.d.*, USGS 2013b, Williams 2013, Willis and Hester 2004

[CEGL008456] *Typha domingensis* Tidal Marsh

Translated Name: **Southern Cattail Tidal Marsh**
Common Name: **Southern Cattail Tidal Marsh**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	Atlantic & Gulf Coastal Marsh, Wet Meadow & Shrubland (2.C.4.Ne)
Macrogroup	Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh (M066)
Group	Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh (G110)
Alliance	*Typha domingensis - Eleocharis rostellata* Gulf Coastal Plain Oligohaline Tidal Marsh Alliance (A4015)

ELEMENT CONCEPT

Global Summary: This association of the northern Gulf of Mexico consists of temperate oligohaline to brackish marshes dominated by *Typha domingensis*. It typically consists of nearly pure stands of *Typha domingensis*, in deeply flooded tidal estuarine waters, with the substrate rarely exposed.

ENVIRONMENTAL DESCRIPTION

Jean Lafitte National Historical Park and Preserve Environment: This community was documented as a component of herbaceous marsh bordering Lake Salvador. It occurs interspersed with other wooded, shrub-herb and herbaceous marshes. It is located adjacent to estuarine and riverine tidal waters, but the occurrence where it was documented is mapped as palustrine semipermanently flooded and not identified as tidal (NPS 2005). Though tidal influence has not been documented for these occurrences, it might be present, especially from wind tides. It is located in an area impacted by levees and ditches that are presumably disrupting the flow of water.
Global Environment: This association occurs in deeply flooded tidal waters, on protected estuarine shores.

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: Documentation and description of this community at Jean Lafitte are based on one plot dominated by *Typha domingensis*. The species with the next highest cover is *Sacciolepis* at 1-2%. A trace amount of several other species was also recorded. This vegetation is distinguished from *Typha domingensis - Sacciolepis striata - Sagittaria lancifolia* Mixed Marsh (CEGL007235) by the absence of significant cover of any other species except *Typha domingensis*. It is possible that only CEGL007235 is present at the park and that this one plot was just an anomaly.
Global Vegetation: Typically, this association consists of pure stands of *Typha domingensis* (NatureServe Ecology - Southeastern U.S. unpubl. data 1999, 2000).

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Typha domingensis*

Global

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Typha domingensis*

CHARACTERISTIC SPECIES

Jean Lafitte National Historical Park and Preserve: *Typha domingensis*
Global: *Typha domingensis*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (31-Aug-2000). This association is currently known from the Gulf coast of Alabama, Louisiana and Texas. Further research is necessary to determine, with confidence, the full range and other characteristics of this community. The conservation status of this community is currently unknown.

RELATED CONCEPTS

Global Similar Types:

- *Typha angustifolia - Hibiscus moscheutos* Salt Marsh (CEGL004201)

- *Typha domingensis* Western Marsh (CEGL001845)

Global Related Concepts:

- *Typha* spp. Thick-mat Marsh Association (Nolfo-Clements 2006) ><

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Jean Lafitte National Historical Park and Preserve Classification Comments: This vegetation clustered with *Typha domingensis - Sacciolepis striata - Sagittaria lancifolia* Mixed Marsh (CEGL007235) and wooded and shrub-herb marshes where *Typha domingensis* had significant cover. It is distinguished from *Typha domingensis - Sacciolepis striata - Sagittaria lancifolia* Mixed Marsh (CEGL007235) by the absence of significant cover of any other species except *Typha domingensis*. It is possible that only CEGL007235 is present at the park and that this one plot was just an anomaly. Nolfo-Clements (2006) identified a thick-mat community dominated by *Typha* spp. with few other species and also identified *Typha* spp. as an overstory in her *Sagittaria lancifolia* thick-mat association.
Global Classification Comments: This association is documented from Meaher State Park, Mobile County, Alabama.

ELEMENT DISTRIBUTION

Jean Lafitte National Historical Park and Preserve Range: This community is documented from one plot located in the marsh bordering Lake Salvador. It is near the Intracoastal Waterway adjacent to a canal. This community may be expected in other areas of the park [see Classification Comments].
Global Range: This association is currently known only from the coast of Alabama, Louisiana, and Texas. It may also occur in Florida and Mississippi.
Nations: US
States/Provinces: AL, FL?, LA, MS?, TX
TNC Ecoregions: 31:C, 53:C
USFS Ecoregions (1994/95): 231Fb:CCC, 232Bs:CCC, 232Dd:CCC, 232Eb:CCC
Federal Lands: NPS (Jean Lafitte); USFWS (McFaddin)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Inventory Notes: Plot data were collected by a number of different observers. Data for this analysis and analytical assistance were provided by NPS.
Jean Lafitte National Historical Park and Preserve Plots: FH21.
Jean Lafitte National Historical Park and Preserve Description Author(s): J. Teague
Global Description Author(s): A.S. Weakley
References: NPS 2005, NatureServe Ecology - Southeastern U.S. unpubl. data, Nolfo-Clements 2006, Southeastern Ecology Working Group n.d.*

A4220 Gulf Coastal Plain Floating Marsh Alliance

Gulf Coastal Plain Floating Marsh Alliance
Gulf Coastal Plain Floating Marsh

ALLIANCE DISTRIBUTION

Nations: US
Subnations: LA

ALLIANCE SOURCES

References: Faber-Langendoen et al. 2017b*
Author of Concept: Faber-Langendoen et al. 2017b

Author of Description: M. Pyne, in Faber-Langendoen et al.

[CEGL007081] *Bacopa monnieri - Eleocharis* spp. Thin Floating Marsh

Translated Name: **Herb-of-Grace - Spikerush species Thin Floating Marsh**
Common Name: **Herb-of-Grace Thin Floating Marsh**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	Atlantic & Gulf Coastal Marsh, Wet Meadow & Shrubland (2.C.4.Ne)
Macrogroup	Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh (M066)
Group	Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh (G110)
Alliance	Gulf Coastal Plain Floating Marsh Alliance (A4220)

ELEMENT CONCEPT

Global Summary: This is a thin floating mat of aquatic and wetland plants described from Jean Lafitte National Historical Park and Preserve, Louisiana. It is a type of mixed, native marsh that forms in areas that have been disturbed by extensive herbivory, air boat activity, or other intense disturbance. It is often expressed as a matrix of taller plants such as *Kosteletzkya virginica* and *Ludwigia leptocarpa* intermingled with shorter ones such as *Bidens laevis, Polygonum hydropiperoides*, and *Thelypteris palustris*. Interspersed within this taller matrix are patches of thinner floating mats characterized by *Bacopa monnieri, Eleocharis olivacea*, and *Hydrocotyle* spp. The *Eleocharis* forms a low, dense continuous mat, and the other marsh plants are lying on it or rising above it. Other species that may be present include *Andropogon glomeratus, Cyperus* spp., *Lythrum lineare, Morella cerifera, Sacciolepis striata, Sagittaria lancifolia, Spartina patens, Symphyotrichum subulatum, Typha domingensis, Vigna luteola* and the non-native *Panicum repens*. This vegetation has been observed to form extensive areas within other more uniform marsh types (e.g., dominated by *Panicum hemitomon, Sagittaria lancifolia, Spartina patens, Typha domingensis*, etc.). These patches are thought to result from herbivory by nutria, muskrats, deer, etc., as well as subsidence. It is found within the larger marsh matrix and on the margins of lakes and large natural bayous, rather than in heavily-traveled waterways.

ENVIRONMENTAL DESCRIPTION

Jean Lafitte National Historical Park and Preserve Environment: This vegetation has been observed to form extensive patches within other more uniform marsh types (e.g., dominated by *Panicum hemitomon, Sagittaria lancifolia, Spartina patens, Typha domingensis*, etc.). These patches are thought to result from herbivory by nutria, muskrats, deer, etc., as well as subsidence. It is found within the larger marsh matrix and on the margins of lakes and large natural bayous, rather than in heavily-traveled waterways. It is documented from marshes that are adjacent to estuarine and riverine tidal waters, but the marshes where it has been documented are mostly mapped as palustrine semipermanently flooded and not identified as tidal (NPS 2005). Though tidal influence has not been documented, it might be present, especially from wind tides. All locations are impacted by levees and ditches that are presumably disrupting the flow of water. Some examples of this community may occur as a floating mat of vegetation (flotant). Nolfo-Clements (2006) identified this or a related "thin-mat" community.

Global Environment: This freshwater herbaceous marsh vegetation is located adjacent to estuarine and riverine tidal waters (NPS 2005), and has been observed to form in disturbed areas impacted by intense air boat activity or herbivory by nutria, muskrats, deer, etc., as well as in subsiding marshes on the margins of lakes and large natural bayous, rather than in heavily-traveled waterways. It may form extensive patches within other more uniform marsh types (e.g., dominated by *Panicum hemitomon, Sagittaria lancifolia, Spartina patens, Typha domingensis*, etc.).

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: This vegetation is often expressed as a matrix of taller plants such as *Kosteletzkya virginica* and *Ludwigia leptocarpa* intermingled with shorter ones such as *Bidens laevis, Polygonum hydropiperoides (= Persicaria hydropiperoides)*, and *Thelypteris palustris*. Interspersed within this taller matrix are patches of thinner floating mats characterized by *Bacopa monnieri, Eleocharis olivacea*, and *Hydrocotyle* spp. The *Eleocharis* forms a low, dense continuous mat, and the other marsh plants are lying on it or rising above it. Other species that may be present include *Andropogon glomeratus, Cyperus* spp., *Lythrum lineare, Morella cerifera, Sacciolepis striata, Sagittaria lancifolia, Spartina patens, Symphyotrichum subulatum, Typha domingensis, Vigna luteola*, and the non-native *Panicum repens*.

Global Vegetation: This vegetation is often expressed as a matrix of taller plants such as *Kosteletzkya virginica* and *Ludwigia leptocarpa* intermingled with shorter ones such as *Bidens laevis, Polygonum hydropiperoides (= Persicaria hydropiperoides)*, and *Thelypteris palustris*. Interspersed within this taller matrix are patches of thinner floating mats characterized by *Bacopa monnieri, Eleocharis olivacea*, and *Hydrocotyle* spp. The *Eleocharis* forms a low, dense continuous mat, and the other marsh plants are lying on it or rising above it. Other species that may be present include *Andropogon glomeratus, Cyperus* spp., *Lythrum lineare, Morella cerifera, Sacciolepis striata, Sagittaria lancifolia, Spartina patens, Symphyotrichum subulatum, Typha domingensis, Vigna luteola* and the non-native *Panicum repens*.

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Bacopa monnieri*, *Bidens laevis*, *Hydrocotyle* spp., *Kosteletzkya virginica*, *Ludwigia leptocarpa*, *Polygonum hydropiperoides*
Herb (field)	Graminoid	*Eleocharis olivacea*
Herb (field)	Fern (Spore-bearing forb)	*Thelypteris palustris*

Global

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Bacopa monnieri*, *Bidens laevis*, *Hydrocotyle* spp., *Kosteletzkya virginica*, *Ludwigia leptocarpa*, *Polygonum hydropiperoides*
Herb (field)	Graminoid	*Eleocharis olivacea*
Herb (field)	Fern (Spore-bearing forb)	*Thelypteris palustris*

CHARACTERISTIC SPECIES

Jean Lafitte National Historical Park and Preserve: *Bacopa monnieri*, *Eleocharis olivacea*, *Kosteletzkya virginica*, *Ludwigia leptocarpa*

Global: *Bacopa monnieri*, *Eleocharis olivacea*, *Kosteletzkya virginica*, *Ludwigia leptocarpa*

OTHER NOTEWORTHY SPECIES

Jean Lafitte National Historical Park and Preserve: Invasive/Exotic Plants: *Panicum repens* (High/Medium)

Global: Invasive/Exotic Plants: *Panicum repens* (High/Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (4-Jun-2015).

RELATED CONCEPTS

Global Similar Types:

- *Eleocharis baldwinii - Hydrocotyle (ranunculoides, umbellata)* Tidal Marsh (CEGL007893) is a thin-mat fresh marsh, described from Turtle Bayou in the western Terrebonne Basin of Louisiana (Sasser et al. 1996).

CLASSIFICATION

Status: Provisional
Classification Confidence: 3 - Weak
Jean Lafitte National Historical Park and Preserve Classification Comments: Vegetation dominated or codominated by *Eleocharis* spp. separated into two types during cluster analysis of 159 plots. One of these two types was attributed to an existing USNVC intermediate salinity association, Louisiana Deltaic Plain Intermediate Oligohaline Spikerush Marsh (CEGL007886). This new type (CEPP007081) was created for the other. Questions about species identifications for *Eleocharis* could be confounding the classification of this community. This vegetation was described from four plots that loosely clustered together along with other plots classified as *Typha domingensis - Sacciolepis striata - Sagittaria lancifolia* Mixed Marsh (CEGL007235). Within the group of four plots, Homoteneity is 0.733 and Bray-Curtis Similarity is 0.546. It has since been confirmed through other field observations.
Global Classification Comments: Nolfo-Clements (2006) identified a thin-mat community at Jean Lafitte National Historical Park and Preserve dominated or codominated by *Eleocharis olivacea, Eleocharis radicans*, and *Eleocharis vivipara*. Associated species included *Hydrocotyle* spp., *Bacopa monnieri, Ludwigia repens*, and occasionally *Micranthemum umbrosum, Sagittaria latifolia, Pontederia cordata, Cyperus* spp., *Habenaria repens, Fuirena pumila, Juncus filipendulus, Ludwigia grandiflora (= Ludwigia uruguayensis), Alternanthera philoxeroides, Phyla lanceolata, Polygonum punctatum*, and *Schoenoplectus americanus*. Occasional floating aquatic species include *Salvinia minima, Lemna minor, Spirodela polyrrhiza*, and *Wolffiella gladiata*. Her community appears to be compatible with this association (CEPP007081). More information is needed to better separate the fresh to oligohaline marshes along the coast of Louisiana into associations.

ELEMENT DISTRIBUTION

Jean Lafitte National Historical Park and Preserve Range: This community was documented as a component of herbaceous marsh bordering Lake Salvador and Bayou Segnette Waterway. It occurs interspersed with other wooded, shrub-herb and herbaceous marshes.
Global Range: Described from Jean Lafitte National Park, Louisiana, and probably found across the still fresh to oligohaline waters of the outer Gulf Coastal Plain.
Nations: US
States/Provinces: LA
TNC Ecoregions: 31:C
USFS Ecoregions (1994/95): 232Eb:CCC
Federal Lands: NPS (Jean Lafitte)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Inventory Notes: Plot data were collected by a number of different observers. Data for this analysis and analytical assistance were provided by NPS.
Jean Lafitte National Historical Park and Preserve Plots: Mar1a, MA1a, MA26a, MA29a, JELA_AA_0029, JELA_AA_0031, JELA_AA_0056, JELA_AA_0075, JELA_AA_0076, JELA_AA_0077.
Jean Lafitte National Historical Park and Preserve Description Author(s): J. Teague and M. Pyne
Global Description Author(s): M. Pyne

References: NPS 2005, Nolfo-Clements 2006, Sasser et al. 1996, Southeastern Ecology Working Group n.d.*

[CEGL007076] *Bidens laevis - Hydrocotyle ranunculoides* Floating Marsh

Translated Name: **Smooth Beggarticks - Floating Marsh-pennywort Floating Marsh**
Common Name: **Native Floating Marsh**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	Atlantic & Gulf Coastal Marsh, Wet Meadow & Shrubland (2.C.4.Ne)
Macrogroup	Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh (M066)
Group	Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh (G110)
Alliance	Gulf Coastal Plain Floating Marsh Alliance (A4220)

ELEMENT CONCEPT

Global Summary: This vegetation occurs in shallow water of openings in native fresh to oligohaline marshes, in areas that are not dominated by rooted perennial herbaceous vegetation. Species that may have moderate cover include *Amaranthus australis, Azolla caroliniana, Bidens laevis, Hydrocotyle ranunculoides, Hydrocotyle umbellata, Lemna obscura, Ludwigia leptocarpa, Nymphaea odorata, Polygonum hydropiperoides, Sagittaria lancifolia, Sagittaria latifolia, Symphyotrichum subulatum*, and *Vigna luteola*. The non-natives *Eichhornia crassipes* and *Alternanthera philoxeroides*, as well as the possibly non-native *Ludwigia peploides*, may be present but are not dominant. Better documentation and description of this community at Jean Lafitte National Park (Louisiana) are needed. This type is more native-dominated than *Eichhornia crassipes* Southeast Temperate Ruderal Aquatic Vegetation (CEGL007671). Examples contain a mixture of native and exotic species, and are more diverse than CEGL007671.

ENVIRONMENTAL DESCRIPTION

Jean Lafitte National Historical Park and Preserve Environment: This vegetation occurs in shallow water of openings in native fresh to oligohaline marshes, in areas that are not dominated by rooted perennial herbaceous vegetation.

Global Environment: This vegetation occurs in shallow water of openings in native fresh to oligohaline marshes, in areas that are not dominated by rooted perennial herbaceous vegetation.

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: Species that may have moderate cover in examples of this marsh type include *Amaranthus australis, Azolla caroliniana, Bidens laevis, Hydrocotyle ranunculoides, Hydrocotyle umbellata, Lemna obscura, Ludwigia leptocarpa, Nymphaea odorata, Polygonum hydropiperoides, Sagittaria lancifolia, Sagittaria latifolia, Symphyotrichum subulatum*, and *Vigna luteola*. The non-natives *Eichhornia crassipes* and *Alternanthera philoxeroides*, as well as the invasive *Ludwigia peploides*, may be present but are not dominant.

Global Vegetation: Species that may have moderate cover include *Amaranthus australis, Azolla caroliniana, Bidens laevis, Hydrocotyle ranunculoides, Hydrocotyle umbellata, Lemna obscura, Ludwigia leptocarpa, Nymphaea odorata, Polygonum hydropiperoides, Sagittaria lancifolia, Sagittaria latifolia, Symphyotrichum subulatum*, and *Vigna luteola*. The non-natives *Eichhornia crassipes* and *Alternanthera philoxeroides*, as well as the invasive *Ludwigia peploides*, may be present but are not dominant.

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Bidens laevis*, *Hydrocotyle ranunculoides*, *Hydrocotyle umbellata*

Global

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Bidens laevis*, *Hydrocotyle umbellata*
Floating aquatic	Aquatic herb	*Hydrocotyle ranunculoides*

CHARACTERISTIC SPECIES

Jean Lafitte National Historical Park and Preserve: *Bidens laevis*, *Hydrocotyle ranunculoides*, *Hydrocotyle umbellata*
Global: *Bidens laevis*, *Hydrocotyle ranunculoides*, *Hydrocotyle umbellata*

OTHER NOTEWORTHY SPECIES

Jean Lafitte National Historical Park and Preserve: Invasive/Exotic Plants: *Alternanthera philoxeroides* (Medium), *Eichhornia crassipes* (High), *Ludwigia peploides* ()
Global: Invasive/Exotic Plants: *Alternanthera philoxeroides* (Medium), *Eichhornia crassipes* (High), *Ludwigia peploides* ()

CONSERVATION STATUS RANK

Global Rank & Reasons: GNR (4-Jun-2015).

RELATED CONCEPTS

Global Similar Types:
Eichhornia crassipes Southeast Temperate Ruderal Aquatic Vegetation (CEGL007671)

CLASSIFICATION

Status: Provisional
Classification Confidence: 3 - Weak

ELEMENT DISTRIBUTION

Global Range: This type is described from Jean Lafitte National Historical Park and Preserve (Louisiana), and is probably found across the still fresh to oligohaline waters of the outer Gulf Coastal Plain.
Nations: US
States/Provinces: LA
TNC Ecoregions: 31:C
USFS Ecoregions (1994/95): 232Eb:CCC
Federal Lands: NPS (Jean Lafitte)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Plots: JELA_AA_0004, JELA_AA_0065, JELA_AA_0078, JELA_AA_0079.
Jean Lafitte National Historical Park and Preserve Description Author(s): M. Pyne
Global Description Author(s): M. Pyne
References: Southeastern Ecology Working Group n.d.*

M067. Atlantic & Gulf Coastal Plain Wet Prairie & Marsh

G188. ATLANTIC & GULF COASTAL PLAIN RIVER & BASIN FRESHWATER MARSH

Group Summary Description: These are non-tidal freshwater marshes dominated by emergent graminoid vegetation, floating-leaved aquatic vegetation, or shrubs. They occur on the coastal plains from Massachusetts to Louisiana and Texas. These marshes are most extensive in Florida along rivers or in the headwaters of rivers, and in karst depressions. The vegetation mosaic includes a range of mostly herbaceous wetland plant communities that may be referred to as marshes, meadows and prairies. The dominant species may vary, but *Pontederia cordata* and *Panicum hemitomon* are typical. Along rivers in Florida, *Cladium mariscus ssp. jamaicense* or *Panicum hemitomon* and *Polygonum punctatum* were apparently the historical dominant plant species, but a variety of other species may also be present. In the deeper water of karst depressions, common plants include *Typha latifolia, Pontederia cordata, Nelumbo lutea*, and others. In areas with less flooding, *Panicum hemitomon, Leersia hexandra*, and other species may be found. Plant species composition (including dominants) may vary seasonally or annually depending on inundation and fire history (especially in Florida).

A3404 *Zizaniopsis miliacea - Zizania aquatica - Pontederia cordata* Southeastern Floodplain Marsh Alliance

Giant Cutgrass - Annual Wild Rice - Pickerelweed Southeastern Floodplain Marsh Alliance
Southeastern Floodplain Marsh

ALLIANCE CONCEPT

Summary: Examples of this southern floodplain marsh vegetation are dominated by *Cicuta maculata, Osmunda regalis var. spectabilis, Peltandra virginica, Sagittaria lancifolia, Sparganium americanum, Zizania aquatica*, or *Zizaniopsis miliacea*. They occur in a variety of situations, most commonly on the Southeastern Coastal Plain. This vegetation often consists of essentially monospecific stands of *Zizaniopsis miliacea*.

Classification Comments: One association (CEGL004510) occurs in the Appalachians, and may belong in another group and alliance.

Similar Alliances:

- *Schoenoplectus tabernaemontani - Pontederia cordata - Panicum hemitomon* Basin Marsh Alliance (A3407) occurs in basins, not in river floodplains.

Diagnostic Characteristics: Southern floodplain marsh of graminoid and forb vegetation dominated by *Cicuta maculata, Osmunda regalis var. spectabilis, Peltandra virginica, Sagittaria lancifolia, Sparganium americanum, Zizania aquatica*, or *Zizaniopsis miliacea*, occurring in a variety of situations, most commonly on the Southeastern Coastal Plain.

Related Concepts:

- Floodplain Marsh (FNAI 2010a) =
- The Kissimmee marshes (Kushlan 1990) =
- The St. Johns marshes (Kushlan 1990) =
- [14] River Marsh and Fresh Water Marsh (Wharton 1978) > [River Marsh is the synonym for A3404.]

ALLIANCE DESCRIPTION

Environment: This alliance occurs along the edges of rivers and streams and in floodplains.

Vegetation: This southern floodplain marsh graminoid and forb vegetation is dominated by *Cicuta maculata, Osmunda regalis var. spectabilis, Peltandra virginica, Sagittaria lancifolia, Sparganium americanum, Zizania aquatica*, or *Zizaniopsis miliacea*, occurring in a variety of situations, most commonly on the Southeastern Coastal Plain.

Physiognomy and Structure: Southern floodplain marsh graminoid and forb vegetation.

Floristics: This southern floodplain marsh graminoid and forb vegetation is dominated by *Cicuta maculata, Osmunda regalis var. spectabilis, Peltandra virginica, Sagittaria lancifolia, Sparganium americanum, Zizania aquatica*, or *Zizaniopsis miliacea*, occurring in a variety of situations, most commonly on the Southeastern Coastal Plain.
Dynamics: Variable depths and durations of flooding and the influence of flowing water are characteristic of the dynamics of this marsh vegetation.

ALLIANCE DISTRIBUTION

Range: This alliance occurs in the southeastern United States, from Virginia and Tennessee south to Florida and west to Texas.
Nations: US
Subnations: AL, FL, GA, LA, MS, NC, SC, TN, TX, VA, WV
Alliance Sources
References: FNAI 2010a, Faber-Langendoen et al. 2017b*, Kushlan 1990, Wharton 1978
Author of Concept: Faber-Langendoen et al. 2017b
Author of Description: C. Nordman, in Faber-Langendoen et al. (2013)

[CEGL004139] *Zizaniopsis miliacea* Coastal Plain Slough Marsh

Translated Name: **Giant Cutgrass Coastal Plain Slough Marsh**
Common Name: **Coastal Plain Giant Cutgrass Slough Marsh**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	Atlantic & Gulf Coastal Marsh, Wet Meadow & Shrubland (2.C.4.Ne)
Macrogroup	Atlantic & Gulf Coastal Plain Wet Prairie & Marsh (M067)
Group	Atlantic & Gulf Coastal Plain River & Basin Freshwater Marsh (G188)
Alliance	*Zizaniopsis miliacea - Zizania aquatica - Pontederia cordata* Southeastern Floodplain Marsh Alliance (A3404)

ELEMENT CONCEPT

Global Summary: Temperate vegetation of marshes and sloughs dominated by *Zizaniopsis miliacea*, often consisting of essentially monospecific stands. This broadly defined type may be divided as more information becomes available. This is primarily a community of the Coastal Plain, but an occurrence is reported from the Piedmont of South Carolina.

ENVIRONMENTAL DESCRIPTION

Jean Lafitte National Historical Park and Preserve Environment: This tall flooded grassland is primarily found along marsh borders of waterways.
Global Environment: This association encompasses temperate vegetation of marshes and sloughs; it is primarily a community of the Coastal Plain, but an occurrence is reported from the Piedmont of South Carolina (B. Pittman pers. comm.).

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: This vegetation is dominated by *Zizaniopsis miliacea*, often consisting of essentially monospecific stands.
Global Vegetation: This vegetation is dominated by *Zizaniopsis miliacea*, often consisting of essentially monospecific stands.

Global Dynamics: At Reelfoot Lake, Tennessee, this vegetation has declined since the 1940s, presumably due to lack of fluctuation in the lake levels due to lake stabilization via a water control structure. It has been largely replaced by stands of *Decodon verticillatus*.

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Zizaniopsis miliacea*

Global

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Zizaniopsis miliacea*

CHARACTERISTIC SPECIES

Jean Lafitte National Historical Park and Preserve: *Zizaniopsis miliacea*
Global: *Zizaniopsis miliacea*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (10-Dec-1998). This is a broadly defined wetland association and, as such, is wide-ranging. As more information becomes available, it may be split into several types. The degree of uncertainty in the rank reflects the need for further inventory to assess the taxonomic relationship of this type and as yet undescribed types. This type remains poorly documented and further research is needed to clarify these data gaps. The ecological integrity of many wetland communities is threatened by hydrological modifications and the alteration of surrounding upland landscapes.

RELATED CONCEPTS

Global Similar Types:
Zizaniopsis miliacea Rocky Riverbed Vegetation (CEGL004140)

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Global Classification Comments: Bert Pittman (pers. comm.) reports an area in the Piedmont (Charlotte Belt Subsection) of South Carolina which is about 1000 acres in extent, with 10 to 20% of it ("several hundred" acres) in marsh dominated by *Zizaniopsis miliacea* with "other aquatic vegetation present." Based on his Piedmont experience this seems "very unusual" to him. Without additional floristic information, this apparent occurrence will be accommodated here for the present. One large stand of this vegetation is found in a marsh at Fort Benning, Georgia (Upper East Gulf Coastal Plain).

ELEMENT DISTRIBUTION

Jean Lafitte National Historical Park and Preserve Range: This vegetation is found bordering larger waterway throughout the Barataria Preserve.
Global Range: Vegetation of marshes and sloughs dominated by *Zizaniopsis miliacea* is reported as ranging from the Atlantic Coastal Plain of possibly the Carolinas south to Florida and into the Upper East Gulf Coastal Plain and

west to Texas into the Upper West Gulf Coastal Plain. It extends north in the interior at least to northwestern Tennessee, and is also reported from the Piedmont of South Carolina (Charlotte Belt Subsection).
Nations: US
States/Provinces: AL, FL, GA, LA, MS, NC, SC, TN, TX
TNC Ecoregions: 31:C, 40:C, 41:P, 42:C, 43:C, 52:C, 53:P, 56:C, 57:P
USFS Ecoregions (1994/95): 231Ae:CCC, 231Bi:CCC, 231Ed:C??, 231El:C??, 231Fa:CPP, 231Fb:CPP, 232Bs:CC?, 232Cg:CC?, 232E:CC, 232Fa:CP?, 232Fc:CP?, 234Aa:CCP, 234An:CCC, 255Ca:C??, 255Da:CCP, 255Db:CCC, 255Dc:CCP
Federal Lands: DOD (Fort Benning); NPS (Jean Lafitte, Natchez Trace); USFS (Davy Crockett); USFWS (Anahuac?, Brazoria?, McFaddin?, Reelfoot)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Plots: None.
Jean Lafitte National Historical Park and Preserve Description Author(s): M. Pyne
Global Description Author(s): Southeastern Ecology Group
References: Nordman et al. 2011, Pittman pers. comm., Schafale 2012, Southeastern Ecology Working Group n.d.*

2.C.5. Salt Marsh

2.C.5.NB. NORTH AMERICAN ATLANTIC & GULF COASTAL SALT MARSH

M079. North American Atlantic & Gulf Coastal Salt Marsh

G120. ATLANTIC & GULF COASTAL BRACKISH SALT MARSH

Group Summary Description: Brackish tidal marshes develop where saltwater mixes with freshwater, primarily in estuaries but also sometimes on the lee side of barrier islands or in other settings. The vegetation is primarily herbaceous, but there may be areas of shrub dominance. Graminoids are prominent and typically include tall species such as *Typha angustifolia, Typha domingensis, Schoenoplectus americanus, Schoenoplectus pungens, Schoenoplectus robustus*, and *Spartina cynosuroides*. The salt marsh grasses *Spartina patens* and *Spartina alterniflora* may also be present, but generally are mixed with other species instead of exhibiting strong dominance as they do in the salt marsh setting. Those *Spartina* are typically most abundant where brackish marsh is transitioning to salt marsh, for example at the estuary mouth. Some brackish tidal marshes are forb-dominated; common species in these settings include *Sagittaria subulata, Limosella australis, Lilaeopsis chinensis, Sagittaria calycina var. spongiosa, Polygonum arifolium, Polygonum hydropiperoides, Zannichellia palustris, Eleocharis parvula*, and *Amaranthus cannabinus*. Some of these forbs also occur as associates where graminoids are dominant.

In Atlantic Canada, the brackish marshes have a somewhat different character. They are characterized by *Carex paleacea, Hierochloe odorata, Juncus balticus, Spartina pectinata*, and/or *Schoenoplectus maritimus/pungens*; *Solidago sempervirens* is frequent; freshwater species, such as *Typha latifolia, Typha angustifolia, Solidago uliginosa*, among others, are typical; *Carex mackenziei, Cladium mariscoides, Eleocharis parvula, Hordeum jubatum, Limosella australis, Samolus valerandi*, and *Teucrium canadense* may be present. Coastal plain species such as *Schoenoplectus americanus, Eleocharis rostellata*, and *Lilaeopsis chinensis* (more typical in low salt marsh) are only found in western Nova Scotia.

A4013 *Spartina alterniflora - Spartina cynosuroides* Brackish Tidal Marsh Alliance

Smooth Cordgrass - Big Cordgrass Brackish Tidal Marsh Alliance

Cordgrass Brackish Tidal Marsh

ALLIANCE CONCEPT

Summary: This alliance comprises brackish tidal marshes of the Atlantic and Gulf coastal plains characterized by *Spartina alterniflora* and/or *Spartina cynosuroides*, with associates including *Typha angustifolia* and *Cladium mariscus ssp. jamaicense*, generally occurring on tidal rivers as opposed to regularly flooded salt marshes forming behind barrier beaches. In addition to the nominals, additional halophytic species such as *Spartina patens, Juncus roemerianus*, and *Iva frutescens* indicate brackish (mesohaline) conditions. Additional associates also may include a large number of species occurring in freshwater or oligohaline marshes.

Classification Comments: The alliance is characterized by the presence of at least one species tolerant of a wide range of salinity levels. Oligohaline tidal marshes (salinity <0.5 ppt) is treated in Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh Group (G110).

Diagnostic Characteristics: Presence of *Spartina alterniflora, Spartina cynosuroides, Spartina patens, Iva frutescens*, or *Juncus roemerianus* occurring on tidal river settings, or occasionally on upper salt marshes influenced by freshwater inputs.

Related Concepts:

- Big Cordgrass Community Type (Odum et al. 1984) **?**
- Brackish Marsh (Gawler and Cutko 2010) **>**
- Brackish Marsh (Schafale and Weakley 1990) **><**
- Brackish Marsh (Nelson 1986) **><**
- Brackish Marsh (Collins and Anderson 1994) **>**
- Brackish Marsh (Wharton 1978) **><**
- Tidal Freshwater Marsh, Oligohaline Variant (Schafale and Weakley 1990) **?**
- Tidal Marsh (FNAI 1992a) **><**

ALLIANCE DESCRIPTION

Environment: Substrates vary from sand or gravel on tidal rivershores, poorly drained peat overlying sand and mucky sand, to silty mud along meanders in tidal rivers and guts in the interiors of extensive marshes where there is significant freshwater input. Tidal flow also varies from regularly flooded low marsh to intermittently flooded high marsh on terraces and levees. Microtopography is relatively flat and lacks pronounced hummocks and hollows.

Vegetation: The floristic composition of brackish marshes includes a mixture of halophytic and freshwater species. The most characteristic species of these environments are *Amaranthus cannabinus, Baccharis halimifolia, Crassula aquatica (= Tillaea aquatica), Echinochloa walteri, Eleocharis halophila, Eleocharis parvula, Hibiscus moscheutos, Kosteletzkya virginica, Lilaeopsis chinensis, Pluchea odorata, Sagittaria calycina, Samolus valerandi ssp. parviflorus (= Samolus parviflorus), Schoenoplectus americanus, Schoenoplectus maritimus, Schoenoplectus robustus, Spartina cynosuroides*, and *Typha angustifolia*. Halophytic species may include *Iva frutescens, Spartina alterniflora*, and *Spartina patens*. *Cladium mariscus ssp. jamaicense, Juncus roemerianus, Spartina bakeri*, and *Typha domingensis* are characteristic in the southern portion of the range. *Carex paleacea* is characteristic in northern New England and the Canadian maritime provinces.

Physiognomy and Structure: The physiognomy of this vegetation varies widely, from short graminoids to a mixture of tall forbs and graminoids, sometimes with scattered shrubs or trees.

Floristics: The floristic composition of brackish marshes includes a mixture of halophytic and freshwater species. The most characteristic species of these environments are *Amaranthus cannabinus, Baccharis halimifolia, Crassula aquatica (= Tillaea aquatica), Echinochloa walteri, Eleocharis halophila, Eleocharis parvula, Hibiscus moscheutos, Kosteletzkya virginica, Lilaeopsis chinensis, Pluchea odorata, Sagittaria calycina, Samolus valerandi ssp. parviflorus (= Samolus parviflorus), Schoenoplectus americanus, Schoenoplectus maritimus, Schoenoplectus*

robustus, Spartina cynosuroides, and *Typha angustifolia*. Halophytic species may include *Iva frutescens, Spartina alterniflora*, and *Spartina patens*. *Cladium mariscus ssp. jamaicense, Juncus roemerianus, Spartina bakeri*, and *Typha domingensis* are characteristic in the southern portion of the range. *Carex paleacea* is characteristic in northern New England and the Canadian maritime provinces.

Dynamics: This alliance comprises vegetation of environmental settings that experiences a wide fluctuation in salinity. This includes the mesohaline reaches of tidal rivers where saltwater from the ocean intermixes with freshwater input from inland, or at the upland interface of tidal marshes that receives significant freshwater input. Flooding regime varies with respect to height from river channel, with more regular flooding occurring adjacent to the river, and irregular flooding on terraces.

ALLIANCE DISTRIBUTION

Range: This alliance ranges from Canada south along the Atlantic Coast, as far as the Gulf Coast.

Nations: CA, US

Subnations: AL, CT, DC?, DE, FL, GA, LA, LB?, MA, MD, ME, MS, NC, NF?, NH, NJ, NS?, NY, PA, PE?, QC, RI, SC, TX, VA

Alliance Sources

References: Collins and Anderson 1994, Coulling 2002, FNAI 1992a, Faber-Langendoen et al. 2017b, Gawler and Cutko 2010, Nelson 1986, Odum 1988, Odum and Smith 1981, Odum et al. 1984, Odum et al. 1984*, Schafale and Weakley 1990, Wharton 1978, Wolfe 1990

Author of Concept: Odum et al. 1984

Author of Description: W.E. Odum et al. (1984)

[CEGL004178] *Cladium mariscus* ssp. *jamaicense* Tidal Salt Marsh

Translated Name: **Jamaica Swamp Sawgrass Tidal Salt Marsh**

Common Name: **Tidal Sawgrass Salt Marsh**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	North American Atlantic & Gulf Coastal Salt Marsh (2.C.5.Nb)
Macrogroup	North American Atlantic & Gulf Coastal Salt Marsh (M079)
Group	Atlantic & Gulf Coastal Brackish Salt Marsh (G120)
Alliance	*Spartina alterniflora - Spartina cynosuroides* Brackish Tidal Marsh Alliance (A4013)

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* in often dense stands. Additional species may include *Juncus roemerianus, Osmunda regalis, Polygonum hydropiperoides, Spartina alterniflora, Spartina bakeri, Typha domingensis, Amaranthus australis, Amaranthus cannabinus, Hibiscus* sp., *Solidago sempervirens var. mexicana*, and *Woodwardia virginica*, among others. In addition, there may be a sparse tree layer (10-15 m tall) of *Acer rubrum, Juniperus virginiana var. silicicola*, and *Sabal palmetto*. There may also be a very sparse to moderate shrub layer (2-5 m) of *Acer rubrum, Baccharis angustifolia, Morella cerifera*, and *Salix caroliniana*, among others. In addition, the noxious exotic *Triadica sebifera* could be present.

ENVIRONMENTAL DESCRIPTION

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

Global Vegetation: Stands are typically dominated by a very dense herbaceous layer of Cladium mariscus ssp. jamaicense. Additional species may include Juncus roemerianus, Osmunda regalis, Polygonum hydropiperoides, Spartina alterniflora, Spartina bakeri, Typha domingensis, Amaranthus australis, Amaranthus cannabinus, Hibiscus sp., Solidago sempervirens var. mexicana, and Woodwardia virginica, among others. In addition, there may be a sparse tree layer (10-15 m tall) of Acer rubrum, Juniperus virginiana var. silicicola, and Sabal palmetto. There may also be a very sparse to moderate shrub layer (2-5 m) of Acer rubrum, Baccharis angustifolia, Morella cerifera, and Salix caroliniana, among others. In addition, the noxious exotic Triadica sebifera could be present.

MOST ABUNDANT SPECIES

Global

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Cladium mariscus* ssp. *jamaicense*

CHARACTERISTIC SPECIES

Global: *Cladium mariscus ssp. jamaicense*

OTHER NOTEWORTHY SPECIES

Global: Invasive/Exotic Plants: *Triadica sebifera* (High)

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (13-Aug-1997).

RELATED CONCEPTS

Global Related Concepts:

- Brackish Marsh (Schafale and Weakley 1990) >
- Estuarine Tidal Marsh (FNAI 1997) >
- Freshwater Marsh (Smith 1996a) >

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Global Classification 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. In southeastern Virginia this species is found as a component of wind-tidal marshes and does not typically dominate.

ELEMENT DISTRIBUTION

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.

Nations: US
States/Provinces: AL, FL, GA, LA, MS, NC, SC
TNC Ecoregions: 53:C, 55:P, 56:C, 57:C

USFS Ecoregions (1994/95): 232B:C?, 232Cb:CCC, 232Ce:CCC, 232Ch:CCC, 232Ci:CCC, 232Db:CCC, 232Dc:CCC, 232Eb:CCC, 232G:CP
Federal Lands: NPS (Cape Hatteras, Cape Lookout, Fort Caroline, Fort Frederica?, Jean Lafitte, Timucuan); USFS (Croatan); USFWS (Alligator River, Swanquarter)

ELEMENT SOURCES

Global Description Author(s): A.S. Weakley
References: FNAI 1990, FNAI 1992a, FNAI 1997, Johnson, A. pers. comm., LNHP 2009, Nelson 1986, Schafale 2000, Schafale 2003b, Schafale 2012, Schafale and Weakley 1990, Smith 1996a, Southeastern Ecology Working Group n.d.*

[CEGL008476] *Schoenoplectus americanus - (Spartina patens) - Typha* spp. Salt Marsh

Translated Name: **Chairmaker's Bulrush - (Saltmeadow Cordgrass) - Cattail species Salt Marsh**
Common Name: **Gulf Coast Bulrush - Cordgrass - Cattail Salt Marsh**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	North American Atlantic & Gulf Coastal Salt Marsh (2.C.5.Nb)
Macrogroup	North American Atlantic & Gulf Coastal Salt Marsh (M079)
Group	Atlantic & Gulf Coastal Brackish Salt Marsh (G120)
Alliance	*Spartina alterniflora - Spartina cynosuroides* Brackish Tidal Marsh Alliance (A4013)

ELEMENT CONCEPT

Global Summary: This association includes tidal, mesohaline to oligohaline marshes dominated or codominated by *Schoenoplectus americanus (= Scirpus olneyi)*. Other associated species can include *Spartina patens, Juncus roemerianus*, and *Typha domingensis*. The general aspect and species composition of this vegetation are variable, not only among occurrences, but also over the course of the growing season. Dominance patterns are not well understood but are likely related to gradients in salinity and hydrology. This association is known from the Gulf Coast of Texas and Louisiana; it may also occur along the Gulf Coast of Mississippi and Alabama. This vegetation may grade down into vegetation dominated by *Spartina patens, Distichlis spicata, Juncus roemerianus* or *Spartina alterniflora*, and up into shrub-dominated zones or saline prairie. The woody shrub component of this zone is diminished by storm tides, as well as the effects of fire. More information is needed on this vegetation type. This vegetation is found in the marshes of the Chenier Plain of Louisiana and upper and mid Texas coast where it may be interspersed with *Spartina patens - Schoenoplectus (americanus, pungens) - (Distichlis spicata)* Salt Marsh (CEGL004755) and *Spartina alterniflora - Distichlis spicata - Spartina patens* Mesohaline Salt Marsh (CEGL002230). It differs from *Spartina patens - Schoenoplectus (americanus, pungens) - (Distichlis spicata)* Salt Marsh (CEGL004755) by the dominance or codominance of *Schoenoplectus americanus*.

ENVIRONMENTAL DESCRIPTION

Jean Lafitte National Historical Park and Preserve Environment: At Jean Lafitte, this vegetation occurs in oligohaline to mesohaline tidally-influenced marshes.
Global Environment: These are tidal, mesohaline to oligohaline marshes.

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: Examples at Jean Lafitte are primarily virtually monotypic stands of *Schoenoplectus americanus (= Scirpus olneyi)*, with few other species. *Sagittaria lancifolia*

may be present. Similar stands of *Schoenoplectus californicus* are treated as a separate association, Giant Bulrush Tidal Herbaceous Vegetation (CEGL003985).

Global Vegetation: Stands are dominated or codominated by *Schoenoplectus americanus (= Scirpus olneyi)*. Other associated species can include *Spartina patens, Juncus roemerianus*, and *Typha domingensis*.

Global Dynamics: The general aspect and species composition of this vegetation are variable, not only among occurrences, but also over the course of the growing season. Dominance patterns are not well understood but are likely related to gradients in salinity and hydrology.

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Sagittaria lancifolia*
Herb (field)	Graminoid	*Schoenoplectus americanus*

Global

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Schoenoplectus americanus*

CHARACTERISTIC SPECIES

Jean Lafitte National Historical Park and Preserve: *Sagittaria lancifolia*, *Schoenoplectus americanus*
Global: *Schoenoplectus americanus*, *Spartina patens*, *Typha domingensis*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G3? (20-Apr-2001). This association is apparently a relatively uncommon oligohaline marsh along the Gulf Coast of Louisiana and Texas. These marshes are threatened by subsidence, saltwater intrusion and freshwater diversion. The degree of uncertainty in the rank reflects the need for further inventory to assess the remaining number of occurrences of this community and the relationship between this and similar communities.

RELATED CONCEPTS

Global Similar Types:

- *Schoenoplectus americanus* - *Spartina patens* Salt Marsh (CEGL006612)
- *Schoenoplectus californicus* Tidal Marsh (CEGL003985)
- *Spartina alterniflora* - *Distichlis spicata* - *Spartina patens* Mesohaline Salt Marsh (CEGL002230)
- *Spartina patens* - *Schoenoplectus (americanus, pungens)* - *(Distichlis spicata)* Salt Marsh (CEGL004755)
- *Spartina patens* - *Typha* spp. Chenier Plain Oligohaline Tidal Marsh (CEGL007887)

Global Related Concepts:

- Brackish Marsh (Smith 1996a) >
- Brackish Marsh (Wieland 1994a) >
- Marshhay Cordgrass Series (Diamond 1993) >
- Mesohaline Wiregrass Marsh (Visser and Sasser 1998) >
- Mesohaline Wiregrass Marsh (Visser et al. 1998) >
- Saline Marsh (Wieland 1994a) >

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Global Classification Comments: The use of prescribed fire by land managers in this community affects the relative abundance of *Schoenoplectus americanus*; this relationship needs to be further explored and described.

ELEMENT DISTRIBUTION

Global Range: This association is currently only known from the Gulf Coast of Texas and Louisiana, but it may range throughout the Gulf Coast of the United States.
Nations: US
States/Provinces: AL?, GA?, LA, MS?, TX:S4
TNC Ecoregions: 31:C
USFS Ecoregions (1994/95): 231Fb:CCC, 232Eb:CCC, 255Dc:CCC
Federal Lands: NPS (Jean Lafitte); USFWS (Anahuac, Brazoria, McFaddin, San Bernard)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Plots: JELA_AA_0005, JELA_AA_0007, JELA_AA_0017, JELA_AA_0039, JELA_AA_0040, JELA_AA_0052.
Jean Lafitte National Historical Park and Preserve Description Author(s): M. Pyne
Global Description Author(s): J. Teague
References: Diamond 1993, LNHP 2009, Smith 1996a, Southeastern Ecology Working Group n.d., Visser and Sasser 1998, Visser and Sasser 1998*, Visser et al. 1998, Wieland 1994a, Wieland 1994b

5. Aquatic Vegetation

5.B.2. Temperate to Polar Freshwater Aquatic Vegetation

5.B.2.NA. NORTH AMERICAN FRESHWATER AQUATIC VEGETATION

M108. Eastern North American Freshwater Aquatic Vegetation

G114. EASTERN NORTH AMERICAN FRESHWATER AQUATIC VEGETATION

Group Summary Description: Submergent marshes can be found across a large part of North America, ranging from boreal, interior Canada (Saskatchewan, Manitoba, Ontario) south through the Great Plains to the Gulf Coastal Plain in Texas and east to the Atlantic from Virginia to Maine. Stands in this group have rooted aquatic herbaceous vegetation, are permanently flooded with water generally less than 2 m deep, and are subject to low to moderate waves and currents. Water salinity varies from fresh to saline, with the saline and brackish sites tending to occur in the Great Plains. Submergent and floating-leaved aquatics dominate submergent marshes. Emergent vegetation has <10% total cover. Total vegetation cover ranges from sparse to dense.

A4064 *Nymphaea odorata - Nuphar* spp. - *Brasenia schreberi* Aquatic Vegetation Alliance

American White Water-lily - Pond-lily species - Watershield Aquatic Vegetation Alliance

Water-lily - Pond-lily Aquatic Vegetation

ALLIANCE CONCEPT

Summary: This alliance, common throughout most of the eastern and central United States and adjacent Canadian provinces, contains vegetation which may occur in a variety of slow-moving waterbodies, including rivers, millponds, streams, shallow ponds or lakes, or on shores of deeper waterbodies including freshwater tidal areas. Stands are dominated by hydromorphic-rooted aquatic plants, typically *Nuphar* spp., with or without *Nymphaea odorata* and *Nymphoides aquatica*. Emergent vegetation is less than 25%, and typically plant species diversity is low. Other species present may include *Utricularia* spp., *Potamogeton* spp., and others. In the north, *Brasenia schreberi* may be locally dominant. Other characteristic northern species include *Nymphaea tetragona* and *Potamogeton amplifolius*. Associates found in the Midwest include *Polygonum amphibium*. Stands of this alliance are permanently to semipermanently flooded, and water depth is generally greater than 0.5 m and up to 2 m.

Diagnostic Characteristics: This alliance is characterized by permanently flooded, low water energy wetlands dominated by *Nuphar* spp., *Nymphaea odorata, Brasenia schreberi*, and *Nymphoides aquatica*.

Related Concepts:

- *Nuphar lutea* herbaceous alliance (Hoagland 1998a) ><
- *Nymphaea odorata* herbaceous alliance (Hoagland 1998a) **?**
- Artificial Pond (Smith 1991) ><
- L5D2aI1a. *Nuphar lutea* (Foti et al. 1994) **?**
- Natural Pond (Smith 1991) ><
- Open water/aquatic bed veg., natural impoundment pond (Ambrose 1990a) **?**
- Small Depression Pond (Schafale and Weakley 1990) ><
- Spatterdock - water lily wetland (Fike 1999) **?**
- Spring-run Stream (FNAI 1990) ><
- Stable Natural Pool (Smith 1991) ><

ALLIANCE DESCRIPTION

Environment: This alliance contains vegetation which may occur in a variety of slow-moving waterbodies, including rivers, millponds, blackwater rivers, streams, shallow ponds or lakes, or on shores of deeper waterbodies including freshwater tidal areas. The water depth is generally greater than 0.5 m and up to 2 m. Stands of this alliance are permanently to semipermanently flooded.

Vegetation: Stands are dominated by hydromorphic-rooted aquatic plants, typically *Nuphar* spp. (any of the North American taxa), with or without *Nymphaea odorata*. Emergent vegetation is less than 25%, and typically plant species diversity is low. Other species present may include *Utricularia* spp., *Potamogeton* spp., and others. In the north, *Brasenia schreberi* may be locally dominant. Other characteristic northern species include *Nymphaea tetragona* and *Potamogeton amplifolius* (Harris et al. 1996). Associates found in the Midwest include *Polygonum amphibium*. In the Southeast, examples may include the floating or emergent "pad-leaved" species *Nelumbo lutea* or *Nymphoides aquatica*. Submerged aquatic species which may be present include *Cabomba caroliniana, Ceratophyllum demersum*, and *Heteranthera dubia*.

Physiognomy and Structure: This alliance consists of communities dominated by floating, rooted aquatic forbs. Typically these forbs have broad, flat leaves attached to elongated stems, allowing them to float on the water surface. Cover of the water surface by these forbs is variable, from somewhat sparse to very dense.

Floristics: Stands are dominated by hydromorphic-rooted aquatic plants, typically *Nuphar* spp. (any of the North American taxa), with or without *Nymphaea odorata*. Emergent vegetation is less than 25%, and typically plant species diversity is low. Other species present may include *Utricularia* spp., *Potamogeton* spp., and others. In the north, *Brasenia schreberi* may be locally dominant. Other characteristic northern species include *Nymphaea*

tetragona and *Potamogeton amplifolius* (Harris et al. 1996). Associates found in the Midwest include *Polygonum amphibium*. In the Southeast, examples may include the floating or emergent "pad-leaved" species *Nelumbo lutea* or *Nymphoides aquatica*. Submerged aquatic species which may be present include *Cabomba caroliniana, Ceratophyllum demersum*, and *Heteranthera dubia*.

ALLIANCE DISTRIBUTION

Range: This alliance is widespread in the eastern United States and adjacent Canada.
Nations: CA, US
Subnations: AL, AR, CT, DE, FL, GA, IA, IL, IN, KY, LA, MA, MB, MD, ME, MI, MN, MO, MS, NC, NH, NJ, NY, OH, OK, ON, PA, QC, RI, SC, TN, TX, VA, VT, WI, WV

ALLIANCE SOURCES

References: Ambrose 1990a, FNAI 1990, Faber-Langendoen et al. 1996, Faber-Langendoen et al. 2017b*, Fike 1999, Foti et al. 1994, Harris et al. 1996, Heineke 1987, Hoagland 1998a, Penfound 1952, Schafale and Weakley 1990, Smith 1991, Wharton 1978, Wolfe 1990
Author of Concept: Faber-Langendoen et al. 2017b
Author of Description: J. Drake, in Faber-Langendoen et al. (2013)

[CEGL004323] *Nelumbo lutea* Aquatic Vegetation

Translated Name: **American Lotus Aquatic Vegetation**
Common Name: **American Lotus Aquatic Wetland**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	North American Freshwater Aquatic Vegetation (5.B.2.Na)
Macrogroup	Eastern North American Freshwater Aquatic Vegetation (M108)
Group	Eastern North American Freshwater Aquatic Vegetation (G114)
Alliance	*Nymphaea odorata - Nuphar* spp. - *Brasenia schreberi* Aquatic Vegetation Alliance (A4064)

ELEMENT CONCEPT

Global Summary: The American lotus type occurs in natural wetlands or artificial impoundments across the eastern United States and southern Ontario. Stands are essentially monospecific *Nelumbo lutea* communities. This association may be divided as more information becomes available. In Wisconsin, this type is located primarily in the backwaters and impoundments of the Mississippi River and along the deep marshes of the lower Wolf River system. In the Central Appalachians this association includes mixed or monospecific *Nelumbo lutea* communities of natural wetlands or artificial impoundments, sometimes with scattered *Cephalanthus occidentalis*. Other floating-leaved aquatic plant species, such as *Nuphar advena* and *Nymphaea odorata*, may be present, as may emergent species such as *Schoenoplectus tabernaemontani (= Scirpus tabernaemontani), Pontederia cordata, Juncus effusus, Typha latifolia, Eichhornia crassipes* (alien), *Hydrocotyle* spp., and floating aquatics, such as *Salvinia minima, Spirodela* spp., *Lemna* spp., and *Azolla caroliniana*. The hydrology of this association is highly variable; the hydrologic placement is debatable.

ENVIRONMENTAL DESCRIPTION

Global Environment: Stands are found in natural wetlands or artificial impoundments. In Wisconsin, this type is located primarily in the backwaters and impoundments of the Mississippi River and along the deep marshes of the lower Wolf River system (E. Epstein pers. comm. 2003). The hydrology of this association in the Central

Appalachian region is highly variable; thus, the hydrologic placement is debatable (Central Appalachian Ecoregional Planning Team pers. comm. 1998).

VEGETATION DESCRIPTION

Global Vegetation: Stands are essentially monospecific *Nelumbo lutea* communities. This association may be divided as more information becomes available. In the Central Appalachian region, mixed or monospecific *Nelumbo lutea* communities of natural wetlands or artificial impoundments sometimes contain scattered *Cephalanthus occidentalis*. Other floating-leaved aquatic plant species, such as *Nuphar advena* and *Nymphaea odorata*, may be present, as may emergent species such as *Schoenoplectus tabernaemontani (= Scirpus tabernaemontani), Pontederia cordata, Juncus effusus, Typha latifolia, Eichhornia crassipes* (alien), *Hydrocotyle* spp., and floating aquatics, such as *Salvinia minima, Spirodela* spp., *Lemna* spp., and *Azolla caroliniana* (Central Appalachian Ecoregional Planning Team pers. comm. 1998).

MOST ABUNDANT SPECIES

CHARACTERISTIC SPECIES

Global:

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G4? (15-Oct-2002). Although natural stands may be relatively rare, this type may also occur in cultural impoundments. The dominant species in stands of this vegetation is widespread across the eastern United States and adjacent Canada. This is not a rare or imperiled vegetation type, even though its occurrence is poorly documented. Stands may occur in natural lakes and ponds or in artificial impoundments.

RELATED CONCEPTS

Global Related Concepts:

- *Nelumbo lutea* Permanently Flooded - Tidal Herbaceous Vegetation (Coulling 2002) **=**
- *Nelumbo lutea* Permanently Flooded - Tidal Herbaceous Vegetation [Provisional] (VDNH 2003) **=**
- *Nelumbo lutea* Semipermanently Flooded - Tidal Herbaceous Vegetation (Fleming et al. 2007b) **=**
- American Lotus Floating-leaved Shallow Aquatic Type (Lee et al. 1998) **=**
- Freshwater Marsh (Nelson 1985) **>**
- IID6a. Natural Impoundment Pond (Allard 1990) **>**
- Inland Emergent Marsh (Chapman et al. 1989) **>**
- Piedmont/Mountain Semipermanent Impoundment (Schafale and Weakley 1990) **>**
- Submergent/Floating Vascular Vegetation (Smith 1996a) **>**
- Tidal Freshwater and Oligohaline Aquatic Bed (Fleming et al. 2001) **>**
- Water lily emergent vegetation (CAP pers. comm. 1998) **?**

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Global Classification Comments: It is unclear whether natural stands (ponds) can be separated from ruderal stands (cultural impoundments that are invaded by *Nelumbo lutea*), complicating the classification and the assessment of the rarity of this type. This type is relatively uncommon in Wisconsin, but several of the occurrences are quite large (hundreds of acres) and reasonably well protected (E. Epstein pers. comm. 2003).

ELEMENT DISTRIBUTION

Global Range: This type is found locally across many parts of the eastern/southeastern United States, from Kentucky and Virginia northeast to Ontario and Wisconsin, south to Texas, and east to Georgia.
Nations: CA, US
States/Provinces: AL, AR, GA, IA, IL?, IN, KY, LA, MI, MO?, MS, NC, NE:S1?, OK, ON, SC, TN, TX, VA:SU
TNC Ecoregions: 31:C, 32:P, 36:C, 37:P, 38:C, 39:C, 40:P, 41:C, 42:C, 43:C, 44:C, 46:C, 48:C, 51:?, 52:P, 53:C, 56:P, 57:P, 58:?, 59:C
USFS Ecoregions (1994/95): 222Ab:CCC, 222Ag:CCC, 222Ah:CCC, 222An:CCC, 222Ch:CCC, 222Db:CCC, 222Ka:CCC, 222Kb:CCC, 222Ke:CCC, 222Kf:CCC, 222Kh:CCC, 222Lb:CCC, 222Lc:CCC, 222Ld:CCC, 222Le:CCC, 231Ga:CCC, 231Gb:CCC, 231Gc:CCC, 232:C, 234Aa:CCC, 234Ac:CCC, 234Ad:CCC, 234Af:CCC, 234Ag:CCC, 234Ai:CCC, 234Al:CCC, 234Am:CCC, 234An:CCC, 251Df:CCC, 255Dc:CCC, M221Ad:CCC, M222Aa:CCC, M222Ab:CCC, M231Aa:CCC, M231Ab:CCC, M231Ac:CCC, M231Ad:CCC
Federal Lands: DOD (Fort Benning); NPS (Effigy Mounds, Jean Lafitte, Mississippi, Natchez Trace); USFS (Kisatchie, Ouachita, Ouachita (Coastal Plain)?, Ouachita (Mountains), Ozark); USFWS (Aransas?, Big Lake, Brazoria, Eufaula, McFaddin, Reelfoot)

ELEMENT SOURCES

Global Description Author(s): A.S. Weakley
References: ALNHP 2002, Allard 1990, Blair 1938, Blair and Hubbell 1938, CAP pers. comm. 1998, Chapman et al. 1989, Coulling 2002, Epstein pers. comm., Fleming and Coulling 2001, Fleming and Patterson 2011a, Fleming et al. 2001, Fleming et al. 2007b, Hoagland 2000, Homoya et al. 1988, Hop et al. 2005, INAI n.d., LNHP 2009, Lee et al. 1998, McAlister and McAlister 1995, Nelson 1985, Nelson 2010, Penfound 1953, Rolfsmeier and Steinauer 2010, Schafale 2012, Schafale and Weakley 1990, Smith 1996a, Southeastern Ecology Working Group n.d.*, VDNH 2003, White and Madany 1978

[CEGL002386] *Nuphar advena - Nymphaea odorata* Aquatic Vegetation

Translated Name: **Broadleaf Pond-lily - American White Water-lily Aquatic Vegetation**
Common Name: **Water-lily Aquatic Wetland**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	North American Freshwater Aquatic Vegetation (5.B.2.Na)
Macrogroup	Eastern North American Freshwater Aquatic Vegetation (M108)
Group	Eastern North American Freshwater Aquatic Vegetation (G114)
Alliance	*Nymphaea odorata - Nuphar* spp. - *Brasenia schreberi* Aquatic Vegetation Alliance (A4064)

ELEMENT CONCEPT

Global Summary: This rooted aquatic or open marsh community occupies shallow-water depressions, oxbow ponds, backwater sloughs of river floodplains, slow-moving streams, ponds, and small lakes throughout the central and eastern United States. It is dominated by rooted, floating-leaved aquatic species, with both submergent and emergent aquatics also present. *Nuphar advena (= Nuphar lutea ssp. advena)* and *Nymphaea odorata* are dominants, either in combination together, or each singly. Other species present include *Brasenia schreberi*, various *Potamogeton* and *Stuckenia* spp., *Eleocharis robbinsii* and other *Eleocharis* spp., *Polygonum amphibium, Polygonum amphibium var. emersum (= Polygonum coccineum), Sparganium americanum, Lemna* spp., *Spirodela polyrrhiza, Typha latifolia*, and *Saururus cernuus*. Submerged aquatics more common in the southern part of the range include *Cabomba caroliniana, Ceratophyllum demersum*, and *Heteranthera dubia*.

ENVIRONMENTAL DESCRIPTION

Jean Lafitte National Historical Park and Preserve Environment: At Jean Lafitte, this vegetation occurs in natural openings in oligohaline marshes.

Global Environment: This community occupies shallow-water depressions, oxbow ponds, sluggish streams, and backwater sloughs of river floodplains, ponds (natural and artificial), and small lakes. In pools and slow-flowing stretches of river, at Obed River (TN), *Nuphar advena* is rooted in sandy substrate (Schmalzer and DeSelm 1982).

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: This community is dominated by rooted, floating-leaved aquatic species, with both submergent and emergent aquatics also present. *Nuphar advena (= Nuphar lutea ssp. advena)* and *Nymphaea odorata* are dominants, either in combination together, or each singly.

Global Vegetation: This community is dominated by rooted, floating-leaved aquatic species, with both submergent and emergent aquatics also present. *Nuphar advena (= Nuphar lutea ssp. advena)* and *Nymphaea odorata* are dominants, either in combination together, or each singly. Other species present include *Brasenia schreberi*, various *Potamogeton* and *Stuckenia* spp., *Eleocharis robbinsii* and other *Eleocharis* spp., *Polygonum amphibium, Polygonum amphibium var. emersum (= Polygonum coccineum), Sparganium americanum, Lemna* spp., *Spirodela polyrrhiza, Typha latifolia*, and *Saururus cernuus* (Anderson 1982, G. Fleming pers. comm.). Submerged aquatic species more common in the southern part of the range include *Cabomba caroliniana, Ceratophyllum demersum*, and *Heteranthera dubia*. This broadly conceived type may include ponds, or zones of ponds, dominated by *Nymphaea odorata*, with or without *Nuphar advena*.

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Floating aquatic	Aquatic herb	*Nuphar advena*, *Nymphaea odorata*

Global

Stratum	Lifeform	Species
Floating aquatic	Aquatic herb	*Nuphar advena*, *Nymphaea odorata*

CHARACTERISTIC SPECIES

Jean Lafitte National Historical Park and Preserve: *Nuphar advena*, *Nymphaea odorata*

Global: *Nuphar advena*, *Nymphaea odorata*

OTHER NOTEWORTHY SPECIES

Global:

CONSERVATION STATUS RANK

Global Rank & Reasons: G4G5 (15-Oct-2002). The dominant species in stands of this vegetation are widespread across the eastern and central United States and adjacent Canada. This is not a rare or imperiled vegetation type, even though its occurrence is poorly documented. Stands may occur in natural lakes and ponds or in artificial impoundments.

RELATED CONCEPTS

Global Similar Types:

- *Equisetum fluviatile - (Eleocharis palustris)* Marsh (CEGL005258)
- *Nuphar advena* Tidal Marsh (CEGL004472)
- *Nuphar polysepala* Aquatic Vegetation (CEGL002001)

- Semipermanent Impoundment (CEPS006581)

Global Related Concepts:

- *Nuphar advena - Nymphaea odorata* Herbaceous Vegetation (Clancy 1996) =
- Floodplain Pond / Pool (Fleming et al. 2001) >
- Freshwater Marsh (Nelson 1985) >
- Inland Emergent Marsh (Chapman et al. 1989) >
- L5D2aI1a. *Nuphar lutea* (Foti et al. 1994) **?**
- Lake Bed (MNNHP 1993) >
- New England coastal plain pondshore (Rawinski 1984a) **?**
- Open Water/Aquatic Bed Veg., Natural Impoundment Pond (Ambrose 1990a) >
- Open water marsh with floating-leaved plants (NAP pers. comm. 1998) **?**
- Small Depression Pond (Schafale and Weakley 1990) >
- Spatterdock - Water Lily Wetland (Fike 1999) =
- Submerged Aquatic Water Lily Subtype (Faber-Langendoen 2001) =
- Submergent/Floating Vascular Vegetation (Smith 1996a) >

Classification

Status: Standard

Classification Confidence: 2 - Moderate

Global Classification Comments: Can occur in mostly natural ponded wetlands as well as artifactual ones such as borrow pits. On the Conecuh National Forest (Alabama), vegetation of this association occurs in Gum Pond and Open Pond as a mix of *Nymphaea odorata* and *Nuphar advena*.

ELEMENT DISTRIBUTION

Jean Lafitte National Historical Park and Preserve Range: This vegetation could be found across the Baratraria Preserve, in open areas within oligohaline marshes.

Global Range: This rooted aquatic community occupies shallow, quiet waters throughout the central and eastern United States, extending from Maine to Ontario and Minnesota, south to Oklahoma and east to Georgia.

Nations: CA, US

States/Provinces: AL:S1, AR, CT, DE, FL, GA, IA:SU, IL, IN, KY, LA, MA, MD, ME, MI, MN, MO, MS, NC, NH:S4S5, NJ:S4, NY, OH, OK, ON, PA:S4, RI, SC, TN, TX, VA:SU, VT, WI, WV

TNC Ecoregions: 31:C, 32:P, 36:C, 37:C, 39:C, 40:P, 41:C, 42:C, 43:C, 44:C, 45:C, 46:C, 47:C, 48:C, 49:C, 50:C, 51:C, 52:C, 53:C, 55:P, 56:C, 57:C, 58:C, 59:C, 60:C, 61:C, 62:C, 63:C

USFS Ecoregions (1994/95): 212Aa:CCC, 212Ba:CCC, 212Bb:CCC, 212Ca:CCC, 212Cb:CCC, 212Da:CCC, 212Db:CCP, 212Dc:CCC, 212Fa:CCP, 212Fb:CCP, 212Fc:CCP, 212Fd:CCP, 212Ga:CCP, 212Gb:CCP, 212Hb:CPP, 212Ja:CCP, 212Jb:CCP, 212Jc:CCP, 212Je:CCP, 212Jf:CCP, 212Jj:CCP, 212Jl:CCP, 212Jm:CCC, 212Ka:CPP, 221Aa:CCP, 221Ab:CCC, 221Ah:CCC, 221Ai:CCC, 221Al:CCC, 221Am:CCC, 221Bd:CCP, 221Da:CCC, 221Db:CCC, 221Ea:CCC, 221Ed:CC?, 221Ef:CCC, 221Fa:CCC, 221Hc:CCC, 221He:CCC, 222Ch:CCC, 222Db:CCC, 222Gc:C??, 222Ha:CCC, 222Ja:CCC, 222Jb:CCC, 222Ji:CCC, 222Jj:CCC, 222Kf:CCC, 222Kg:CCC, 222Kh:CCC, 222Kj:CCC, 222L:CC, 231Bc:CCC, 231Bd:CCC, 231Ga:CCC, 231Gb:CCC, 231Gc:CCC, 232Bf:CCC, 232C:CC, 232D:CC, 232Eb:CCC, 234Aa:CCC, 234Ac:CCC, 234Ad:CCC, 234Af:CCC, 234Ag:CCC, 234Ai:CCC, 234Al:CCC, 234Am:CCC, 234An:CCC, 251Cf:CCC, 251Dd:CCC, 251Dg:CCC, 251Eb:CCC, M212Af:CCC, M212Bb:CCC, M212Bc:CCC, M212Bd:CCC, M212Cb:CCC, M212Cc:CCC, M212Ea:CCP, M212Eb:CCP, M221Aa:CCC, M221Ab:CCC, M221Ac:CCC, M221Ad:CCC, M221Ba:CCC, M221Bb:CCC, M221Bc:CCC, M221Bd:CCC, M221Be:CCC, M221Bf:CCC, M221Da:CCC, M221Dc:CCC

Federal Lands: DOD (Fort Benning); NPS (Acadia, Appalachian Trail [Lower New England], Appalachian Trail [Northern Appalachians], C&O Canal, Carl Sandburg Home, Cuyahoga Valley, Effigy Mounds, George Washington Parkway, Indiana Dunes, Jean Lafitte, Minute Man, Natchez Trace, Obed River, Ozark Riverways, Saint Croix, Saint-Gaudens, Shiloh); USFS (Angelina, Chequamegon, Chequamegon-Nicolet, Conecuh, Davy Crockett,

Kisatchie, Nicolet, Ocala, Ozark, Sabine, Sam Houston?, Talladega, Talladega (Oakmulgee), Talladega (Talladega)); USFWS (Back Bay, Erie, Great Swamp, Monomoy, Patuxent, Reelfoot)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Plots: JELA_AA_0006.
Jean Lafitte National Historical Park and Preserve Description Author(s): M. Pyne
Global Description Author(s): D. Faber-Langendoen, C.W. Nordman, S.C. Gawler and M. Pyne
References: Ambrose 1990a, Anderson 1982, Breden et al. 2001, Chapman et al. 1989, Chastain et al. 2006, Clancy 1996, Coxe 2009, Edinger et al. 2002, Edinger et al. 2014, Eichelberger 2011a, Evans et al. 2009, FNAI 1990, Faber-Langendoen 2001, Fike 1999, Fleming 2007, Fleming and Coulling 2001, Fleming and Patterson 2011a, Fleming et al. 2001, Foti et al. 1994, Gawler 2002, Gawler and Bowman 2012, Gawler and Cutko 2010, Gawler et al. 2005, Harrison 2004, Harrison 2011, Hoagland 2000, Homoya et al. 1988, Hop et al. 2005, Hop et al. 2009, INAI n.d., LNHP 2009, Lubinski et al. 2003, MNNHP 1993, Metzler and Barrett 2006, Midwestern Ecology Working Group n.d.*, NAP pers. comm. 1998, NatureServe Ecology - Southeastern U.S. unpubl. data, Nelson 1985, Nelson 2010, Nordman et al. 2011, ONHD unpubl. data, Peet et al. unpubl. data, Penfound 1953, Rawinski 1984a, Schafale 2012, Schafale and Weakley 1990, Schmalzer and DeSelm 1982, Smith 1996a, Sperduto and Nichols 2004, Swain and Kearsley 2001, TNHS unpubl. data, Thompson and Jenkins 1992, Thompson and Sorenson 2000, WNHI unpubl. data, White 2003, White and Madany 1978, Zanoni et al. 1979, Zimmerman et al. 2012

M401. North American Temperate Ruderal Aquatic Vegetation

G595. EASTERN NORTH AMERICAN RUDERAL AQUATIC VEGETATION

Group Summary Description: This ruderal aquatic vegetation occurs in freshwater wetlands of lakes, rivers, and ponds, in areas which are permanently or semipermanently flooded. The dominant growth forms are floating, rooting and submersed aquatic vegetation. The most common species include the exotics *Alternanthera philoxeroides, Eichhornia crassipes, Ludwigia peploides, Pistia stratiotes*, and *Salvinia molesta* in warm-temperate regions. In cool-temperate regions, *Myriophyllum spicatum, Hydrocharis morsus-ranae*, and *Trapa natans* are locally common. These exotic species can spread vigorously and form extensive mats that cover the surface or submersed areas of the water.

A4219 *Eichhornia crassipes - Alternanthera philoxeroides* Ruderal Aquatic Vegetation Alliance

Common Water-hyacinth - Alligator-weed Ruderal Aquatic Vegetation Alliance
Ruderal Common Water-hyacinth - Alligator-weed Aquatic Vegetation

ALLIANCE CONCEPT

Summary: This ruderal aquatic vegetation occurs in warm-temperate freshwater wetlands of lakes, rivers, and ponds. The dominant growth form is floating aquatic vegetation. The most common species include the exotics *Alternanthera philoxeroides, Eichhornia crassipes, Ludwigia grandiflora ssp. hexapetala, Ludwigia peploides, Pistia stratiotes*, and *Salvinia molesta*. These exotic species can spread vigorously and form extensive mats that cover the surface or submersed areas of the water.
Diagnostic Characteristics: Floating aquatic vegetation dominated by ruderal species such as *Alternanthera philoxeroides, Eichhornia crassipes, Ludwigia grandiflora ssp. hexapetala, Ludwigia peploides, Pistia stratiotes*, and *Salvinia molesta* or other species of *Salvinia*. Native plant species have little cover, generally less than 10-20%.

ALLIANCE DESCRIPTION

Environment: *Climate:* This aquatic vegetation occurs in warm-temperate and tropical areas, which have a humid climate. *Soil/substrate/hydrology:* This aquatic vegetation occurs in freshwater wetlands that are permanently or

semipermanently flooded. Areas may be impounded, natural lakes, or low-gradient flowing streams and rivers. Often patches of this vegetation will occur in the more slowly flowing sections of rivers and streams.
Vegetation: In the warm-temperate region, *Alternanthera philoxeroides, Eichhornia crassipes, Ludwigia peploides*, and *Pistia stratiotes* are the typical aquatic exotic species. Other species include *Egeria densa, Ludwigia grandiflora ssp. hexapetala, Hydrilla verticillata, Ipomoea aquatica, Myriophyllum aquaticum, Myriophyllum spicatum, Najas minor, Nymphoides peltata, Nymphoides cristata, Panicum repens, Potamogeton crispus, Salvinia auriculata, Salvinia biloba, Salvinia herzogii, Salvinia minima, Salvinia molesta*, and *Salvinia natans*.
Physiognomy and Structure: Floating-leaved herbaceous aquatic plants dominate. They can have sparse to dense cover.
Floristics: In the warm-temperate region, *Alternanthera philoxeroides, Eichhornia crassipes, Ludwigia peploides*, and *Pistia stratiotes* are the typical aquatic exotic species. Other species include *Egeria densa, Ludwigia grandiflora ssp. hexapetala, Hydrilla verticillata, Ipomoea aquatica, Myriophyllum aquaticum, Myriophyllum spicatum, Najas minor, Nymphoides peltata, Nymphoides cristata, Panicum repens, Potamogeton crispus, Salvinia auriculata, Salvinia biloba, Salvinia herzogii, Salvinia minima, Salvinia molesta*, and *Salvinia natans*.
Dynamics: In the warm-temperate region, cold temperatures can cause damage to most of these plants, and probably limits their ranges to the north. After flooding events, these plants can establish in new areas where the floodwater has carried them. Many of these plants can also be spread to new areas on the props of boats. Various control methods have been used to reduce nuisance infestations (Gettys et al. 2009).

ALLIANCE DISTRIBUTION

Range: Occurs in the southeastern United States, and the south-central states of Arkansas, Louisiana, and Texas.
Nations: MX, US
Subnations: AL, AR, FL, GA, KY, LA, MS, NC, OK, SC, TN, TX, VA

ALLIANCE SOURCES

References: Aquatic Nuisance Species Program 2003, Cowardin et al. 1979, Faber-Langendoen et al. 2017b*, Gettys et al. 2009, Kushlan 1990, Morris 1974
Author of Concept: Faber-Langendoen et al. 2017b
Author of Description: C.W. Nordman, in Faber-Langendoen et al. (2016)

[CEGL003858] *Alternanthera philoxeroides* Ruderal Aquatic Vegetation

Translated Name: **Alligator-weed Ruderal Aquatic Vegetation**
Common Name: **Ruderal Alligator-weed Aquatic Vegetation**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	North American Freshwater Aquatic Vegetation (5.B.2.Na)
Macrogroup	North American Temperate Ruderal Aquatic Vegetation (M401)
Group	Eastern North American Ruderal Aquatic Vegetation (G595)
Alliance	*Eichhornia crassipes - Alternanthera philoxeroides* Ruderal Aquatic Vegetation Alliance (A4219)

ELEMENT CONCEPT

Global Summary: This vegetation occurs in the upper reaches of artificial impoundments, as well as in slow-moving water of streams in the Coastal Plain, and is dominated by monospecific stands of *Alternanthera philoxeroides*, an exotic species.

ENVIRONMENTAL DESCRIPTION

Jean Lafitte National Historical Park and Preserve Environment: At Jean Lafitte, examples are found in slow-moving water on the margins of bayous and ditches.
Global Environment: This vegetation occurs in shallow water on the flat to gently sloping margins of the upper reaches of artificial impoundments, as well as in slow-moving water of streams in the Coastal Plain.

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: At Jean Lafitte, examples are dominated by *Alternanthera philoxeroides*, an exotic emergent aquatic herbaceous forb. *Ludwigia peploides* may also be present. It may occur as an exotic mat complex with *Eichhornia crassipes, Oxycaryum cubense*, and *Salvinia molesta*.
Global Vegetation: This vegetation consists of monospecific stands of *Alternanthera philoxeroides*, an exotic emergent aquatic herbaceous forb.

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Floating aquatic	Aquatic herb	*Alternanthera philoxeroides*

Global

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Alternanthera philoxeroides*

CHARACTERISTIC SPECIES

Jean Lafitte National Historical Park and Preserve: *Alternanthera philoxeroides*
Global: *Alternanthera philoxeroides*

OTHER NOTEWORTHY SPECIES

Jean Lafitte National Historical Park and Preserve: Invasive/Exotic Plants: *Alternanthera philoxeroides* (Medium), *Eichhornia crassipes* (High), *Ludwigia peploides* (), *Salvinia molesta* (Medium)
Global: Invasive/Exotic Plants: *Alternanthera philoxeroides* (Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (invasive) (29-Jul-2002). This exotic vegetation is widespread in the southeastern United States, particularly in artificial impoundments.

RELATED CONCEPTS

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak

ELEMENT DISTRIBUTION

Global Range: This exotic vegetation is currently known from the Atlantic and Gulf coastal plains from North Carolina south to Florida and west to at least Mississippi. It may extend further west into Texas and north to Kentucky. It could at least potentially occur throughout the southeastern United States, particularly in artificial impoundments or slow-moving streams.
Nations: US
States/Provinces: AL, GA, KY?, LA, MS, NC, SC, TN

TNC Ecoregions: 31:C, 43:C, 53:C, 56:C, 57:C
USFS Ecoregions (1994/95): 232A:CC, 232B:CC, 232C:CC, 232D:CC, 232Eb:CCC
Federal Lands: DOD (Fort Benning); NPS (Jean Lafitte, Natchez Trace, Shiloh)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Plots: None.
Jean Lafitte National Historical Park and Preserve Description Author(s): M. Pyne
Global Description Author(s): M. Pyne
References: Nordman et al. 2011, Southeastern Ecology Working Group n.d.*

[CEGL007671] *Eichhornia crassipes* Southeast Temperate Ruderal Aquatic Vegetation

Translated Name: **Common Water-hyacinth Southeast Temperate Ruderal Aquatic Vegetation**
Common Name: **Ruderal Water-hyacinth Aquatic Vegetation**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	North American Freshwater Aquatic Vegetation (5.B.2.Na)
Macrogroup	North American Temperate Ruderal Aquatic Vegetation (M401)
Group	Eastern North American Ruderal Aquatic Vegetation (G595)
Alliance	*Eichhornia crassipes - Alternanthera philoxeroides* Ruderal Aquatic Vegetation Alliance (A4219)

ELEMENT CONCEPT

Global Summary: This association includes floating or rooted aquatic vegetation dominated by *Eichhornia crassipes*; stands are often essentially monospecific. Other species may include *Paspalidium geminatum, Lemna* spp., *Azolla caroliniana, Pistia stratiotes, Spirodela polyrrhiza, Salvinia minima (= Salvinia auriculata)*.

ENVIRONMENTAL DESCRIPTION

Jean Lafitte National Historical Park and Preserve Environment: This vegetation is found floating on waters of artificial waterways, particularly those that are heavily traveled.
Global Environment: These essentially monospecific mats of floating or rooted aquatic vegetation dominated by *Eichhornia crassipes* are found in disturbed marshes.

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: Examples are dominated by *Eichhornia crassipes*. These floating mats are dominated primarily by exotics or possible exotics. Other species that may occur as codominants include *Alternanthera philoxeroides, Hydrocotyle* spp., *Ludwigia peploides, Oxycaryum cubense*, and *Salvinia minima*. Other species that may have moderate cover are *Polygonum hydropiperoides* and *Sagittaria lancifolia*. Additional species occurring in low cover include *Amaranthus australis, Azolla caroliniana, Bidens laevis, Hydrocotyle* spp., *Lemna obscura, Ludwigia peploides, Nelumbo lutea, Symphyotrichum subulatum, Vigna luteola*, and the non-native *Alternanthera philoxeroides*.
Global Vegetation: Stands of this association are often essentially monospecific floating or rooted aquatic vegetation dominated by *Eichhornia crassipes*. Other species may include *Paspalidium geminatum, Lemna* spp., *Azolla caroliniana, Pistia stratiotes, Spirodela polyrrhiza*, and *Salvinia minima (= Salvinia auriculata)*.

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Herb (field)	Flowering forb	*Sagittaria lancifolia*
Floating aquatic	Aquatic herb	*Eichhornia crassipes*

Global

Stratum	Lifeform	Species
Floating aquatic	Aquatic herb	*Eichhornia crassipes*

CHARACTERISTIC SPECIES

Jean Lafitte National Historical Park and Preserve: *Eichhornia crassipes*
Global: *Eichhornia crassipes*

OTHER NOTEWORTHY SPECIES

Jean Lafitte National Historical Park and Preserve: Invasive/Exotic Plants: *Alternanthera philoxeroides* (Medium), *Eichhornia crassipes* (High)
Global: Invasive/Exotic Plants: *Eichhornia crassipes* (High), *Salvinia minima* ()

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.

RELATED CONCEPTS

Global Similar Types:

- *Bidens laevis* - *Hydrocotyle ranunculoides* Floating Marsh (CEGL007076)
- *Oxycaryum cubense* - *Salvinia molesta* Exotic Floating Mat (CEGL007075)

Global Related Concepts:

- *Eichhornietum crassipedis* (Borhidi 1991) **?**
- *Eichhornietum crassipedis* (Samek and Moncada 1971) **?**
- Vegetazione dei fiume a lento corso (Ciferri 1936) **>**
- Vegetazione delle Isole galleggianti (Ciferri 1936) **>**
- Water-hyacinth Mat -- 27.6 (Dansereau 1966) **?**

CLASSIFICATION

Status: Standard
Classification Confidence: 3 - Weak
Jean Lafitte National Historical Park and Preserve Classification Comments: Documentation and description of this community at Jean Lafitte are based on two plots dominated by *Eichhornia crassipes*.
Global Classification Comments: Usually floating but becoming rooted with lowered water table. Not certain if correctly placed here. Reported from South Carolina by C. Aulbach-Smith (pers. comm. 2001). The species does overwinter in South Carolina 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.

ELEMENT DISTRIBUTION

Jean Lafitte National Historical Park and Preserve Range: This vegetation is documented in an open-water area located between Lake Salvador and Cataouatche Canal in the northwest part of the Barataria unit.
Global Range: This association is found in the southeastern United States and adjacent Mexico.
Nations: MX, US
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 (1994/95): 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?, Jean Lafitte, Natchez Trace)

ELEMENT SOURCES

Jean Lafitte National Historical Park and Preserve Inventory Notes: Plot data were collected by a number of different observers. Data for this analysis and analytical assistance were provided by NPS.
Jean Lafitte National Historical Park and Preserve Plots: SV1, SV2.
Jean Lafitte National Historical Park and Preserve Description Author(s): J. Teague
Global Description Author(s): A.S. Weakley
References: Areces-Mallea et al. 1999, Aulbach-Smith pers. comm., Borhidi 1991, Ciferri 1936, Dansereau 1966, FNA Editorial Committee 2002a, Hillestad et al. 1975, Nordman et al. 2011, Samek and Moncada 1971, Southeastern Ecology Working Group n.d.*

[CEGL007075] *Oxycaryum cubense - Salvinia molesta* Exotic Floating Mat

Translated Name: **Cuban Bulrush - Kariba-weed Exotic Floating Mat**
Common Name: **Deltaic Plain Kariba-weed Exotic Floating Mat**

USNVC CLASSIFICATION

Classification Level	Observed Classification
Division	North American Freshwater Aquatic Vegetation (5.B.2.Na)
Macrogroup	North American Temperate Ruderal Aquatic Vegetation (M401)
Group	Eastern North American Ruderal Aquatic Vegetation (G595)
Alliance	*Eichhornia crassipes - Alternanthera philoxeroides* Ruderal Aquatic Vegetation Alliance (A4219)

ELEMENT CONCEPT

Global Summary: These are smaller-scale floating mats in canals and ditches in the outer Gulf Coastal Plain dominated by *Oxycaryum cubense* and *Salvinia molesta*. These are found at Jean Lafitte National Park, Louisiana, in an exotic floating marsh complex with *Eichhornia crassipes* Southeast Temperate Ruderal Aquatic Vegetation (CEGL007671) and *Alternanthera philoxeroides* Ruderal Aquatic Vegetation (CEGL003858).

ENVIRONMENTAL DESCRIPTION

Jean Lafitte National Historical Park and Preserve Environment: These smaller-scale floating mats are found in canals, bayous, ditches, and other artificial waterways in the outer Gulf Coastal Plain of the southeastern United States.

Global Environment: These smaller-scale floating mats are found in canals, bayous, ditches, and other artificial waterways in the outer Gulf Coastal Plain of the southeastern United States.

VEGETATION DESCRIPTION

Jean Lafitte National Historical Park and Preserve Vegetation: These smaller-scale floating mats are dominated by *Oxycaryum cubense* and *Salvinia molesta*. They are found at Jean Lafitte National Park, Louisiana, in an exotic floating marsh complex with *Eichhornia crassipes* Ruderal Herbaceous Vegetation (CEGL007671) and *Alternanthera philoxeroides* Herbaceous Vegetation (CEGL003858).

Global Vegetation: Examples are dominated by *Oxycaryum cubense* and *Salvinia molesta*. In addition, the exotics *Eichhornia crassipes* and *Alternanthera philoxeroides* may be present.

MOST ABUNDANT SPECIES

Jean Lafitte National Historical Park and Preserve

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Oxycaryum cubense*
Floating aquatic	Aquatic herb	*Salvinia molesta*

Global

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Oxycaryum cubense*
Floating aquatic	Aquatic herb	*Salvinia molesta*

CHARACTERISTIC SPECIES

Jean Lafitte National Historical Park and Preserve: *Oxycaryum cubense*, *Salvinia molesta*

Global: *Oxycaryum cubense*, *Salvinia molesta*

OTHER NOTEWORTHY SPECIES

Jean Lafitte National Historical Park and Preserve: Invasive/Exotic Plants: *Salvinia molesta* (Medium)

Global: Invasive/Exotic Plants: *Alternanthera philoxeroides* (Medium), *Eichhornia crassipes* (High), *Salvinia molesta* (Medium)

CONSERVATION STATUS RANK

Global Rank & Reasons: GNA (invasive) (4-Jun-2015). This is exotic-dominated vegetation and does not receive a conservation rank.

RELATED CONCEPTS

Global Similar Types:

- *Eichhornia crassipes* Southeast Temperate Ruderal Aquatic Vegetation (CEGL007671)

Classification

Status: Provisional

Classification Confidence: 3 - Weak

ELEMENT DISTRIBUTION

Global Range: This type is known from southern Louisiana in the Deltaic Plain.
Nations: US
States/Provinces: LA
TNC Ecoregions: 31:C
USFS Ecoregions (1994/95): 232Eb:CCC
Federal Lands: NPS (Jean Lafitte)
Element Sources
Jean Lafitte National Historical Park and Preserve Plots: JELA_AA_0022.
Jean Lafitte National Historical Park and Preserve Description Author(s): M. Pyne
Global Description Author(s): M. Pyne
References: Southeastern Ecology Working Group n.d.*

Bibliography for JELA classification (Association and Alliance references)

Alexander, T. R., and A. G. Crook. 1984. Recent vegetational changes in southern Florida. Pages 199-210 in: P. J. Gleason, editor. Environments of South Florida: Present and past II. Miami Geologic Society, Memorandum No. 2. Coral Gables, FL.

Allan, J. D., and A. S. Flecker. 1993. Biodiversity conservation in running waters: Identifying the major factors that threaten destruction of riverine species and ecosystems. BioScience 43:32-43.

Allard, D. J. 1990. Southeastern United States ecological community classification. Interim report, Version 1.2. The Nature Conservancy, Southeast Regional Office, Chapel Hill, NC. 96 pp.

Allen, C. 1993c. Ecological assessment of the forest vegetation of Keiffer Prairie Research Natural Area in the Kisatchie National Forest. Unpublished report. USDA Forest Service, Kisatchie National Forest, and Northeast Louisiana University, Alexandria. 60 pp.

Allen, C. M. 1993b. Ecological assessment of the Cunningham Brake Research Natural Area in the Kisatchie National Forest, Louisiana. Unpublished report. Northeast Louisiana University, Department of Biology. 50 pp.

ALNHP [Alabama Natural Heritage Program]. 2002. Eufaula National Wildlife Refuge: Natural community and rare plant survey. Alabama Natural Heritage Program, The Nature Conservancy, Montgomery.

ALNHP [Alabama Natural Heritage Program]. No date. Unpublished data on file. Alabama Natural Heritage Program, Auburn University.

Ambrose, J. 1990a. Georgia's natural communities--A preliminary list. Unpublished document. Georgia Natural Heritage Inventory. 5 pp.

Anderson, D. M. 1982. Plant communities of Ohio: A preliminary classification and description. Division of Natural Areas and Preserves, Ohio Department of Natural Resources, Columbus, OH. 182 pp.

Aquatic Nuisance Species Program. 2003. Illegal aquatic plants of South Carolina. South Carolina Department of Natural Resources, West Columbia, SC. [http://www.dnr.sc.gov/water/envaff/aquatic/img/illegalaqua.pdf]

Areces-Mallea, A. E., A. S. Weakley, X. Li, R. G. Sayre, J. D. Parrish, C. V. Tipton, and T. Boucher. 1999. A guide to Caribbean vegetation types: Preliminary classification system and descriptions. The Nature Conservancy, Arlington, VA. 166 pp.

Aulbach-Smith, C. Personal communication. Botanical Services of SC.

Battaglia, L. L., J. S. Denslow, and T. G. Hargis. 2007. Does woody species establishment alter herbaceous community composition of freshwater floating marshes? Journal of Coastal Research 23(6):1580-1587.

Battaglia, L. L., J. S. Denslow, J. R. Inczauskis, and S. G. Baer. 2009. Effects of native vegetation on invasion success of Chinese tallow in a floating marsh ecosystem. Journal of Ecology 97:239-246.

Beaven, G. F., and H. J. Oosting. 1939. Pocomoke Swamp: A study of a cypress swamp on the eastern shore of Maryland. Bulletin of the Torrey Botanical Club 66:367-389.

Blair, W. F. 1938. Ecological relationships of the mammals of the Bird Creek region, northeastern Oklahoma. The American Midland Naturalist 20:473-526.

Blair, W. F., and T. H. Hubbell. 1938. The biotic districts of Oklahoma. The American Midland Naturalist 20:425-454.

Borhidi, A. 1991. Phytogeography and vegetation ecology of Cuba. Akademiai Kiado. Budapest, Hungary. 858 pp. plus color plates and map by A. Borhidi and O. Muniz (1970) inside of back cover.

Bowman, P. 1999. Great Cypress Swamp communities. Unpublished report. Delaware Natural Heritage Program, Smyrna, DE. 5 pp.

Breden, T. F., Y. R. Alger, K. S. Walz, and A. G. Windisch. 2001. Classification of vegetation communities of New Jersey: Second iteration. Association for Biodiversity Information and New Jersey Natural Heritage Program, Office of Natural Lands Management, Division of Parks and Forestry, New Jersey Department of Environmental Protection, Trenton.

Burns, R. M., and B. H. Honkala, technical coordinators. 1990b. Silvics of North America. Volume 2: Hardwoods. Agriculture Handbook 654. USDA Forest Service, Washington, DC. 877 pp.

Burton, J. D. 1990. *Maclura pomifera* (Raf.) Schneid., Osage-orange. In: R. M. Burns and B. H. Honkala, technical coordinators. Silvics of North America. Volume 2: Hardwoods. Agriculture Handbook 654. USDA Forest Service, Washington, DC. 877 pp.

Campbell, J. J. N., and J. Grubbs. 1992. Natural plant communities of Hopkins County, Kentucky. Transactions of the Kentucky Academy of Science 53:29-38.

CAP [Central Appalachian Forest Working Group]. 1998. Central Appalachian Working group discussions. The Nature Conservancy, Boston, MA.

Chapman, K. A., D. A. Albert, and G. A. Reese. 1989. Draft descriptions of Michigan's natural community types. Michigan Department of Natural Resources, Lansing, MI. 35 pp.

Chastain, R. A., M.A. Struckhoff, K. W. Grabner, E. D. Stroh, H. He, D. R. Larsen, T. A. Nigh, and J. Drake. 2006. Mapping vegetation communities in Ozark National Scenic Riverways: Final technical report to the National Park Service. Open-File Report 2006-1354. U.S. Geological Survey, Reston, VA. 90 pp. plus appendices.

Ciferri, R. 1936. Studio geobotanico dell'Isola Hispaniola (Antille), R. Universita di Pavia. Atti Ist. Bot. Univ. Pavia 8:3-336.

Clancy, K. 1996. Natural communities of Delaware. Unpublished review draft. Delaware Natural Heritage Program, Division of Fish and Wildlife, Delaware Division of Natural Resources and Environmental Control, Smyrna, DE. 52 pp.

Clewell, A. F. 1971. The vegetation of the Apalachicola National Forest: An ecological perspective. Unpublished document. USDA Forest Service, Tallahassee, FL. 152 pp.

Collins, B. R., and K. H. Anderson. 1994. Plant communities of New Jersey. Rutgers University Press, New Brunswick, NJ. 287 pp.

Conner, W. H., and J. W. Day, Jr. 1976. Productivity and composition of a baldcypress-water tupelo site and a bottomland hardwood site in a Louisiana swamp. American Journal of Botany 63:1354-1364.

Conner, W. H., J. G. Gosselink, and R. T. Parrondo. 1981. Comparison of the vegetation of three Louisiana swamp sites with different flooding regimes. American Journal of Botany 68:320-331.

Conner, W. H., K. W. Krauss, and T. W. Doyle. 2007. Ecology of tidal freshwater forests in coastal deltaic Louisiana and northeastern South Carolina. Pages 223-53 in: W. H. Conner, T. W. Doyle, and K. W. Krauss, editors. Ecology of Tidal Freshwater Forested Wetlands of the Southeastern United States. Springer, The Netherlands.

Coulling, P. P. 2002. A preliminary classification of tidal marsh, shrub swamp, and hardwood swamp vegetation and assorted non-tidal, chiefly non-maritime, herbaceous wetland communities of the Virginia Coastal Plain. October 2002. Virginia Department of Conservation and Recreation, Division of Natural Heritage. Natural Heritage Technical Report 02-18. 30 pp.

Couvillion, B. R., and H. Beck. 2013. Marsh collapse thresholds for coastal Louisiana estimated using elevation and vegetation index data. Journal of Coastal Research, Special Issue 63:58-67.

Couvillion, B. R., J. A. Barras, G. D. Steyer, W. Sleavin, M. Fischer, H. Beck, N. Trahan, B. Griffin, and D. Heckman. 2011. Land area change in coastal Louisiana from 1932 to 2010. U.S. Geological Survey Scientific Investigations Map 3164, scale 1:265,000. 12 pp. pamphlet.

Cowardin, L. M., V. Carter, F. C. Golet, and E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. FWS/OBS-79/31. USDI Fish & Wildlife Service, Office of Biological Services, Washington, DC. 103 pp.

Coxe, R. 2009. Guide to Delaware vegetation communities. Spring 2009 edition. State of Delaware, Division of Fish and Wildlife, Delaware Natural Heritage Program, Smyrna.

Dansereau, P. 1966. Studies on the vegetation of Puerto Rico. Part I. Description and integration of the plant-communities. University of Puerto Rico, Institute of Caribbean Sciences. Special Publication No. 1. Mayagüez, Puerto Rico. 287 pp.

Deegan L. A., H. M. Kennedy, and C. Neill. 1984. Natural factors and human modifications contributing to marsh loss in Louisiana's Mississippi River deltaic plain. Environmental Management 8(6):519-528.

Dennis, J. V. 1988. The great cypress swamps. Louisiana State University Press. 142 pp.

Denslow, J. S., and L. L. Battaglia. 2002. Stand composition and structure across a hydrologic gradient: Jean Lafitte National Park, Louisiana, U.S.A. Wetlands 22(4):738-752.

Diamond, D. D. 1993. Classification of the plant communities of Texas (series level). Unpublished document. Texas Natural Heritage Program, Austin. 25 pp.

Duever, M. J., J. E. Carlson, J. F. Meeder, L. C. Duever, L. H. Gunderson, L. A. Riopelle, T. R. Alexander, R. L. Myers, and D. P. Spangler. 1986. The Big Cypress National Preserve. National Audubon Society Research Report No. 8. National Audubon Society, New York. 444 pp.

Eastern Ecology Working Group of NatureServe. No date. International Ecological Classification Standard: International Vegetation Classification. Terrestrial Vegetation. NatureServe, Boston, MA.

Edinger, G. J., D. J. Evans, S. Gebauer, T. G. Howard, D. M. Hunt, and A. M. Olivero, editors. 2002. Ecological communities of New York state. Second edition. A revised and expanded edition of Carol Reschke's ecological communities of New York state. (Draft for review). New York Natural Heritage Program, New York State Department of Environmental Conservation, Albany, NY.

Edinger, G. J., D. J. Evans, S. Gebauer, T. G. Howard, D. M. Hunt, and A. M. Olivero, editors. 2014. Ecological communities of New York state. Second edition. A revised and expanded edition of Carol Reschke's ecological communities of New York state. New York Natural Heritage Program, New York State Department of Environmental Conservation, Albany, NY.

Ehrenfeld, J. G. 1977. Vegetation of Morristown National Historical Park: Ecological analysis and management alternatives. Final Report. USDI National Park Service Contract No. 1600-7-0004. 166 pp.

Eichelberger, B. 2011a. Pennsylvania Natural Heritage Program. Spatterdock - Water-lily Emergent Wetland Factsheet. [http://www.naturalheritage.state.pa.us/Community.aspx?=15996] (accessed February 13, 2012)

Epstein, Eric. Personal communication. Community Ecologist, Wisconsin Natural Heritage Program, Madison, WI.

Evans, M. 1991. Kentucky ecological communities. Draft report to the Kentucky Nature Preserves Commission. 19 pp.

Evans, M., B. Yahn, and M. Hines. 2009. Natural communities of Kentucky 2009. Kentucky Nature Preserves Commission, Frankfort, KY. 22 pp.

Ewel, J. J. 1986. Invasibility: Lessons from south Florida. In: H. A. Mooney and J. A. Drake, editors. Ecology of biological invasions of North America and Hawaii. Ecology Studies Volume 58. Springer-Verlag, New York.

Ewel, K. C., and H. T. Odum, editors. 1984b. Cypress swamps. University of Florida Press, Gainesville.

Eyre, F. H., editor. 1980. Forest cover types of the United States and Canada. Society of American Foresters, Washington, DC. 148 pp.

Faber-Langendoen, D., and Midwest State Natural Heritage Program Ecologists. 1996. Terrestrial vegetation of the midwest United States. International classification of ecological communities: Terrestrial vegetation of the United States. The Nature Conservancy, Arlington, VA.

Faber-Langendoen, D., editor. 2001. Plant communities of the Midwest: Classification in an ecological context. Association for Biodiversity Information, Arlington, VA. 61 pp. plus appendix (705 pp.).

Faber-Langendoen, D., J. Drake, M. Hall, G. Kittel, S. Menard, C. Nordman, M. Pyne, M. Reid, M. Russo, K. Schulz, L. Sneddon, K. Snow, and J. Teague. 2013-2017b. Screening alliances for induction into the U.S. National Vegetation Classification: Part 1 - Alliance concept review. NatureServe, Arlington, VA.

Faber-Langendoen, D., J. Drake, S. Gawler, M. Hall, C. Josse, G. Kittel, S. Menard, C. Nordman, M. Pyne, M. Reid, L. Sneddon, K. Schulz, J. Teague, M. Russo, K. Snow, and P. Comer, editors. 2010-2017a. Divisions, Macrogroups and Groups for the Revised U.S. National Vegetation Classification. NatureServe, Arlington, VA. plus appendices. [in preparation]

Faircloth, W. 1971. The vascular flora of central south Georgia. University microfilms. Ph.D. dissertation, University of Georgia, Athens.

Fike, J. 1999. Terrestrial and palustrine plant communities of Pennsylvania. Pennsylvania Natural Diversity Inventory. Pennsylvania Department of Conservation and Recreation, Bureau of Forestry, Harrisburg, PA. 86 pp.

Fleetwood, R. J. 1973. Plants of Brazoria/San Bernard National Wildlife Refuges. Brazoria National Wildlife Refuge, U.S. Fish and Wildlife Service, Angleton, TX. 61 pp.

Fleming, G. P. 1998. Virginia natural community framework, version January 30, 1998. Unpublished document. Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond. 6 pp.

Fleming, G. P. 2007. Ecological communities of the Potomac Gorge in Virginia: Composition, floristics, and environmental dynamics. Natural Heritage Technical Report 07-12. Unpublished report submitted to the National Park Service. Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond. 341 pp. plus appendices.

Fleming, G. P., and K. D. Patterson. 2011a. Natural communities of Virginia: Ecological groups and community types. Natural Heritage Technical Report 11-07. Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond. 34 pp.

Fleming, G. P., and P. P. Coulling. 2001. Ecological communities of the George Washington and Jefferson national forests, Virginia. Preliminary classification and description of vegetation types. Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond, VA. 317 pp.

Fleming, G. P., and W. H. Moorhead, III. 1998. Comparative wetlands ecology study of the Great Dismal Swamp, Northwest River, and North Landing River in Virginia. Natural Heritage Technical Report 98-9. Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond. Unpublished report submitted to the U.S. Environmental Protection Agency. 181 pp. plus appendices.

Fleming, G. P., K. Taverna, and P. P. Coulling. 2007b. Vegetation classification for the National Capitol Region parks, eastern region. Regional (VA-MD-DC) analysis prepared for NatureServe and USGS-NPS Vegetation Mapping Program, March 2007. Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond.

Fleming, G. P., P. P. Coulling, D. P. Walton, K. M. McCoy, and M. R. Parrish. 2001. The natural communities of Virginia: Classification of ecological community groups. First approximation. Natural Heritage Technical Report 01-1. Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond, VA. 76 pp.

FNA Editorial Committee [Flora of North America Editorial Committee], editors. 2002a. Flora of North America, north of Mexico. Volume 26. Magnoliophyta: Liliidae: Liliales and Orchidales. Oxford University Press, New York. 723 pp.

FNAI [Florida Natural Areas Inventory]. 1990. Guide to the natural communities of Florida. Florida Natural Areas Inventory and Florida Department of Natural Resources, Tallahassee. 111 pp.

FNAI [Florida Natural Areas Inventory]. 1992a. Natural communities. Unpublished document. The Nature Conservancy, Florida Natural Areas Inventory, Tallahassee. 6 pp.

FNAI [Florida Natural Areas Inventory]. 1992b. Natural community classification. Unpublished document. The Nature Conservancy, Florida Natural Areas Inventory, Tallahassee. 16 pp.

FNAI [Florida Natural Areas Inventory]. 1997. Plants and lichens, vertebrates, invertebrates, and natural communities tracked by Florida Natural Areas Inventory. Florida Natural Areas Inventory, Tallahassee. 71 pp.

FNAI [Florida Natural Areas Inventory]. 2010a. Guide to the natural communities of Florida: 2010 edition. Florida Natural Areas Inventory, Tallahassee, FL.

Foti, T., compiler. 1994b. Natural vegetation classification system of Arkansas, draft five. Unpublished document. Arkansas Natural Heritage Commission, Little Rock. 8 pp.

Foti, T., M. Blaney, X. Li, and K. G. Smith. 1994. A classification system for the natural vegetation of Arkansas. Proceedings of the Arkansas Academy of Science 48:50-53.

Frost, C. C., H. E. LeGrand, Jr., and R. E. Schneider. 1990. Regional inventory for critical natural areas, wetland ecosystems, and endangered species habitats of the Albemarle-Pamlico estuarine region: Phase 1. North Carolina Department of Environment, Health, and Natural Resources, Division of Parks and Recreation, Natural Heritage Program, Raleigh, NC. 454 pp.

Gallyoun, M., G. Meyer, A. Andreu, and W. Slocumb. 1996. Mapping vegetation communities with The Nature Conservancy's vegetation classification system on five small national parks in the southeastern USA. Unpublished report. The Nature Conservancy, Southeast Regional Office, Conservation Science Department, Chapel Hill, NC.

Gawler, S. C. 2002. Natural landscapes of Maine: A guide to vegetated natural communities and ecosystems. Maine Natural Areas Program, Department of Conservation, Augusta, ME.

Gawler, S. C., and A. Cutko. 2010. Natural landscapes of Maine: A classification of vegetated natural communities and ecosystems. Maine Natural Areas Program, Department of Conservation, Augusta.

Gawler, S. C., and P. S. Bowman. 2012. Vegetation classification and mapping at Saint-Gaudens National Historic Site, New Hampshire. Natural Resource Technical Report NPS/NER/NRTR--2012/584.1. National Park Service, Fort Collins, CO.

Gawler, S. C., R. E. Zaremba, and B. Agius. 2005. Vegetation mapping at Minute Man National Historical Park. Draft final report. Technical Report NPS/NER/NRTR--XXXX/XXX. National Park Service. Philadelphia, PA.

Gettys, L. A., W. T. Haller, and M. Bellaud, editors. 2009. Biology and control of aquatic plants: A best management practices handbook. Aquatic Ecosystem Restoration Foundation, Marietta GA. 210 pp. [http://plants.ifas.ufl.edu/misc/pdfs/AERF_handbook.pdf]

Glick, P., J. Clough, A. Polaczyk, B. Couvillion, and B. Nunley. 2013. Potential effects of sea-level rise on coastal wetlands in southeastern Louisiana. Journal of Coastal Research, Special Issue 63:211-233.

Harris, A. G., S. C. McMurray, P. W. C. Uhlig, J. K. Jeglum, R. F. Foster, and G. D. Racey. 1996. Field guide to the wetland ecosystem classification for northwestern Ontario. Ontario Ministry of Natural Resources, Northwest Science and Technology, Thunder Bay, Ontario. Field guide FG-01. 74 pp. plus appendix.

Harrison, J. W. 2011. The natural communities of Maryland: 2011 working list of ecological community groups and community types. Unpublished report. Maryland Department of Natural Resources, Wildlife and Heritage Service, Natural Heritage Program, Annapolis. 33 pp.

Harrison, J. W., compiler. 2004. Classification of vegetation communities of Maryland: First iteration. A subset of the International Classification of Ecological Communities: Terrestrial Vegetation of the United States, NatureServe. Maryland Natural Heritage Program, Maryland Department of Natural Resources, Annapolis. 243 pp.

Heineke, T. E. 1987. The flora and plant communities of the middle Mississippi River Valley. Ph.D. dissertation, Southern Illinois University, Carbondale. 653 pp.

Hillestad, H. O., J. R. Bozeman, A. S. Johnson, C. W. Berisford, and J. I. Richardson. 1975. The ecology of the Cumberland Island National Seashore, Camden County, Georgia. Technical Report Series No. 75-5. Georgia Marine Sciences Center, Skidway Island, GA.

Hilsenbeck, C. E., R. H. Hofstetter, and T. R. Alexander. 1979. Preliminary synopsis of major plant communities in the East Everglades area: Vegetation map supplement. Unpublished document. Metropolitan Dade County Planning Department, Miami, FL.

Hoagland, B. 2000. The vegetation of Oklahoma: A classification for landscape mapping and conservation planning. The Southwestern Naturalist 45(4):385-420.

Hoagland, B. W. 1997. Preliminary plant community classification for Oklahoma. Unpublished draft document, version 35629. University of Oklahoma, Oklahoma Natural Heritage Inventory, Norman. 47 pp.

Hoagland, B. W. 1998a. Classification of Oklahoma vegetation types. Working draft. University of Oklahoma, Oklahoma Natural Heritage Inventory, Norman. 43 pp.

Homoya, M. A., J. Aldrich, J. Bacone, L. Casebere, and T. Post. 1988. Indiana natural community classification. Indiana Natural Heritage Program, Indianapolis, IN. Unpublished manuscript.

Hop, K., S. Lubinski, and S. Menard. 2005. U.S. Geological Survey-National Park Service Vegetation Mapping Program, Effigy Mounds National Monument, Iowa. USDI U.S. Geological Survey, La Crosse, WI. 202 pp.

Hop, K., S. Lubinski, J. Dieck, J. Drake, and S. Menard. 2009. National Park Service Vegetation Inventory Program: Indiana Dunes National Lakeshore, Indiana. USDI U.S. Geological Survey, La Crosse, WI, and NatureServe, St. Paul, MN. 312 pp.

Howard R. J., and I. A. Mendelssohn. 1999. Salinity as a constraint on growth of oligohaline marsh macrophytes. I. Species variation in stress tolerance. American Journal of Botany 86(6):785-794.

Illinois Nature Preserve Commission. 1973. Comprehensive plan for the Illinois nature preserves system, part 2: The natural divisions of Illinois, J. E. Schwegman, principal author. 32 pp.

INAI [Iowa Natural Areas Inventory]. No date. Vegetation classification of Iowa. Iowa Natural Areas Inventory, Iowa Department of Natural Resources, Des Moines.

Johnson, Ann F. Personal communication. Florida Natural Areas Inventory, Tallahassee.

Johnson, F. L., and D. T. Bell. 1976. Tree growth and mortality in the streamside forest. Castanea 41(1):34-40.

Jones, F. B. 1982. Flora of the Texas Coastal Bend. Mission Press, Corpus Christi, TX. 267 pp.

Jones, S. M., D. H. Van Lear, and S. K. Cox. 1981b. Major forest community types of the Savannah River Plant: A field guide. USDE Savannah River Plant, National Environmental Research Park Program. Report No. SRO-NERP-9. 79 pp. plus 24 illustrations.

Kershner, B., D. Mathews, G. Nelson, and R. Spellenberg. 2008. Field guide to trees of North America. National Wildlife Foundation. Sterling Publishing Co, Inc., New York.

Klimas, C. V. 1988b. Forest vegetation of the leveed floodplain of the lower Mississippi River. U.S. Army Corps of Engineers, Waterways Experimental Station, Lower Mississippi River Environmental Program. Report No. 11. Vicksburg, MS. 281 pp.

Krauss, K. W., J. A. Duberstein, T. W. Doyle, W. H. Conner, R. H. Day, L. W. Inabinette, and J. L. Whitbeck. 2009. Site condition, structure, and growth of bald cypress along tidal/non-tidal salinity gradients. Wetlands 29:505-519.

Küchler, A. W. 1964. Potential natural vegetation of the conterminous United States. American Geographic Society Special Publication 36. New York, NY. 116 pp.

Kunze, L. M. 1994. Preliminary classification of native, low elevation, freshwater wetland vegetation in western Washington. Washington State Department of Natural Resources, Natural Heritage Program. 120 pp.

Kushlan, J. A. 1990. Freshwater marshes. Pages 324-363 in: R. L. Myers and J. J. Ewel, editors. Ecosystems of Florida. University of Central Florida Press, Orlando.

Lambertini, C., I. Mendelsshon, M. G. H. Gustafsson, B. Olesen, T. Riis, B. K. Sorrell, and H. Brix. 2012. Tracing the origin of Gulf Coast *Phragmites* (Poaceae): A story of long distance dispersal and hybridization. American Journal of Botany 99:538-551.

Lee, H., W. Bakowsky, J. Riley, J. Bowles, M. Puddister, P. Uhlig, and S. McMurray. 1998. Ecological land classification for southern Ontario: First approximation and its application. Ontario Ministry of Natural Resources, Southcentral Science Section, Science Development and Transfer Branch. SCSS Field Guide FG-02.

LNHP [Louisiana Natural Heritage Program]. 2009. Natural communities of Louisiana. Louisiana Natural Heritage Program, Louisiana Department of Wildlife & Fisheries, Baton Rouge. 46 pp. [http://www.wlf.louisiana.gov/sites/default/files/pdf/page_wildlife/6776-Rare%20Natural%20Communities/LA_NAT_COM.pdf]

Loope, L., M. Duever, A. Herndon, J. Snyder, and D. Jansen. 1994. Hurricane impact on uplands and freshwater swamp forest. BioScience 44:238-246.

Lubinski, S., K. Hop, and S. Gawler. 2003. Vegetation Mapping Program: Acadia National Park, Maine. Report produced by U.S. Department of the Interior, U.S. Geological Survey, Upper Midwest Environmental Sciences Center, and Maine Natural Areas Program in conjunction with M. Story (NPS Vegetation Mapping Coordinator) NPS, Natural Resources Information Division, Inventory and Monitoring Program, and K. Brown (USGS Vegetation Mapping Coordinator), USGS, Center for Biological Informatics and NatureServe. [http://biology.usgs.gov/npsveg/ftp/vegmapping/acad/reports/acadrpt.pdf]

Marks, M., B. Lapin, and J. Randall. 1994. *Phragmites australis (P. communis)*: Threats, management, and monitoring. Natural Areas Journal 14(4):285-294.

Martin, D. L., and L. M. Smith. 1991. A survey and description of the natural plant communities of the Kisatchie National Forest, Winn and Kisatchie districts. Louisiana Department of Wildlife and Fisheries, Baton Rouge, LA. 372 pp.

McAlister, W. H., and M. K. McAlister. 1995. A naturalist's guide: Aransas. University of Texas Press, Austin. 354 pp.

McCormick, J., and H. A. Somes, Jr. 1982. The coastal wetlands of Maryland. Unpublished report to Maryland Department of Natural Resources, Coastal Zone Management Program. Jack McCormick and Associates, Chevy Chase, MD.

McCrain, G. R., and B. H. Church. 1985. An analysis of past and present plant community patterns in Moores Creek National Battlefield along with associated impacts affecting distribution and restoration. Prepared by Resource Management Co., Raleigh, NC, under Purchase Order Number PX-5550-3-0062 for the USDI, National Park Service, Southeast Regional Office, Atlanta, GA.

McKnight, J. S., D. D. Hook, O. G. Langdon, and R. L. Johnson. 1981. Flood tolerance and related characteristics of trees of the bottomland forests of the southern U.S. Pages 29-69 in: J. R. Clark and J. Benforado, editors. Wetlands of bottomland hardwood forests. Elsevier Scientific Publishing Company, New York.

McManamay, R. H., A. Curtis, and M. W. Byrne. 2012. Vegetation mapping at Moores Creek National Battlefield. Natural Resource Data Series NPS/SECN/NRDS--2012/319. National Park Service, Fort Collins, CO. 173 pp.

Metzler, K., and J. Barrett. 2006. The vegetation of Connecticut: A preliminary classification. State Geological and Natural History Survey, Report of Investigations No. 12. Connecticut Natural Diversity Database, Hartford.

Metzler, K., and R. Rosza. 1982. Vegetation of fresh and brackish tidal marshes in Connecticut. Newsletter of the Connecticut Botanical Society 10(1):1-3.

Midwestern Ecology Working Group of NatureServe. No date. International Ecological Classification Standard: International Vegetation Classification. Terrestrial Vegetation. NatureServe, Minneapolis, MN.

Mitsch, W. J., and J. G. Gosselink. 1993. Wetlands. Second edition. Van Nostrand Reinhold Company, New York. 722 pp.

MNNHP [Minnesota Natural Heritage Program]. 1993. Minnesota's native vegetation: A key to natural communities. Version 1.5. Minnesota Department of Natural Resources, Natural Heritage Program, St. Paul, MN. 110 pp.

Morris, T. L. 1974. Water hyacinth *Eichhornia crassipes* (Mart.) Solms: Its ability to invade aquatic ecosystems of Paynes Prairie Preserve. M.S. thesis, University of Florida, Gainesville.

Myers, R. L. 1983. Site susceptibility to invasion by the exotic tree *Melaleuca quinquenervia* in southern Florida. Journal of Applied Ecology 20:645-658.

Myers, R. L. 1984. Ecological compression of *Taxodium distichum var. nutans* by *Melaleuca quinquenervia* in southern Florida. Pages 358-364 in: K. C. Ewel and H. T. Odum, editors. Cypress swamps. University of Florida Press, Gainesville.

NAP [Northern Appalachian-Boreal Forest Working Group]. 1998. Northern Appalachian-Boreal Working group discussions. The Nature Conservancy, Boston, MA.

NatureServe Ecology - Southeastern United States. No date. Unpublished data. NatureServe, Durham, NC.

NatureServe. No date. International Ecological Classification Standard: International Vegetation Classification. Central Databases. NatureServe, Arlington, VA.

Nelson, J. B. 1986. The natural communities of South Carolina: Initial classification and description. South Carolina Wildlife and Marine Resources Department, Division of Wildlife and Freshwater Fisheries, Columbia, SC. 55 pp.

Nelson, P. 2010. The terrestrial natural communities of Missouri. Revised edition. Missouri Natural Areas Committee, Department of Natural Resources and the Department of Conservation, Jefferson City.

Nelson, P. W. 1985. The terrestrial natural communities of Missouri. Missouri Natural Areas Committee, Jefferson City. 197 pp. Revised edition, 1987.

Neubauer, S. C. 2013. Ecosystem responses of a tidal freshwater marsh experiencing saltwater intrusion and altered hydrology. Estuaries and Coasts 36:491-507.

Niering, N. A. 1985. Wetlands. The Audubon Society Nature Guides. Chanticleer Press, Inc. 638 pp.

Nijjer, S., W. E. Rogers, and E. Siemann. 2007. Negative plant-soil feedbacks may limit persistence of an invasive tree due to rapid accumulation of soil pathogens. Proceedings of the Royal Society: Biological Sciences 274(1625): 2621-2627. [http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2275889/]

Nolfo-Clements, L. E. 2006. Vegetative survey of wetland habitats at Jean Lafitte National Historical Park and Preserve in southeastern Louisiana. Southeastern Naturalist 5(3):499-514.

Nordman, C., M. Russo, and L. Smart. 2011. Vegetation types of the Natchez Trace Parkway, based on the U.S. National Vegetation Classification. NatureServe Central Databases (International Ecological Classification Standard: Terrestrial Ecological Classifications). Arlington, VA. Data current as of 11 April 2011. 548 pp.

NPS [National Park Service]. 2005. Jean Lafitte NHP 2005 Habitat Data Map (1:12,000) created by USGS-NWRC. Unpublished data shared by NPS.

Odum, W. E. 1988. Comparative ecology of tidal freshwater and salt marshes. Annual Review of Ecological Systems 19:147-176.

Odum, W. E., and T. J. Smith. 1981. Ecology of tidal, low salinity ecosystems. Pages 36-44 in: R. C. Carey, P. S. Markovits, and J. B. Kirkwood, editors. Proceedings of the workshop on coastal ecosystems of the southeastern United States. FWS/OBS-80/59. USDI Fish & Wildlife Service, Office of Biological Services, Washington, DC.

Odum, W. E., T. J. Smith, III, J. K. Hoover, and C. C. McIvor. 1984. The ecology of tidal freshwater marshes of the United States east coast: A community profile. FWS/OBS-83/17. USDI Fish & Wildlife Service, Office of Biological Services, Washington, DC. 176 pp.

Olmsted, I. C., and L. L. Loope. 1984. Plant communities of Everglades National Park. Pages 167-184 in: P. J. Gleason, editor. Environments of South Florida: Present and past. II. Miami Geologic Society, Coral Gables, FL.

ONHD [Ohio Natural Heritage Database]. No date. Vegetation classification of Ohio and unpublished data. Ohio Natural Heritage Database, Division of Natural Areas and Preserves, Ohio Department of Natural Resources, Columbus.

Oosting, H. J. 1942. An ecological analysis of the plant communities of Piedmont, North Carolina. The American Midland Naturalist 28:1-127.

Peet, R. K., T. R. Wentworth, M. P. Schafale, and A.S. Weakley. No date. Unpublished data of the North Carolina Vegetation Survey. University of North Carolina, Chapel Hill.

Penfound, W. T. 1952. Southern swamps and marshes. Botanical Review 7:413-446.

Penfound, W. T. 1953. Plant communities of Oklahoma lakes. Ecology 34:561-583.

Penfound, W. T. 1967. A physiognomic classification of vegetation in conterminous United States. Botanical Review 33:289-320.

Penfound, W. T., and E. S. Hathaway. 1938. Plant communities in the marshlands of southeastern Louisiana. Ecological Monographs 8(1):1-56.

Perles, S. J., G. S. Podniesinski, E. A. Zimmerman, W. A. Millinor, and L. A. Sneddon. 2006b. Vegetation classification and mapping at Friendship Hill National Historic Site. Technical Report NPS/NER/NRTR--2006/041. National Park Service, Philadelphia, PA. 113 pp.

Pittman, Dr. Albert. Personal communication. South Carolina Heritage Trust, South Carolina Department of Natural Resources, PO Box 167, Columbia, SC 29202. (803)734-3920.

Poirrier, M. A., K. Burt-Utley, J. F. Utley, and E. A. Spalding. 2010. Submersed aquatic vegetation of the Jean Lafitte National Historical Park and Preserve. Southeastern Naturalist 9(3):477-486.

Poirrier, Michael. Personal communication. Professor, University of New Orleans, New Orleans, LA.

Pyne, M. 1994. Tennessee natural communities. Unpublished document. Tennessee Department of Conservation, Ecology Service Division, Nashville. 7 pp.

Rawinski, T. 1984a. Natural community description abstract - southern New England calcareous seepage swamp. Unpublished report. The Nature Conservancy, Boston, MA. 6 pp.

Robertson, P. A., M. D. MacKenzie, and L. F. Elliott. 1984. Gradient analysis and classification of the woody vegetation for four sites in southern Illinois and adjacent Missouri. Vegetatio 58:87-104.

Rolfsmeier, S. B., and G. Steinauer. 2010. Terrestrial ecological systems and natural communities of Nebraska (Version IV - March 9, 2010). Nebraska Natural Heritage Program, Nebraska Game and Parks Commission. Lincoln, NE. 228 pp.

Samek, V., and M. Moncada. 1971. Comunidades vegetales de las lagunas blancas de Pinar del Rio, Cuba. Acad. Cien. Cuba, Ser. Pinar del Rio 27:1-48.

Sasser, C. E., J. G. Gosselink, E. M. Swenson, M. Swarzenski, and N. C. Leibowitz. 1996. Vegetation, substrate and hydrology in floating marshes in the Mississippi River delta plain wetlands, USA. Vegetatio 122:129-142.

Schafale, M. 2000. Fourth approximation guide. Coastal Plain. January 2000 draft. North Carolina Natural Heritage Program, Raleigh.

Schafale, M. 2003b. Fourth approximation guide. Coastal Plain communities. March 2003 draft. North Carolina Natural Heritage Program, Raleigh.

Schafale, M. P. 2012. Classification of the natural communities of North Carolina, 4th Approximation. North Carolina Department of Environment, Health, and Natural Resources, Division of Parks and Recreation, Natural Heritage Program, Raleigh.

Schafale, M. P., and A. S. Weakley. 1990. Classification of the natural communities of North Carolina. Third approximation. North Carolina Department of Environment, Health, and Natural Resources, Division of Parks and Recreation, Natural Heritage Program, Raleigh. 325 pp.

Schmalzer, P. A., and H. R. DeSelm. 1982. Vegetation, endangered and threatened plants, critical plant habitats and vascular flora of the Obed Wild and Scenic River. Unpublished report. USDI National Park Service, Obed Wild and Scenic River. 2 volumes. 369 pp.

Schneider, R. L., N. E. Martin, and R. R. Sharitz. 1989. Impact of dam operations on hydrology and associated floodplain forests of southeastern rivers. Pages 1113-1122 in: R. R. Sharitz and J. W. Gibbons, editors. Freshwater wetlands and wildlife. U.S. Department of Energy. Symposium Series 61. Oak Ridge, TN.

Shirley, L. J., and L. L. Battaglia. 2006. Assessing vegetation change in coastal landscapes of the northern Gulf of Mexico. Wetlands 26(4):1057-1070.

Shirley, L. J., and L. L. Battaglia. 2008. Projecting fine resolution land-cover dynamics for a rapidly changing terrestrial-aquatic transition in Terrebonne Basin, Louisiana, U.S.A. Journal of Coastal Research 24(6):1545-1554.

Smith, L. 1999. Coastal marsh types currently recognized in Louisiana and relationships with existing types in ICEC-TNC. Draft report. Louisiana Department of Wildlife and Fisheries, Natural Heritage Program, Baton Rouge. 20 pp.

Smith, L. M. 1996b. The rare and sensitive natural wetland plant communities of interior Louisiana. Unpublished document. Louisiana Department of Wildlife and Fisheries, Louisiana Natural Heritage Program, Baton Rouge. 38 pp.

Smith, L. M., compiler. 1996a. Natural plant communities in Louisiana currently recognized by the Louisiana Natural Heritage Program. Unpublished document. Louisiana Department of Wildlife and Fisheries, Natural Heritage Program, Baton Rouge. 2 pp.

Smith, Latimore M. Personal communication. Natural Heritage Program Ecologist. Louisiana Department of Wildlife and Fisheries, Natural Heritage Program, Baton Rouge.

Smith, T. L. 1991. Natural ecological communities of Pennsylvania. First revision. Unpublished report. Pennsylvania Science Office of The Nature Conservancy, Middletown, PA. 111 pp.

Sneddon, L., M. Anderson, and K. Metzler. 1996. Community alliances and elements of the Eastern Region. Unpublished report. The Nature Conservancy, Eastern Heritage Task Force, Boston, MA. 235 pp.

Sneddon, L., R. E. Zaremba, E. Largay, G. Podniesinski, S. Perles, and J. Thompson. 2008. Vegetation classification and mapping of Morristown National Historical Park, New Jersey. Technical Report NPS/NER/NRTR--2008/116. National Park Service, Philadelphia, PA. 162 pp. [http://biology.usgs.gov/npsveg/morr/morrrpt.pdf]

Soil Conservation Service. 1990. Soil survey of Natchitoches Parish, Louisiana. Prepared by Martin, P. G., Jr., C. L. Butler, E. Scott, J. E. Lyles, M. Mariano, J. Ragus, P. Mason, and L. Schoelerman. USDA Soil Conservation Service, in cooperation with USDA Forest Service, Louisiana Agricultural Experiment Station, and Louisiana Soil and Water Conservation Commission. 193 pp. plus maps.

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

Sperduto, D. D., and W. F. Nichols. 2004. Natural communities of New Hampshire: A guide and classification. New Hampshire Natural Heritage Bureau, DRED Division of Forests and Lands, Concord. 242 pp.

Stutzenbaker, C. D. 1999. Aquatic and wetland plants of the Western Gulf Coast. Texas Parks and Wildlife Press, Austin. 118 pp.

Swain, P. C., and J. B. Kearsley. 2001. Classification of natural communities of Massachusetts. September 2001 draft. Natural Heritage and Endangered Species Program, Massachusetts Division of Fisheries and Wildlife, Westborough, MA.

Swearingen, J., and K. Saltonstall. 2012. *Phragmites* field guide: Distinguishing native and exotic forms of common reed (*Phragmites australis*) in the United States. TN Plant Materials No. 56. USDA Natural Resources Conservation Service, Boise, ID. 23 pp. [http://www.nrcs.usda.gov/Internet/FSE_PLANTMATERIALS/publications/idpmctn11494.pdf]

Thomas, R. D., and C. M. Allen. 1993. Atlas of the vascular flora of Louisiana. Volume I: Ferns & fern allies, conifers, & monocotyledons. Louisiana Department of Wildlife and Fisheries, Natural Heritage Program and The Nature Conservancy, Louisiana Field Office, Baton Rouge. 218 pp.

Thompson, E. H., and E. R. Sorenson. 2000. Wetland, woodland, wildland: A guide to the natural communities of Vermont. The Nature Conservancy and the Vermont Department of Fish and Wildlife. University Press of New England, Hanover, NH. 456 pp.

Thompson, E., and J. Jenkins. 1992. Summary of field data from Minuteman National Park plant communities study. A report prepared under a contract with the Massachusetts Natural Heritage and Endangered Species Program for the National Park Service. 39 pp.

TNC [The Nature Conservancy]. 1985. Global Vertebrate Characterization Abstract Habitats. Unpublished document. The Nature Conservancy, Arlington, VA.

TNC [The Nature Conservancy]. 1995a. A classification and description of plant communities in southern Illinois. Report by the Southern Illinois Field Office, Ullin, IL, and the Midwest Regional Office, Minneapolis, MN.

TNHS [Texas Natural History Survey]. No date. Unpublished data. Texas Natural History Survey, The Nature Conservancy, San Antonio.

Turner, R. L., J. E. Van Kley, L. S. Smith, and R. E. Evans. 1999. Ecological classification system for the national forests and adjacent areas of the West Gulf Coastal Plain. The Nature Conservancy, Nacogdoches, TX. 95 pp. plus appendices.

UNESCO [United Nations Educational, Scientific and Cultural Organization]. 1973. International classification and mapping of vegetation. Series 6, Ecology and Conservation. United Nations Educational, Scientific, and Cultural Organization. Paris. 93 pp.

USFS [U.S. Forest Service]. 1988. Silvicultural examination and prescription field book. USDA Forest Service, Southern Region. Atlanta, GA. 35 pp.

USGS [U.S. Geological Survey]. 2013b. Trends and causes of historical wetland loss in coastal Louisiana. Fact Sheet 2013-3017. U.S. Geological Survey. March 2013

Van Kley, J. E., and D. N. Hine. 1998. The wetland vegetation of Caddo Lake. Texas Journal of Science 50(4):267-290.

VDNH [Virginia Division of Natural Heritage]. 2003. The natural communities of Virginia: Hierarchical classification of community types. Unpublished document, working list of November 2003. Virginia Department of Conservation and Recreation, Division of Natural Heritage, Ecology Group, Richmond.

Visser, J. M., and C. E. Sasser. 1998. 1997 Coastal vegetation analysis. Unpublished report to Greg Steyer, Louisiana Department of Natural Resources, Baton Rouge, LA. Draft report November 20, 1998. 47 pp.

Visser, J. M., C. E. Sasser, R. H. Chabreck, and R. G. Linscombe. 1998. Marsh vegetation types of the Mississippi River Deltaic Plain. Estuaries 21(48):818-828.

Visser, J. M., C. E. Sasser, R. H. Chabreck, and R. G. Linscombe. 2000. Marsh vegetation types of the Chenier Plain, Louisiana, USA. Estuaries 23(3):318-327.

Wall, D. P., and S. P. Darwin. 1999. Vegetation and elevational gradients within a bottomland hardwood forest of southeastern Louisiana. American Midland Naturalist 142(1):17-30.

Wharton, C. H. 1978. The natural environments of Georgia. Georgia Department of Natural Resources, Atlanta. 227 pp.

Wharton, C. H. 1989. The natural environments of Georgia. Georgia Dep. of Natural Resources. Bulletin 114:75-80.

Wharton, C. H., W. M. Kitchens, E. C. Pendleton, and T. W. Sipe. 1982. The ecology of bottomland hardwood swamps of the Southeast: A community profile. U.S. Fish and Wildlife Service, Office of Biological Services. FWS/OBS-81/37. Washington, DC.

Whipple, S. A., L. H. Wellman, and B. J. Good. 1981. A classification of hardwood and swamp forests on the Savannah River Plant, SC. USDE Savannah River Plant National Environmental Research Park Program. SRO-NERP-6. 36 pp.

Whitbeck, Julie L., Ph.D. Personal communication. Ecologist, National Park Service, New Orleans, LA.

White, D. A., S. P. Darwin, and L. B. Thien. 1983. Plants and plant communities of Jean Lafitte National Historical Park, Louisiana. Tulane Studies in Zoology and Botany 24:101-129.

White, J., and M. Madany. 1978. Classification of natural communities in Illinois. Pages 311-405 in: Natural Areas Inventory technical report: Volume I, survey methods and results. Illinois Natural Areas Inventory, Urbana, IL.

White, J., and R. C. Anderson. 1970. A cypress swamp outlier in southern Illinois. Illinois State Academy of Science 63(1):6-13.

White, Jr., R. D. 2003. Vascular plant inventory and plant community classification for Carl Sandburg Home National Historic Site. NatureServe, Durham, NC. 160 pp.

White, Jr., R. D. 2004. Vascular plant inventory and plant community classification for Cowpens National Battlefield. NatureServe, Durham, NC. 126 pp.

White, R. D., Jr., and T. Govus. 2003. Vascular plant inventory and plant community classification for Ninety Six National Historic Site. Prepared for the National Park Service. NatureServe, Durham, NC. 146 pp.

Wieland, R. G. 1994a. Marine and estuarine habitat types and associated ecological communities of the Mississippi Coast. Museum Technical Report 25. Mississippi Department of Wildlife, Fisheries, and Parks, Museum of Natural Science, Jackson, MS. 270 pp.

Wieland, R. G. 1994b. Mississippi Natural Heritage Program: Ecological communities. Unpublished document. Mississippi Department of Wildlife, Fisheries, and Parks, Museum of Natural Science, Natural Heritage Program, Jackson, MS. 7 pp.

Wieland, R. G. 2000b. Ecological communities of Mississippi: Mississippi Natural Heritage Program. Unpublished document. Mississippi Department of Wildlife, Fisheries, and Parks, Museum of Natural Science, Natural Heritage Program, Jackson, MS. 8 pp.

Williams, S. J. 2013. Sea-level rise implications for coastal regions. Journal of Coastal Research, Special Issue 63:184-196. [http://tidesandcurrents.noaa.gov/sltrends/msltrendstable.htm]

Willis, J. M., and M. W. Hester. 2004. Interactive effects of salinity, flooding, and soil type on *Panicum hemitomon*. Wetlands 24(1):43-50.

WNHI [Wisconsin Natural Heritage Inventory]. No date. Vegetation classification of Wisconsin and unpublished data. Wisconsin Natural Heritage Program, Wisconsin Department of Natural Resources, Madison.

Wolfe, S. H., editor. 1990. An ecological characterization of the Florida Springs Coast: Pithlachascotee to Waccasassa rivers. USDI Fish & Wildlife Service, Biological Report 90(21). Slidell, LA. 323 pp.

Wright, J. P., and J. D. Fridley. 2010. Biogeographic synthesis of secondary succession rates in eastern North America. Journal of Biogeography 37:1584-1596.

Zanoni, T. A., P. G. Risser, and I. H. Butler. 1979. Natural areas for Oklahoma. Oklahoma Natural Heritage Program, Norman. 72 pp.

Zimmerman, E. A., T. Davis, M. A. Furedi, B. Eichelberger, J. McPherson, S. Seymour, G. Podniesinski, N. Dewar, and J. Wagner, editors. 2012. Terrestrial and palustrine plant communities of Pennsylvania. Pennsylvania Natural Heritage Program, Pennsylvania Department of Conservation and Natural Resources, Harrisburg. [http://www.naturalheritage.state.pa.us/Communities.aspx]

Zollner, Douglas. Personal communication. Ecologist, The Nature Conservancy, Arkansas Field Office, Little Rock.

Appendix C: Field Key to Vegetation Types

Field Key to Vegetation Types

This appendix is a field key to vegetation types (plant communities) of Jean Lafitte National Historical Park and Preserve (JELA, also referred to as the "Park"). The field key includes vegetation types represented by vegetation plot data (legacy plots and quick plots) and field observations for the JELA vegetation mapping project of the National Park Service Vegetation Mapping Inventory Program. Vegetation types that are not represented in this vegetation field key possibly could be present in the Park.

Most of the vegetation types in this field key represent a subset of the U.S. National Vegetation Classification (USNVC) that were recognized from the JELA vegetation mapping project. For each USNVC association in the field key, the scientific name for the association in the USNVC is given followed by a Community Element Global code (CEGL00####). Some vegetation types in this field key are "provisional" or "park-special" types that are not officially recognized in the current version of the USNVC (USNVC Database 2017); provisional[9] and park-special[10] vegetation types were included or derived for the JELA vegetation mapping project by NatureServe because these vegetation types captured vegetation concepts across the Park not otherwise described by associations in the USNVC. For the one provisional vegetation type that is in the field key, a scientific name is given followed by a Community Element Proposed code (CEPP00####). For the four park-special vegetation types that are in the field key, either a scientific or common name is given followed by a Community Park Special code (CEPS00####). Two other vegetation types in the USNVC were recognized from the JELA vegetation mapping project; one an alliance-level type and the other a group-level type. For the one alliance type that is in the field key, the scientific name for the alliance type in the USNVC is given followed by an Alliance code (A####). For the one group type that is in the field key, the common name for the group type in the USNVC is given followed by a Group code (G###).

Guidance on Using the Vegetation Field Key

The vegetation field key consists mostly of dichotomous options that ultimately lead to a vegetation type; in one instance, a lead goes to three, rather than two, options. The field key is divided into two subkeys, Key A and Key B. Key A narrows the focus to vegetation types that are dominated or codominated by trees or short trees, regardless of being in upland or wetland environments. Key B narrows the focus to vegetation types that are dominated by herbaceous vegetation, with or without shrubs and regardless of being in upland or wetland environments.

Worth noting, true "upland" landforms and vegetation stands are uncommon to rare at JELA. Most sites receive some degree of saturation or flooding; therefore, the distinctions between upland and

[9]A provisional vegetation type is one that has not been submitted for acceptance into the standard USNVC because the vegetation type has not yet been comprehensively reviewed for inclusion into the International Vegetation Classification and has not been peer reviewed for inclusion in the USNVC.

[10]A park-special vegetation type is one that lacks robust classification data for inclusion to the International Vegetation Classification and USNVC. However, the status of a park-special vegetation type could change if sufficient classification data were to warrant submission for peer review of potential status in the USNVC.

wetland and the distinctions among various types of flooding regimes and their related vegetation types, may be obscure at the Park.

For best results, all assessments of vegetation types in the field should be done on a defined area of homogeneous (uniform) vegetation (i.e., a single vegetation type). For vegetation types that are larger scale (greater than 0.5 hectares [ha]), a half hectare area (5,000-square meters) is used, which is equivalent to a 40-meter radius around a center point, or to a 50- by 100-meter rectangle. For vegetation types that are smaller scale (0.25–0.5 ha), a quarter hectare area (2,500-square meters) is used, which is equivalent to a 28-meter radius around a center point or to a 50- by 50-meter square.

"Appendix B: Descriptions of Vegetation Types" in this report is recommended to complement this vegetation field key to determine a correct assessment of vegetation classification. Appendix B provides descriptions to all vegetation types included in this vegetation field key, regardless of being an association, provisional, park-special, alliance, or group vegetation type.

Key to Keys

1a. Vegetation (upland or wetland) dominated or codominated by trees or small trees..... **Key A**

1b. Vegetation (upland, wetland, or marsh) dominated by herbaceous plants, with or without shrubs (shrub cover varies)..... **Key B**

Key A

1a. Vegetation dominated or codominated (50% or greater) by *Triadica sebifera* (= *Sapium sebiferum*) - typically on spoil banks that are variously flooded. Two associations are listed, a drier one and a wetter one. (**Note:** *Triadica sebifera* is present in many stands but does not dominate most of the forests and woodlands sampled at Jean Lafitte). **2**

1b. Vegetation not dominated by *Triadica sebifera* (= *Sapium sebiferum*) (**Note:** *Triadica sebifera* is present in many stands but does not dominate most of the forests and woodlands sampled at Jean Lafitte). **3**

2a. Upland to infrequently flooded vegetation dominated or codominated by *Triadica sebifera* (= *Sapium sebiferum*). Codominants may include *Celtis laevigata*, *Acer rubrum*, *Quercus nigra*, and/or *Quercus virginiana*. Weedy vines and shrubs such as *Rubus trivialis* and *Baccharis halimifolia* are often present. Should be found around developed uplands, in the vicinity of houses, roads, on spoil banks, shell middens, etc. ..... ***Triadica sebifera* Ruderal Forest CEGL007037**

2b. Wetland vegetation dominated or codominated by *Triadica sebifera* (= *Sapium sebiferum*). Other codominant plants include *Baccharis halimifolia* and *Acer rubrum*. A variety of wetland and marsh herbaceous species are often present at low cover. ..... ***Triadica sebifera* Ruderal Wet Forest CEGL007412**

3a. Forests and woodlands of "uplands." These sites are not frequently flooded, but may appear wet during certain times of the year from poor drainage and occasional flooding events. Apparent site hydrology may be affected by subsidence of the landscape, causing relatively dry land to become wetter. These stands are characterized either by a more-or-less natural suite of *Quercus* species (e.g. *Quercus virginiana* or *Quercus texana*) and other typical trees including *Acer rubrum*, *Celtis laevigata*, *Liquidambar styraciflua*, *Quercus nigra*, and/or *Ulmus americana*; OR successional post-disturbance stands which do not have analogues in typical natural and semi-natural vegetation, these heavily (>50%) dominated by *Quercus nigra* OR by *Celtis laevigata,* or by post-disturbance mixtures of these with other native and/or exotic species. Shrub and ground layers of these successional stands will typically have exotic and/or weedy components present to dominant. **4**

3b. Semi-permanently and seasonally flooded open and closed forests/woodlands, typically with some standing water. These swamp and wooded marsh communities may have low or high cover of shrubs and wetland herbs. **9**

4a. Upland mesic forests or woodlands (these sites may appear wet during certain times of the year from poor drainage and occasional flooding events) characterized by a suite of *Quercus* species (e.g. *Quercus virginiana* or *Quercus texana*, which may be scattered to dominant in the canopy) and other trees including *Acer rubrum*, *Celtis laevigata*, *Liquidambar styraciflua*, *Quercus nigra*, and/or *Ulmus americana*. *Quercus nigra* may codominate with other oaks, but should not be the sole or primary dominant. The understory is characterized by *Sabal minor*, *Ilex decidua*, and *Crataegus viridis*. The canopy may also include *Fraxinus pennsylvanica*, *Carya illinoinensis*, *Gleditsia triacanthos*, and *Acer negundo*. Stands should have some larger/older trees and appear uneven-aged. **5**

4b. Successional post-disturbance stands dominated by *Quercus nigra,* by *Celtis laevigata*, or by mixtures of these with other native and/or exotic species; these stands do not have natural analogues in typical natural and semi-natural vegetation, and lack the characteristic species of 4a above (e.g. *Quercus virginiana* or *Quercus texana*). Stands may appear younger, and more even-aged. These stands may experience temporary or periodic flooding, but are not seasonally or semi-permanently flooded, and these species combinations may occur in upland or wetland environments. **6**

5a. Forest dominated by *Quercus virginiana* with *Quercus nigra* and *Celtis laevigata* in the canopy and *Sabal minor* and *Ilex decidua* in the understory. *Liquidambar styraciflua* and *Ulmus americana* are also often common in the canopy. This type is somewhat variable in moisture status; the drier examples are among the driest forests at JELA. Some other examples are quite wet, with standing water during certain times of the year from poor drainage, subsidence, and occasional flooding events. Some examples occur on shell middens, but not all shell middens are oak-dominated. Stands typically have more or less closed canopies. .....
..***Quercus virginiana - Celtis laevigata - Quercus pagoda / Sabal minor*** **Forest CEGL004648**

5b. Forest or woodland of natural levee backslopes and distributary floodplains characterized by *Quercus texana*, *Liquidambar styraciflua*, *Fraxinus pennsylvanica*, *Carya illinoinensis*, and *Gleditsia triacanthos*. Some stands may contain *Quercus nigra*, *Celtis laevigata*, *Acer rubrum*, and *Ulmus americana*. In addition, *Quercus virginiana* may be present at low cover, but not dominant as in CEGL004648. Understory species include *Sabal minor*, *Crataegus viridis*, *Ilex decidua*, and *Carpinus caroliniana*. This type is conceptually, as well as topographically, between CEGL004648 (above) and *Acer rubrum* - (*Fraxinus profunda*) / *Sabal minor* Forest CEGL007229 (below). Stands presently have open canopies, but were thought to have been more closed in the past. .....
....***Quercus texana -Celtis laevigata - Ulmus (americana, crassifolia) - (Gleditsia triacanthos)*** **Forest CEGL004619**

6a. Ruderal, post-disturbance stands on spoil banks, artificial levees, other anthropogenic landforms, etc. dominated or codominated by either *Quercus nigra* or *Celtis laevigata* (for purposes of this determination and that of the two component types, the canopy and subcanopy can be considered together in terms of the dominant vegetation). **7**

6b. Other ruderal, post-disturbance vegetation complexes, ruderal or early-successional vegetation, and other types that cannot be otherwise easily or reliably classified, composed of mixtures of upland and/or wetland trees. **8**

7a. Ruderal, post-disturbance stands dominated (> 50%) or codominated by *Quercus nigra* with *Celtis laevigata, Liquidambar styraciflua, Ulmus americana,* etc. .....
..... ***Quercus nigra*** **Ruderal Forest CEGL004638**

7b. Ruderal, post-disturbance stands dominated (> 50%) or codominated by *Celtis laevigata.* Stands may contain *Quercus nigra, Quercus virginiana,* etc. .....
..... ***Celtis laevigata*** **Coastal Plain Ruderal Forest CEGL004854**

8a. Narrow bands of vegetation typically adjacent to and directly flanking narrow waterways through historically marshland habitat, found on spoil banks, narrow artificial levees or embankments, composed of a series of narrow, below 0.5 ha (minimum mapping unit or MMU), patches of various forested natural and semi-natural communities, these narrow patches too small to be a mappable or functional example of any of those communities. Component species can include any of the following (more or less from wet to dry: *Taxodium distichum, Nyssa aquatica, Fraxinus profunda, Salix nigra, Acer rubrum, Acer negundo, Liquidambar styraciflua, Quercus nigra, Quercus virginiana,* and others). Vegetation on or adjacent to historically natural waterway levees should NOT be classed as this type. .... **Ruderal Mixed Spoil Bank Forest [Park Special] CEPS009725**

8b. Upland successional deciduous forests of variable composition, composed of native and exotic trees over mixed, weedy and/or native shrubs. At Jean Lafitte, this includes mixtures of *Celtis laevigata, Morus alba, Quercus nigra, Melia azedarach*, and other essentially upland species. These are conventionally configured stands of forested vegetation, not narrow bands of vegetation found adjacent to and directly flanking smaller, linear waterways through historically marshland habitat. Stands found on historically natural waterway levees may be classed as this type..... **Ruderal Mixed Deciduous Forest [Park Special] CEPS004809**

9a. Earlier-successional wetland deciduous forests of variable composition, composed of a mixture of native and exotic wetland trees over mixed, weedy and/or native shrubs. At Jean Lafitte, this includes mixtures of *Acer negundo, Acer rubrum, Liquidambar styraciflua, Salix nigra, Triadica sebifera,* and other wetland trees. These are conventionally configured stands of forested vegetation, not narrow bands of vegetation adjacent to and directly flanking smaller, linear waterways through historically marshland habitat. Some of these stands are dominated by *Acer rubrum,* and could approach CEGL007229 in composition. If these lack *Fraxinus profunda/pennsylvanica,* they should key here. There remains a possibility of confusion with CEGL007229 in any case. ..... **Disturbed Woody Wetland [Park Special] CEPS006671**

9b. Later-successional semi-permanently and seasonally flooded open and closed forests/woodlands with a canopy characterized by *Taxodium distichum*, *Acer rubrum*, *Fraxinus profunda*, *Nyssa aquatica*, *Salix nigra*, (and/or *Morella cerifera*). These swamp and wooded marsh communities may have low or high cover of shrubs and wetland herbs..... **10**

10a. Wetland forest with an open to very open canopy dominated by *Acer rubrum* or codominated by *Acer rubrum* and *Fraxinus profunda*. There is typically a high cover of *Sabal minor* in the understory. Other associated canopy trees that may occur at low to moderate cover include *Taxodium distichum*, *Liquidambar styraciflua*, and *Ulmus americana;* these species will never codominate. Herbaceous cover may be low to high, and includes species such as *Pontederia cordata*, *Polygonum hydropiperoides*, *Saururus cernuus*, and *Hydrocotyle* spp. Standing water and low to high cover of floating aquatics may be present. This vegetation may occur at the transition of higher natural levee backslope forests to swamp or marsh. Some stands dominated by *Acer rubrum* and *Fraxinus pennsylvanica* may actually be Disturbed Woody Wetland [Park Special] CEPS006671, so this should be considered as a "second call."..... ..... ***Acer rubrum - (Fraxinus profunda) / Sabal minor* Forest CEGL007229**

10b. Forest dominated by other wetland trees, including *Taxodium distichum*, *Nyssa aquatica*, and/or *Salix nigra*; canopy not dominated by *Acer rubrum*, though it may be present and have moderate to high cover, OR shrubby woodland with emergent taller shrubs and small trees, including *Acer rubrum, Ilex cassine,* and *Persea palustris* in a shrub-herb marsh dominated by *Morella cerifera*..... **11**

11a. Shrublands characterized by an open to closed shrub layer dominated by *Morella cerifera* (typically >25% cover), with a canopy of taller shrubs and small trees, including *Acer rubrum, Ilex cassine,* and *Persea palustris*. The herbaceous marsh ground layer is dominated by *Panicum hemitomon* in more open areas with *Woodwardia areolata*, both embedded in a dense floating mat of *Sphagnum* sp. ....***Ilex cassine - Morella cerifera / Woodwardia areolata - Sphagnum* sp. Flotant Shrub Swamp CEGL007093**

11b. Forests and woodlands (>5m tall) with a sparse (>10%) to closed canopy of *Taxodium distichum*, *Nyssa aquatica*, and/or *Salix nigra*. The understory may be open or closed and dominated by shrubs, wetland herbs (emergents), or floating aquatics..... **12**

12a. Forests and woodlands dominated by *Salix nigra*, either mixed with *Taxodium distichum* or with emergent individuals of it, OR a more monospecific stand, occasionally with an understory of *Morella cerifera.*..... **13**

12b. Forests and woodlands not dominated by *Salix nigra.* **14**

13a. Forests and woodlands dominated by *Salix nigra* and possibly *Acer rubrum* often with an understory of *Morella cerifera.* .... ***Salix nigra* / *Morella cerifera* Ruderal Wet Forest CEGL007437**

13b. Marsh fringe woodland with a short-statured, open, tree canopy dominated by some combination of *Taxodium distichum* and *Salix nigra*, possibly with *Triadica sebifera*. An open shrub layer of *Morella cerifera* may be present. The herbaceous layer may achieve high cover. Many wetland herbs may be present, including *Thelypteris palustris*, *Polygonum hydropiperoides*, *Hydrocotyle umbellata*, *Eleocharis vivipara*, *Sagittaria lancifolia*, *Alternanthera philoxeroides*, *Kosteletzkya virginica*, *Saccharum giganteum*, *Panicum dichotomiflorum*, *Eupatorium capillifolium*, and *Habenaria repens*, with floating aquatics such as *Salvinia minima*..... ***Taxodium distichum - Salix nigra / Morella cerifera / Thelypteris palustris* Woodland [Park Special] CEPS009724**

14a. Backswamp forests and woodlands with a moderate to closed canopy of *Taxodium distichum* and/or *Nyssa aquatica* with floating aquatics (these varying from high to low cover). Hurricane-damaged examples may exhibit a broken-up or patchy canopy..... **15**

14b. Marsh fringe woodlands with an open to sparse canopy of *Taxodium distichum*, *Nyssa aquatica* and/or *Salix nigra* over a shrub understory or herbaceous marsh that may have high cover. Understory and marsh vegetation may have higher cover than the sparse canopy. These woodlands may or may not have low cover of floating aquatics. **16**

15a. Backswamp vegetation characterized by a moderate to closed canopy of *Taxodium distichum* and *Nyssa aquatica* with a subcanopy of *Acer rubrum*, low cover of wetland herbs (mostly on buttresses), and high cover of floating aquatics and standing water. Stands are semi-permanently to permanently flooded. ..... ***Taxodium distichum - (Nyssa aquatica) / Forestiera acuminata* - Planera aquatica Floodplain Forest CEGL002421**

15b. Backswamp vegetation characterized by a moderate to closed canopy of *Taxodium distichum* (*Nyssa aquatica* is present and dominates or codominates some examples) with an open subcanopy of *Acer rubrum*. Shrubs such as *Morella cerifera*, *Cephalanthus occidentalis*, and *Sabal minor* are common at low to moderate cover. Herbaceous cover is typically high with wetland herbs such as *Pontederia cordata*, *Polygonum hydropiperoides*, and *Saururus cernuus*. Standing water and floating aquatics may be present with low cover. Stands are seasonally flooded. ..... ***Taxodium distichum - Nyssa aquatica - Acer rubrum / Itea virginica* Floodplain Forest CEGL007422**

16a. Marsh fringe vegetation with a short statured open tree canopy (>10%) dominated or codominated by *Taxodium distichum* (*Acer rubrum* and *Nyssa aquatica* may codominate some examples). Open shrub layer but *Morella cerifera* is usually present. *Baccharis halimifolia* and *Cephalanthus occidentalis* may also be present. Moderate to high herbaceous cover characterized by a variety of marsh herbs including *Thelypteris palustris*, *Hydrocotyle* spp., *Polygonum hydropiperoides*, *Sagittaria lancifolia*, *Typha domingensis*, *Kosteletzkya virginica*, *Cyperus* spp., *Alternanthera philoxeroides*, and many others The epiphyte *Tillandsia usneoides* is typically present. Standing water and low to high cover of floating aquatics is often present. This type is subject to tidal influence, at least of wind tides. This is naturally more open than CEGL007422 above, but this distinction may be obscured by hurricane effects..... ***Taxodium distichum / Morella cerifera / Thelypteris palustris* Tidal Woodland CEGL007065**

16b. Marsh fringe vegetation with a short-statured, open tree canopy dominated by some combination of *Taxodium distichum* and *Salix nigra*, possibly with *Triadica sebifera*. An open shrub layer of *Morella cerifera* may be present. The herbaceous layer may achieve high cover. Many wetland herbs may be present, including *Thelypteris palustris*, *Polygonum hydropiperoides*, *Hydrocotyle umbellata*, *Eleocharis vivipara*, *Sagittaria lancifolia*, *Alternanthera philoxeroides*, *Kosteletzkya virginica*, *Saccharum giganteum*, *Panicum dichotomiflorum*, *Eupatorium capillifolium*, and *Habenaria repens*, with floating aquatics such as *Salvinia minima*..... ***Taxodium distichum - Salix nigra / Morella cerifera / Thelypteris palustris* Woodland [Park Special] CEPS009724**

Key B

1a. Marsh or disturbed upland vegetation dominated by shrubs (typically >25% cover). **2**

1b. Marsh or disturbed upland vegetation dominated by upland or emergent wetland herbaceous plants, floating aquatic plants, or submersed aquatic plants. Shrubs may be present, but at <25% cover. If there is uncertainty about the shrub cover, or if shrubs are patchy, there should be a second call for the alternative physiognomy..... **5**

2a. Disturbed upland shrub vegetation dominated by *Baccharis halimifolia* or *Sesbania drummondii*, on anthropogenic or post-disturbance surfaces, including spoil banks, disturbed wet flats, powerline rights-of-way, abandoned fields and other cleared areas. The hydrologic status of these areas may be unclear. **3**

2b. Marsh shrubland dominated by *Morella cerifera,* not by *Baccharis halimifolia* **4**

3a. Shrub vegetation dominated by *Baccharis halimifolia.*..... .....***Baccharis halimifolia*** **Ruderal Shrubland CEGL004657**

3b. Shrub vegetation dominated by *Sesbania drummondii* with *Kosteletzkya virginica* and *Hibiscus moscheutos*, not *Baccharis halimifolia.*..... .....***Sesbania drummondii*** **Ruderal Shrubland CEPP007085**

4a. Marsh vegetation with typically >25% cover of shrubs; this layer dominated by *Morella cerifera*, possibly mixed with low cover of *Baccharis halimifolia*. A sparse (< 10%) canopy of small trees may be present. Herbaceous layer of marsh dominated by a variety of plants, including *Eleocharis* spp., *Hydrocotyle* spp., *Sagittaria lancifolia*, *Spartina patens*, *Cladium mariscoides* ssp. *jamaicense, Symphyotrichum subulatum*, and/or *Typha domingensis*. <u>*Panicum hemitomon*</u> <u>is not the herbaceous dominant</u>. ....***Morella cerifera / Typha domingensis - Sagittaria lancifolia - Eleocharis*** **spp. Tidal Marsh CEGL007241**

4b. Marsh vegetation with a shrub layer dominated by *Morella cerifera* (typically >25% cover). Some small trees may be present (more in some examples than in others). <u>*Panicum hemitomon*</u> <u>is typically the clear herbaceous dominant</u>. Other characteristic species include *Andropogon glomeratus*, *Thelypteris palustris*, and other herbs at low cover...... ..... ***Morella cerifera - Panicum hemitomon*** **Flotant Marsh CEGL007834**

5a. Disturbed upland vegetation dominated by herbaceous plants. Shrubs may be present, but at <25% cover. Typical components at JELA include weedy native species such as *Ambrosia artemisiifolia, Andropogon virginicus, Baccharis halimifolia, Eupatorium capillifolium,* and *Sabal minor.* Some stands placed here may contain "semi-shrubs" such as *Rubus* spp. and *Sambucus nigra* ssp. *canadensis,* as there is no equivalent shrub type in which to place these stands..... .....***Andropogon virginicus - Ambrosia artemisiifolia - Conyza canadensis*** **Eastern Ruderal Grassland A3321**

5b. Marsh vegetation dominated by emergent wetland herbaceous plants, floating aquatic plants, or submersed aquatic plants. Shrubs may be present, but at <25% cover. **6**

6a. Freshwater anthropogenic marsh vegetation complex, present in, and practically confined to, borrow-pit ponds adjacent to constructed levees; dominated by a random, small-scale mosaic of shrubs, emergent forbs, emergent graminoids, floating aquatic plants, and submersed aquatic plants, mixtures of native and exotic species, present in combinations that cannot be correlated with other natural or semi-natural vegetation in the Park. Associations present in patches at a scale below the 0.25 ha MMU (mapped at the NVC group level). There appears to be a "bulrush-cattail (*Schoenoplectus-Typha*) variant" and a "pickerelweed-lizards tail (*Pontederia-Saururus*) variant" but these are interfingered at a small scale and cannot be assessed accurately. *Pontederia*, if co-dominant in an herbaceous marsh, may be characteristic..... .....**Eastern North American Ruderal Aquatic Vegetation G595**

6b. Natural or semi-natural fresh to oligohaline marsh vegetation, present in areas affected by typical ecological processes, vegetation (native and exotic) occurring in more-or-less natural settings, not confined to borrow-pit ponds adjacent to constructed levees; dominated by shrubs, emergent herbaceous plants, floating aquatic plants, or submersed aquatic plants in more-or-less predictable and recurring patterns on the landscape..... **7**

7a. Thick or thinner mats of submersed or floating aquatic vegetation, composed of variable mixtures of branching forbs and slender graminoids, or other low stature plants that may have specialized leaves or other structures (large wide floating leaves, swollen leaf bases, sprawling stems rooting at the nodes, filiform and repeatedly divided leaves, etc.), often found along and in bayous and ditches, as well as in natural openings in emergent marsh. Some are dominated by one or a few species (e.g. *Nymphaea, Nelumbo, Eichhornia, Alternanthera, Oxycaryum*); OR more diverse mats of native forbs (e.g. *Bidens laevis, Hydrocotyle spp., Kosteletzkya virginica, Ludwigia leptocarpa*). Includes herbivory-degraded marshes with remnant patches of species dominant in 7b. below..... **8**

7b. Emergent marsh (some may be "flotant" but not thin floating mats), dominated by one or another of a variety of graminoids (including *Eleocharis, Panicum, Phragmites, Schoenoplectus, Spartina, Typha, Zizaniopsis*) and/or forbs (*Sagittaria lancifolia*), these tending to be dominated by one species over others..... **14**

8a. Submersed aquatic vegetation, most of the plant biomass located below the surface of the water, typically containing *Cabomba caroliniana, Ceratophyllum demersum, Hydrilla verticillata, Myriophyllum heterophyllum, Naias guadelupensis,* and others. This may occur as patches of *Vallisneria americana* and *Naias guadelupensis* in larger waterways such as the Intracoastal Waterway; or as patches of *Cabomba caroliniana, Ceratophyllum demersum*, etc. in smaller waterways..... ..... ***Potamogeton perfoliatus - (Stuckenia pectinata, Zannichellia palustris)* Tidal Marsh CEGL007689**

8b. Floating aquatic vegetation, occurring either as vegetation lining waterways, as well as in natural openings in emergent marsh..... **9**

9a. Vegetation dominated by distinctive large-leaved floating plants (*Nymphaea, Nuphar*) or by distinctive plants with their large peltate (umbrella-like) leaves borne on stalks above the water surface (*Nelumbo*). **10**

9b. Floating mats of variable mixtures of branching forbs (*Bidens laevis, Hydrocotyle spp., Kosteletzkya virginica, Ludwigia leptocarpa,* etc.) and slender graminoids, as well as low-stature or sprawling plants. Examples may be dominated by native plants or by exotic ones... **11**

10a. Vegetation dominated by distinctive large-leaved floating plants (*Nymphaea, Nuphar*)..... ..... ***Nuphar advena - Nymphaea odorata*** **Aquatic Vegetation CEGL002386**

10b. Vegetation dominated by distinctive plants with their large peltate (umbrella-like) leaves borne on stalks above the water surface (*Nelumbo*). .... ***Nelumbo lutea*** **Aquatic Vegetation CEGL004323**

11a. Floating thin mats lining artificial higher traffic waterways, low diversity, dominated by a few primarily exotic species (*Alternanthera, Eichhornia, Oxycaryum, Salvinia*). .. [three choices] **12**

11b. Other floating mats, not dominated by exotic species, found in natural openings on the margins of larger emergent marshes and in areas directly impacted by severe herbivory or subsidence in the main marsh, and generally not lining artificial higher traffic waterways. The exotics *Alternanthera, Eichhornia,* and/or *Oxycaryum* may be present but do not dominate as a whole. **13**

12a. Floating mats lining higher traffic waterways, dominant species is the exotic *Eichhornia crassipes*, with *Alternanthera philoxeroides, Ludwigia peploides*..... .....***Eichhornia crassipes*** **Southeast Temperate Ruderal Aquatic Vegetation CEGL007671**

12b. Floating mats lining higher traffic waterways, dominant species is the exotic *Alternanthera philoxeroides,* possibly with *Ludwigia peploides.* .... ***Alternanthera philoxeroides*** **Ruderal Aquatic Vegetation CEGL003858**

12c. Thin floating mat lining higher traffic waterways, primarily composed of the exotic fern *Salvinia molesta,* with emergent *Oxycaryum cubense* (Cuban sedge). ....***Oxycaryum cubense - Salvinia molesta*** **Exotic Floating Mat CEGL007075**

13a. Herbaceous freshwater marsh which is variable in its species composition at finer scales, with taller plants such as *Kosteletzkya virginica* and *Ludwigia leptocarpa* interspersed with shorter ones such as *Bidens laevis, Polygonum hydropiperoides,* and *Thelypteris palustris.* There may be extensive patches dominated by *Bacopa monnieri, Eleocharis olivacea,* and *Hydrocotyle* spp. which are embedded in a matrix of the thicker-mat marsh, and which form a lower layer of the vegetation. The *Eleocharis* forms a low, dense continuous mat, and the other marsh plants are lying on it or rising above it. This floating mat is found in subsiding marshes on the margins of lakes and large natural bayous, as well as interior "ponds" in marshes, these resulting from, or are enhanced by, herbivory of *Typha, Panicum,* and/or *Sagittaria.* .... ***Bacopa monnieri - Eleocharis*** **spp. Thin Floating Marsh CEGL007081**

13b. Diverse and variable floating mat, primarily composed of native species, found primarily along artificial waterways, containing a mixture of *Bidens laevis*, *Hydrocotyle ranunculoides*, *Hydrocotyle umbellata, Amaranthus australis*, *Azolla caroliniana*, *Lemna obscura*, *Symphyotrichum subulatum*, *Vigna luteola*, *Polygonum hydropiperoides,* and *Sagittaria lancifolia* (which will not be dominant). The non-natives *Eichhornia crassipes* and *Alternanthera philoxeroides* as well as the possibly non-native *Ludwigia peploides* may be present, but are not dominant. ....***Bidens laevis - Hydrocotyle ranunculoides*** **Floating Marsh CEGL007076**

14a. Emergent marsh (some may be "flotant" but not thin floating mats) dominated by forbs (primarily *Sagittaria lancifolia*). **Note:** *Sagittaria lancifolia* may appear to be more dominant than it actually is, versus *Typha* and other graminoids, when viewed laterally, due to its wider leaves, so caution should be exercised in this regard. **15**

14b. Emergent marsh (some may be "flotant" but not thin floating mats) dominated by grass-like plants (grasses, graminoids, and cattails), including *Eleocharis* spp., *Panicum hemitomon, Phragmites australis, Schoenoplectus* spp., *Spartina patens*, *Typha domingensis,* and *Zizaniopsis miliacea.* **16**

15a. Herbaceous marsh strongly dominated by *Sagittaria lancifolia* without significant woody cover (<10%). Other herbaceous species occur, but at much lower cover than *Sagittaria lancifolia*. Associated species include *Eleocharis macrostachya,* (a graminoid which appears as upright green stems arising from long rhizomes; its achene is surmounted by a tubercle which is distinct from the achene body), *Leersia hexandra, Typha domingensis,* and *Alternanthera philoxeroides.* In contrast to CEGL007886 below, *Thelypteris palustris* is absent to rare in this type. .....***Sagittaria lancifolia*** **Mississippi River Deltaic Plain Tidal Marsh CEGL007889**

15b. Herbaceous marsh codominated by *Sagittaria lancifolia* and *Eleocharis rostellata*, sometimes with other species including *Thelypteris palustris*, *Spartina patens*, *Typha domingensis*, *Sacciolepis striata*, and/or *Lythrum lineare*. *Eleocharis rostellata* is a tall (0.2 to 0.6 m.) graminoid which appears in dense swards that lean over and contain lots of dead stems, with an achene surmounted by a tubercle arising from and confluent with the achene body. This type may include stands of *Sagittaria lancifolia* with *Eleocharis rostellata* as well as *Eleocharis rostellata* without *Sagittaria lancifolia*. [these *Eleocharis*-dominated stands are also keyed in the graminoid section of the key below] .... ***Eleocharis rostellata - Sagittaria lancifolia*** **Oligohaline Tidal Marsh CEGL007886**

16a. Emergent marsh strongly dominated by *Typha domingensis*, or dominated by *Typha domingensis* with many other marsh species present and sometimes codominating, at high (>60%) cover. For the purposes of this key, dead biomass of *Typha* should be counted toward its cover value, as this will affect the signature of the patch and can help indicate the prevalence of *Typha* early in the growing season. **17**

16b. Vegetation not dominated or strongly codominated by *Typha domingensis*, instead dominated by other grass-like plants (grasses and sedges), including *Eleocharis* spp., *Panicum hemitomon, Phragmites australis, Schoenoplectus* spp., *Spartina patens*, and *Zizaniopsis miliacea.* **18**

17a. Marsh strongly dominated by *Typha domingensis*. Other marsh species are present but at lower cover. This type uncommon to rare at Jean Lafitte, found at Geocrib Area on shore of Lake Salvador and in the Fleming Plantation; most marshes are more diverse. ..... ***Typha domingensis*** **Tidal Marsh CEGL008456**

17b. Marsh dominated or strongly codominated by *Typha domingensis* (>60%; dead *Typha* biomass should be counted toward this cover value). *Sagittaria lancifolia* may be a codominant, but it should represent a minority of the cover (<40%). Many other marsh species are present and may also contribute cover, including *Eleocharis macrostachya*, *Hydrocotyle* spp., *Polygonum hydropiperoides*, *Panicum hemitomon*, *Sacciolepis striata,* and *Zizaniopsis miliacea.* ..... ***Typha domingensis - Sacciolepis striata - Sagittaria lancifolia*** **Marsh CEGL007235**

18a. Emergent marsh clearly dominated by *Panicum hemitomon* (estimate of dominance cover should include dried culms and leaves from previous growing seasons) with lower cover of many other marsh species. Woody species, if present, have lower cover (typically <10%). Some examples have *Sagittaria lancifolia* and/or *Leersia* spp. (*L. hexandra, L. oryzoides*) present. ..... ***Panicum hemitomon*** **Marsh CEGL004665**

18b. Emergent marsh dominated by other tall or short grass-like plants including *Cladium mariscus, Eleocharis* spp., *Phragmites australis, Schoenoplectus* spp., *Spartina patens*, and *Zizaniopsis miliacea.* **19**

19a. Emergent marsh dominated by tall (> 2 meters by mid-May) more-or-less erect grasses or tall graminoids (e.g. sawgrass/bulrush); (*Cladium mariscus, Phragmites australis, Schoenoplectus californicus,* or *Zizaniopsis miliacea*). Taller graminoids are diagnostic and affect photo signatures more, so they have precedence for determination of the vegetation type. **20**

19b. Emergent marsh dominated by lower-stature (< 2 meters, usually < 1 meter) erect to bent over or sprawling grasses or graminoids (*Eleocharis* spp., *Schoenoplectus* spp., *Spartina patens*) .. **23**

20a. Emergent marsh dominated by tall (> 2 meters by mid-May) more-or-less erect grasses (*Phragmites australis* or *Zizaniopsis miliacea*)..... **21**

20b. Emergent marsh dominated by tall (> 2 meters by mid-May) more-or-less erect graminoids (sawgrass *Cladium mariscus*, or bulrush *Schoenoplectus californicus*)..... **22**

21a. Emergent marsh dominated by tall (> 2 meters by mid-May) *Zizaniopsis miliacea,* often with *Leersia hexandra.* ..... ***Zizaniopsis miliacea*** **Coastal Plain Slough Marsh CEGL004139**

21b. Emergent marsh dominated or codominated by tall (> 2 meters by mid-May) *Phragmites australis* ssp. *berlandieri* (a non-invasive type) with other marsh species present at lower cover. ..... ***Phragmites australis ssp. berlandieri - (Sagittaria platyphylla, Vigna luteola)*** **Tidal Marsh CEGL007891**

22a. Emergent marsh dominated by tall (> 2 meters by mid-May) *Cladium mariscus* ssp. *jamaicense.* ..... ***Cladium mariscus*** **ssp. *jamaicense*** **Tidal Salt Marsh CEGL004178**

22b. Emergent marsh strongly dominated by tall (> 2 meters by mid-May) *Schoenoplectus californicus.* ..... ***Schoenoplectus californicus*** **Tidal Marsh CEGL003985**

23a. Emergent marsh dominated by *Eleocharis rostellata*, sometimes with moderate to high cover of *Spartina patens*, *Sagittaria lancifolia*, *Typha domingensis*, *Sacciolepis striata*, and/or *Lythrum lineare*. *Eleocharis rostellata* is a tall (0.2 to 0.6 m.) graminoid which appears in dense swards that lean over and contain lots of dead stems, and its achene is surmounted by a tubercle arising from and confluent with the achene body. This type may include stands of *Eleocharis rostellata* without *Sagittaria lancifolia,* as well as *Sagittaria lancifolia* with *Eleocharis rostellata.*..... ***Eleocharis rostellata - Sagittaria lancifolia*** **Oligohaline Tidal Marsh CEGL007886**

23b. Emergent herbaceous marsh dominated or codominated by *Schoenoplectus* spp. or *Spartina patens.*..... **24**

24a. Emergent marsh dominated or codominated by *Spartina patens* (dead *Spartina* biomass should be counted toward its cover value), with many other marsh species present at lower cover. ..... ***.Spartina patens - Vigna luteola*** **Mississippi River Deltaic Plain Tidal Marsh CEGL007888**

24b. Emergent marsh dominated or codominated by Schoenoplectus spp. (primarily Schoenoplectus americanus [=Schoenoplectus olneyi] or Schoenoplectus californicus, possibly Schoenoplectus pungens). **25**

25a. Emergent marsh dominated or codominated by *Schoenoplectus americanus* [=*Schoenoplectus olneyi*]..... ..... ***Schoenoplectus americanus - (Spartina patens) - Typha*** **spp. Salt Marsh CEGL008476**

25b. Emergent marsh strongly dominated by *Schoenoplectus californicus.* .... ***Schoenoplectus californicus*** **Tidal Marsh CEGL003985**

Appendix D: List of Plant Species

Explanation of the Species List

Plant taxa were identified and documented from vegetation plots (legacy plots and quick plots) in which the plots were used to characterize vegetation types, including associations in the U.S. National Vegetation Classification, of the Jean Lafitte National Historical Park and Preserve (JELA). Plant taxa also were identified and documented from accuracy assessment sites in which the sites were used to assess the accuracy of the vegetation map layer produced for the JELA vegetation mapping project. Plant taxa from legacy plots were entered into a PLOTS v.3.2 (National Park Service 2011) database and later converted into the PLOTS version 4.0 (National Park Service 2015) database for the project. Plant taxa from quick plots and accuracy assessment sites, along with other site and environmental data, were entered into the PLOTS version 4.0 (National Park Service 2015) database for the project according to National Park Service specifications.

Table D–1 is an export of plant taxa generated from the PLOTS database for this project. This list includes taxa identified to the genus, species, and subspecies level. This list is not intended to be a comprehensive list of every taxon at JELA. The plant taxa list is organized alphabetically by scientific name, and taxa names were standardized to the PLANTS Database (U.S. Department of Agriculture, Natural Resource Conservation Service 2016), which is in accordance with the NatureServe Ecology vascular plant taxonomic standard (Kartesz 1999). Taxa that were observed in the field during data collection but were not recorded in the data are listed in table D–2.

Table D–1. Plant species list from the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

Scientific Name	Common Name	Family
Acer negundo	boxelder	Aceraceae
Acer rubrum	red maple	Aceraceae
Aeschynomene indica	Indian jointvetch	Fabaceae
Ageratina altissima	white snakeroot	Asteraceae
Ageratina aromatica	lesser snakeroot	Asteraceae
Albizia julibrissin	silktree	Fabaceae
Allium canadense	meadow garlic	Liliaceae
Alternanthera philoxeroides	alligatorweed	Amaranthaceae
Amaranthus australis	southern amaranth	Amaranthaceae
Ambrosia artemisiifolia	annual ragweed	Asteraceae
Ambrosia psilostachya	Cuman ragweed	Asteraceae
Ambrosia trifida	great ragweed	Asteraceae
Ammannia coccinea	valley redstem	Lythraceae
Ampelopsis cordata	heartleaf peppervine	Vitaceae
Andropogon glaucopsis	purple bluestem	Poaceae
Andropogon glomeratus	bushy bluestem	Poaceae
Andropogon virginicus	broomsedge bluestem	Poaceae
Apios americana	groundnut	Fabaceae
Arisaema dracontium	green dragon	Araceae
Arisaema triphyllum	Jack in the pulpit	Araceae
Asclepias perennis	aquatic milkweed	Asclepiadaceae
Azolla caroliniana	Carolina mosquitofern	Azollaceae
Baccharis halimifolia	eastern baccharis	Asteraceae
Bacopa monnieri	herb of grace	Scrophulariaceae

Table D–1 (continued). Plant species list from the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

Scientific Name	Common Name	Family
Bacopa rotundifolia	disk waterhyssop	Scrophulariaceae
Berchemia scandens	Alabama supplejack	Rhamnaceae
Bidens laevis	smooth beggartick	Asteraceae
Bignonia capreolata	crossvine	Bignoniaceae
Boehmeria cylindrica	smallspike false nettle	Urticaceae
Bolboschoenus robustus	sturdy bulrush	Cyperaceae
Brunnichia ovata	American buckwheat vine	Polygonaceae
Bulbostylis ciliatifolia var. coarctata	capillary hairsedge	Cyperaceae
Cabomba caroliniana	Carolina fanwort	Cabombaceae
Callicarpa americana	American beautyberry	Verbenaceae
Campsis radicans	trumpet creeper	Bignoniaceae
Campylium radicale	campylium moss	Amblystegiaceae
Carex alata	broadwing sedge	Cyperaceae
Carex cherokeensis	Cherokee sedge	Cyperaceae
Carex comosa	longhair sedge	Cyperaceae
Carex crus-corvi	ravenfoot sedge	Cyperaceae
Carex decomposita	cypressknee sedge	Cyperaceae
Carex frankii	Frank's sedge	Cyperaceae
Carex hyalinolepis	shoreline sedge	Cyperaceae
Carex sp.	sedge	
Carpinus caroliniana	American hornbeam	Betulaceae
Carya illinoinensis	pecan	Juglandaceae
Cayratia japonica	bushkiller	Vitaceae
Celtis laevigata	sugarberry	Ulmaceae
Centella asiatica	spadeleaf	Apiaceae
Centella erecta	erect centella	Apiaceae
Cephalanthus occidentalis	common buttonbush	Rubiaceae
Ceratophyllum demersum	coon's tail	Ceratophyllaceae
Chasmanthium laxum	slender woodoats	Poaceae
Cicuta maculata	spotted water hemlock	Apiaceae
Cinnamomum camphora	camphortree	Lauraceae
Cirsium horridulum	yellow thistle	Asteraceae
Cladium mariscus ssp. jamaicense	Jamaica swamp sawgrass	Cyperaceae
Clematis	leather flower	Ranunculaceae
Clematis crispa	swamp leather flower	Ranunculaceae
Cocculus carolinus	Carolina coralbead	Menispermaceae
Colocasia esculenta	coco yam	Araceae
Commelina diffusa	climbing dayflower	Commelinaceae
Commelina erecta	whitemouth dayflower	Commelinaceae
Commelina virginica	Virginia dayflower	Commelinaceae
Conoclinium coelestinum	blue mistflower	Asteraceae
Cornus drummondii	roughleaf dogwood	Cornaceae
Cornus foemina	stiff dogwood	Cornaceae
Crataegus	hawthorn	Rosaceae
Crataegus viridis	green hawthorn	Rosaceae
Crinum americanum	seven sisters	Liliaceae
Cuscuta indecora	bigseed alfalfa dodder	Cuscutaceae
Cyperus	flatsedge	Cyperaceae
Cyperus haspan	haspan flatsedge	Cyperaceae

Table D–1 (continued). Plant species list from the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

Scientific Name	Common Name	Family
Cyperus odoratus	fragrant flatsedge	Cyperaceae
Cyperus surinamensis	tropical flatsedge	Cyperaceae
Cyperus virens	green flatsedge	Cyperaceae
Decodon verticillatus	swamp loosestrife	Lythraceae
Dichanthelium	rosette grass	Poaceae
Dichanthelium commutatum	variable panicgrass	Poaceae
Dichanthelium scoparium	velvet panicum	Poaceae
Dicliptera brachiata	branched foldwing	Acanthaceae
Diospyros virginiana	common persimmon	Ebenaceae
Echinodorus cordifolius	creeping burhead	Alismataceae
Echinochloa crus-galli	barnyardgrass	Poaceae
Echinochloa walteri	coast cockspur grass	Poaceae
Echinodorus cordifolius	creeping burhead	Alismataceae
Eichhornia crassipes	common water hyacinth	Pontederiaceae
Eleocharis	spikerush	Cyperaceae
Eleocharis albida	white spikerush	Cyperaceae
Eleocharis cellulosa	Gulf Coast spikerush	Cyperaceae
Eleocharis elliptica	elliptic spikerush	Cyperaceae
Eleocharis macrostachya	pale spikerush	Cyperaceae
Eleocharis olivacea	bright green spikerush	Cyperaceae
Eleocharis parvula	dwarf spikerush	Cyperaceae
Eleocharis rostellata	beaked spikerush	Cyperaceae
Eleocharis vivipara	viviparous spikerush	Cyperaceae
Epidendrum magnoliae	green fly orchid	Orchidaceae
Erechtites hieraciifolius	American burnweed	Asteraceae
Eupatorium capillifolium	dogfennel	Asteraceae
Eupatorium semiserratum	smallflower thoroughwort	Asteraceae
Eupatorium serotinum	lateflowering thoroughwort	Asteraceae
Forestiera acuminata	eastern swampprivet	Oleaceae
Fraxinus americana	white ash	Oleaceae
Fraxinus caroliniana	Carolina ash	Oleaceae
Fraxinus pennsylvanica	green ash	Oleaceae
Fraxinus profunda	pumpkin ash	Oleaceae
Fuirena	umbrella-sedge	Cyperaceae
Fuirena pumila	dwarf umbrella-sedge	Cyperaceae
Fuirena squarrosa	hairy umbrella-sedge	Cyperaceae
Galium	bedstraw	Rubiaceae
Galium tinctorium	stiff marsh bedstraw	Rubiaceae
Gleditsia triacanthos	honeylocust	Fabaceae
Habenaria repens	waterspider bog orchid	Orchidaceae
Hibiscus	rosemallow	Malvaceae
Hibiscus grandiflorus	swamp rosemallow	Malvaceae
Hibiscus lasiocarpos	rosemallow	Malvaceae
Hibiscus moscheutos	crimsoneyed rosemallow	Malvaceae
Hydrocotyle	hydrocotyle	Apiaceae
Hydrocotyle ranunculoides	floating marshpennywort	Apiaceae
Hydrocotyle umbellata	manyflower marshpennywort	Apiaceae
Hydrocotyle verticillata	whorled marshpennywort	Apiaceae
Hygrophila lacustris	gulf swampweed	Acanthaceae

Table D–1 (continued). Plant species list from the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

Scientific Name	Common Name	Family
Hymenocallis	spiderlily	Liliaceae
Hypericum hypericoides	St. Andrew's cross	Clusiaceae
Hypericum mutilum	dwarf St. Johnswort	Clusiaceae
Ilex cassine	dahoon	Aquifoliaceae
Ilex decidua	possumhaw	Aquifoliaceae
Ilex vomitoria	yaupon	Aquifoliaceae
Ipomoea sagittata	saltmarsh morning-glory	Convolvulaceae
Iris	iris	Iridaceae
Iris fulva	copper iris	Iridaceae
Iva annua	annual marsh elder	Asteraceae
Juncus	rush	Juncaceae
Juncus effusus	common rush	Juncaceae
Juncus marginatus	grassleaf rush	Juncaceae
Juncus polycephalos	manyhead rush	Juncaceae
Juniperus virginiana	eastern redcedar	Cupressaceae
Justicia lanceolata	looseflower water-willow	Acanthaceae
Justicia ovata	looseflower water-willow	Acanthaceae
Koelreuteria paniculata	goldenrain tree	Sapindaceae
Kosteletzkya virginica	Virginia saltmarsh mallow	Malvaceae
Lantana camara	lantana	Verbenaceae
Leersia	cutgrass	Poaceae
Leersia hexandra	southern cutgrass	Poaceae
Leersia oryzoides	rice cutgrass	Poaceae
Leersia virginica	whitegrass	Poaceae
Lemna	duckweed	Lemnaceae
Lemna obscura	little duckweed	Lemnaceae
Leptochloa fusca	Malabar sprangletop	Poaceae
Ligustrum japonicum	Japanese privet	Oleaceae
Ligustrum lucidum	glossy privet	Oleaceae
Ligustrum sinense	Chinese privet	Oleaceae
Lilaeopsis carolinensis	Carolina grasswort	Apiaceae
Limnobium spongia	American spongeplant	Hydrocharitaceae
Liquidambar styraciflua	sweetgum	Hamamelidaceae
Lobelia cardinalis	cardinalflower	Campanulaceae
Lonicera japonica	Japanese honeysuckle	Caprifoliaceae
Ludwigia decurrens	wingleaf primrose-willow	Onagraceae
Ludwigia grandiflora	large-flower primrose-willow	Onagraceae
Ludwigia leptocarpa	anglestem primrose-willow	Onagraceae
Ludwigia palustris	marsh seedbox	Onagraceae
Ludwigia peploides	floating primrose-willow	Onagraceae
Lycopus rubellus	taperleaf water horehound	Lamiaceae
Lygodium japonicum	Japanese climbing fern	Lygodiaceae
Lythrum alatum	winged lythrum	Lythraceae
Lythrum lineare	wand lythrum	Lythraceae
Magnolia grandiflora	southern magnolia	Magnoliaceae
Malvaviscus arboreus var. drummondii	wax mallow	Malvaceae
Matelea	milkvine	Asclepiadaceae
Matelea gonocarpos	angularfruit milkvine	Asclepiadaceae

Table D–1 (continued). Plant species list from the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

Scientific Name	Common Name	Family
Melia azedarach	Chinaberrytree	Meliaceae
Mikania scandens	climbing hempvine	Asteraceae
Mitreola petiolata	lax hornpod	Loganiaceae
Morella cerifera	wax myrtle	Myricaceae
Morus alba	white mulberry	Moraceae
Myriophyllum heterophyllum	twoleaf watermilfoil	Haloragaceae
Myriophyllum spicatum	Eurasian watermilfoil	Haloragaceae
Najas guadalupensis	southern waternymph	Najadaceae
Nekemias arborea	peppervine	Vitaceae
Nelumbo lutea	American lotus	Nelumbonaceae
Nuphar	pond-lily	Nymphaeaceae
Nuphar lutea ssp. advena	yellow pond-lily	Nymphaeaceae
Nymphaea odorata	American white waterlily	Nymphaeaceae
Nyssa aquatica	water tupelo	Cornaceae
Nyssa biflora	swamp tupelo	Cornaceae
Nyssa sylvatica	blackgum	Cornaceae
Onoclea sensibilis	sensitive fern	Dryopteridaceae
Ophioglossum	adderstongue	Ophioglossaceae
Oplismenus hirtellus ssp. setarius	basketgrass	Poaceae
Osmunda cinnamomea	cinnamon fern	Osmundaceae
Osmunda regalis	royal fern	Osmundaceae
Ostrya virginiana	hophornbeam	Betulaceae
Oxycaryum cubense	Cuban bulrush	Cyperaceae
Packera glabella	butterweed	Asteraceae
Panicum	panicgrass	Poaceae
Panicum anceps	beaked panicgrass	Poaceae
Panicum dichotomiflorum	fall panicgrass	Poaceae
Panicum hemitomon	maidencane	Poaceae
Panicum repens	torpedo grass	Poaceae
Panicum rigidulum	redtop panicgrass	Poaceae
Panicum verrucosum	warty panicgrass	Poaceae
Parthenocissus quinquefolia	Virginia creeper	Vitaceae
Passiflora incarnata	purple passionflower	Passifloraceae
Passiflora lutea	yellow passionflower	Passifloraceae
Penthorum sedoides	ditch stonecrop	Crassulaceae
Persea borbonia	redbay	Lauraceae
Persea palustris	swamp bay	Lauraceae
Phalaris angusta	timothy canarygrass	Poaceae
Phanopyrum gymnocarpon	savannah-panicgrass	Poaceae
Phoradendron leucarpum	oak mistletoe	Viscaceae
Phragmites australis	common reed	Poaceae
Phragmites australis ssp. berlandieri	subtropical common reed	Poaceae
Phyla lanceolata	lanceleaf fogfruit	Verbenaceae
Phyla nodiflora	turkey tangle fogfruit	Verbenaceae
Phytolacca americana	American pokeweed	Phytolaccaceae
Pistia stratiotes	water lettuce	Araceae
Pleopeltis polypodioides	resurrection fern	Polypodiaceae
Pleopeltis polypodioides ssp. michauxiana	resurrection fern	Polypodiaceae
Pluchea	camphorweed	Asteraceae

Table D–1 (continued). Plant species list from the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

Scientific Name	Common Name	Family
Pluchea camphorata	camphor pluchea	Asteraceae
Pluchea foetida	stinking camphorweed	Asteraceae
Polygonum	knotweed	Polygonaceae
Polygonum glabrum	denseflower knotweed	Polygonaceae
Polygonum hydropiperoides	swamp smartweed	Polygonaceae
Polygonum lapathifolium	curlytop knotweed	Polygonaceae
Polygonum punctatum	dotted smartweed	Polygonaceae
Polygonum virginianum	jumpseed	Polygonaceae
Polypogon monspeliensis	annual rabbitsfoot grass	Poaceae
Pontederia cordata	pickerelweed	Pontederiaceae
Populus deltoides	eastern cottonwood	Salicaceae
Proserpinaca pectinata	combleaf mermaidweed	Haloragaceae
Prunus serotina	black cherry	Rosaceae
Ptilimnium capillaceum	herbwilliam	Apiaceae
Quercus laurifolia	laurel oak	Fagaceae
Quercus lyrata	overcup oak	Fagaceae
Quercus nigra	water oak	Fagaceae
Quercus phellos	willow oak	Fagaceae
Quercus texana	Nuttall oak	Fagaceae
Quercus virginiana	live oak	Fagaceae
Rhynchospora	beaksedge	Cyperaceae
Rhynchospora corniculata	shortbristle horned beaksedge	Cyperaceae
Rhynchospora latifolia	sandswamp whitetop	Cyperaceae
Rhynchospora microcephala	smallhead beaksedge	Cyperaceae
Rhynchospora macra	large beaksedge	Cyperaceae
Ricinus communis	castorbean	Euphorbiaceae
Rivina humilis	rougeplant	Phytolaccaceae
Rorippa palustris	bog yellowcress	Brassicaceae
Rubus	blackberry	Rosaceae
Rubus argutus	sawtooth blackberry	Rosaceae
Rubus flagellaris	northern dewberry	Rosaceae
Rubus trivialis	southern dewberry	Rosaceae
Ruellia caerulea	Britton's wild petunia	Acanthaceae
Ruellia nudiflora	violet wild petunia	Acanthaceae
Rumex crispus	curly dock	Polygonaceae
Rumex verticillatus	swamp dock	Polygonaceae
Sabal minor	dwarf palmetto	Arecaceae
Sabatia	rose gentian	Gentianaceae
Saccharum	sugarcane	Poaceae
Saccharum baldwinii	narrow plumegrass	Poaceae
Saccharum giganteum	sugarcane plumegrass	Poaceae
Sacciolepis striata	American cupscale	Poaceae
Sagittaria lancifolia	bulltongue arrowhead	Alismataceae
Sagittaria latifolia	broadleaf arrowhead	Alismataceae
Sagittaria platyphylla	delta arrowhead	Alismataceae
Salix nigra	black willow	Salicaceae
Salvinia	watermoss	Salviniaceae
Salvinia minima	water spangles	Salviniaceae
Salvinia molesta	kariba-weed	Salviniaceae

Table D–1 (continued). Plant species list from the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

Scientific Name	Common Name	Family
Sambucus nigra	black elderberry	Caprifoliaceae
Samolus valerandi	seaside brookweed	Primulaceae
Samolus valerandi ssp. parviflorus	seaside brookweed	Primulaceae
Sanicula	sanicle	Apiaceae
Sanicula canadensis	Canadian blacksnakeroot	Apiaceae
Saururus cernuus	lizard's tail	Saururaceae
Schoenoplectus	bulrush	Cyperaceae
Schoenoplectus americanus	chairmaker's bulrush	Cyperaceae
Schoenoplectus californicus	California bulrush	Cyperaceae
Schoenoplectus tabernaemontani	softstem bulrush	Cyperaceae
Scirpus	bulrush	Cyperaceae
Scirpus cyperinus	woolgrass	Cyperaceae
Scutellaria ovata	heartleaf skullcap	Lamiaceae
Sesbania drummondii	poisonbean	Fabaceae
Sesbania herbacea	bigpod sesbania	Fabaceae
Setaria magna	giant bristlegrass	Poaceae
Setaria parviflora	marsh bristlegrass	Poaceae
Smilax	greenbrier	Smilacaceae
Smilax bona-nox	saw greenbrier	Smilacaceae
Smilax laurifolia	laurel greenbrier	Smilacaceae
Smilax rotundifolia	roundleaf greenbrier	Smilacaceae
Smilax smallii	lanceleaf greenbrier	Smilacaceae
Solanum americanum	American black nightshade	Solanaceae
Solidago	goldenrod	Asteraceae
Solidago altissima	Canada goldenrod	Asteraceae
Solidago sempervirens	seaside goldenrod	Asteraceae
Sonchus asper	spiny sowthistle	Asteraceae
Spartina patens	saltmeadow cordgrass	Poaceae
Sphagnum	sphagnum	Sphagnaceae
Spiranthes odorata	marsh lady's tresses	Orchidaceae
Spirodela	duckmeat	Lemnaceae
Spirodela polyrrhiza	common duckmeat	Lemnaceae
Stuckenia pectinata	sago pondweed	Potamogetonaceae
Styrax americanus	American snowbell	Styracaceae
Symphyotrichum elliottii	Marsh American-Aster	Asteraceae
Symphyotrichum subulatum	eastern annual saltmarsh aster	Asteraceae
Taxodium distichum	bald cypress	Cupressaceae
Thelypteris kunthii	Kunth's maiden fern	Thelypteridaceae
Thelypteris palustris	eastern marsh fern	Thelypteridaceae
Tillandsia usneoides	Spanish moss	Bromeliaceae
Toxicodendron radicans	eastern poison ivy	Anacardiaceae
Tradescantia ohiensis	bluejacket	Commelinaceae
Tradescantia paludosa	confederate spiderwort	Commelinaceae
Triadenum virginicum	Virginia marsh St. Johnswort	Clusiaceae
Triadenum walteri	greater marsh St. Johnswort	Clusiaceae
Triadica sebifera	Chinese tallow	Euphorbiaceae
Typha domingensis	southern cattail	Typhaceae
Typha latifolia	broadleaf cattail	Typhaceae
Ulmus	elm	Ulmaceae

Table D–1 (continued). Plant species list from the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

Scientific Name	Common Name	Family
Ulmus alata	winged elm	Ulmaceae
Urtica chamaedryoides	heartleaf nettle	Urticaceae
Vallisneria americana	American eelgrass	Hydrocharitaceae
Verbena brasiliensis	Brazilian vervain	Verbenaceae
Verbesina virginica	white crownbeard	Asteraceae
Vigna luteola	hairypod cowpea	Fabaceae
Viola	violet	Violaceae
Viola septemloba	southern coastal violet	Violaceae
Viola sororia	common blue violet	Violaceae
Vitis aestivalis	summer grape	Vitaceae
Vitis cinerea	graybark grape	Vitaceae
Vitis rotundifolia	muscadine	Vitaceae
Wolffia	watermeal	Lemnaceae
Woodwardia areolata	netted chainfern	Blechnaceae
Woodwardia areolata	netted chainfern	Blechnaceae
Xyris	yelloweyed grass	Xyridaceae
Xyris laxifolia var. iridifolia	irisleaf yelloweyed grass	Xyridaceae
Youngia japonica	Oriental false hawksbeard	Asteraceae
Zizaniopsis miliacea	giant cutgrass	Poaceae

Table D–2. Plant species list observed but not recorded from the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

Scientific Name	Common Name	Family
Eleocharis ambigens	creeping spikerush	Cyperaceae
Iris giganticaerulea	giant blue iris	Iridaceae
Rhynchospora colorata	starrush whitetop	Cyperaceae
Schoenoplectus pungens	common threesquare	Cyperaceae

Appendix E: Descriptions of Map Classes

Explanation of Map-Class Descriptions

This appendix provides descriptions of the 26 map classes used to map the Jean Lafitte National Historical Park and Preserve (JELA, also referred to as the "Park") for the National Park Service (NPS) Vegetation Mapping Inventory (VMI) Program. Of these 26 map classes, 24 represent natural (including ruderal) vegetation types identified with this vegetation mapping project, most of which are associations in the U.S. National Vegetation Classification (USNVC). Some map classes represent a single vegetation type, whereas other map classes represent more than one vegetation type. Of the remaining 2 of the 26 map classes, one map class represents a cultural vegetation type in the USNVC for developed areas, and the other map class represents nonvegetation open water (non-USNVC).

For those map classes representing natural (including ruderal) vegetation types, "Appendix B: Descriptions of Vegetation Types" and "Appendix C: Field Key to Vegetation Types" should be used to complement the map-class descriptions in this appendix.

Each map-class description provides the formal map-class code and name used for mapping. For those map classes representing a single vegetation type in the USNVC, the type's common name was used (e.g., Southern Cattail Tidal Marsh for a single USNVC association and Eastern North American Ruderal Aquatic Vegetation for a single USNVC group). For those map classes representing a single park-special vegetation type, a common name derived by NatureServe was used, but without the "[Park Special]" postfix (e.g., Ruderal Mixed Spoil Bank Forest). For those map classes representing more than one vegetation type, a comparable name (e.g., the Bald-cypress - Tupelo Flooded Forest map class for the collective USNVC associations of Bald-cypress - Water Tupelo Floodplain Forest and Southern Coastal Plain Bald-cypress - Tupelo Swamp Forest) was derived. For the one map class representing cultural vegetation, a generic name (i.e., Developed Area) was derived. For the one map class representing open-water features, a generic name (i.e., Open Water) was derived.

The vegetation classification name(s) and code(s) that the map class represents are provided at the beginning of each map-class description, with the exception of nonvegetated open water. Each map class is described with a focus on how the class presents in the JELA landscape, noting that this may not reflect how the various vegetation types present across their range. Descriptions are from a mapping, rather than an ecological, perspective, but ecological concepts relevant to the mapping effort were integrated into the map-class description. Full ecological descriptions of each vegetation association are available in "Appendix B: Descriptions of Vegetation Types."

Tree species, such as live oak (*Quercus virginiana*), Chinese tallow (*Triadica sebifera*), black willow (*Salix nigra*), red maple (*Acer rubrum*), and bald cypress (*Taxodium distichum*), are assumed to be of heights >5 meters, unless otherwise specified in the description. Unless otherwise noted, herbaceous types have greater than 10% herbaceous cover and less than 25% total tree and shrub canopy closure, shrubland types have greater than 25% shrub canopy closure and less than 25% tree canopy closure, woodlands have greater than 25% tree canopy closure, and forests typically have greater than 60% tree canopy closure, but can be less than 60% canopy closure depending on the environment.

Adjectives are used in the map-class descriptions to provide a general idea of the commonness of each map class by area and percent cover of the JELA vegetation map layer. These adjectives are detailed in Table E–1.

Table E–1. Adjectives used to describe map-class commonness of occurrence by area and percent cover of the Jean Lafitte National Historical Park and Preserve vegetation map layer.

Adjective	Area (hectares)	Percent Cover
Rare	<27.6	0-0.249
Uncommon	27.61-110.6	0.25-0.99
Common	110.61-552.9	1-4.99
Very Common	>552.91	5-100

Unless otherwise specified, when map-class signatures or presentations are discussed, they are in reference to the color-infrared 3-band aerial imagery used during the mapping process.

When accuracy assessment (AA) results are reported in the map-class description, two views are discussed—mapped too aggressively and mapped too conservatively. The view of "mapped too aggressively" refers to errors in the users' accuracy. The users' accuracy reports on the probability that an AA site in the tested map class does not have a vegetation type that is represented by the map class. This is an error of commission indicating where too much area was mapped as the tested map class. The lower the users' accuracy for a map class, the higher the likelihood that the map class was overmapped (i.e., mapped too aggressively). The view of "mapped too conservatively" refers to errors in the producers' accuracy. The producers' accuracy reports on the probability that an AA site in a different map class has a vegetation type that is represented by the tested map class. This is an error of omission indicating where too little area was mapped as the tested map class. The lower the producers' accuracy for a map class, the higher the likelihood that the map class was undermapped (i.e., mapped too conservatively).

Straight accuracies are listed for users' and producers' in the reporting of AA results. When straight accuracies are below 80%, the 90% confidence intervals are provided to present where the interval range is in regards to the 80% accuracy standard set by the NPS VMI Program. The 90% confidence intervals to users' and producers' accuracies for all map classes that were included in the AA study are provided in "Appendix I: Accuracy Assessment Contingency Table."

Along with text descriptions of the map classes, images form field pictures are provided when possible to visually depict the vegetation types and nonvegetation features that the map classes represent. The images are a partial representation; capturing all variations within a map class would not be possible.

Map-classification codes, names, and their crosswalk (cross-reference) to vegetation types are listed in List E–1. The map class that represent nonvegetation open water, which is not included in the USNVC, is also included in List E–1. The map classification set within the hierarchy of the USNVC is presented in List E–2. In List E–2, map classes that represent more than one vegetation type are noted with an asterisk (*). These map classes may represent vegetation types in more than one

location in the USNVC. The map classification is listed alphabetically by map-class code in Table E–2 at the end of this appendix.

Minimum Mapping Units

The NPS VMI Program's standard minimum mapping unit (MMU) of 0.5 hectare (ha) was applied to mapping forest map classes. For woodland, shrubland, herbaceous vegetation, and nonvegetated open-water map classes, a MMU of 0.25 ha was applied. The smaller MMU was applied because of the consistent small patch presentation of vegetation types represented by the map classes. At the request of JELA staff, all instances of cultural developed areas, irrespective of size, were mapped to allow staff a better accounting of developed areas within the Park.

For polygons that represent vegetation crossing outside the boundary for the JELA vegetation mapping project, mappers allowed the polygons to be mapped less than the MMU if the vegetation that continued over the project boundary was contiguous and covered at least the standard MMU for that map class. In these instances, map classes with a 0.5-ha MMU were mapped down to 0.1 ha, and map classes with a 0.25-ha MMU were mapped down to 0.05 ha. For example, a 0.18-ha polygon of the Ruderal Chinese Tallow Forest (FXCT) map class would be mapped inside the boundary if at least 0.32 ha of contiguous connected FXCT was outside the boundary.

List E–1. List of map-class codes and names, with crosswalk to vegetation types in the U.S. National Vegetation Classification for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.*

Live Oak Forest
FLOF - Natural Levee Live Oak Forest
Quercus virginiana - *Celtis laevigata* - *Quercus pagoda* / *Sabal minor* Swamp Forest (CEGL004648)
Ruderal Water Oak Forest
FXWO - Ruderal Water Oak Forest
Quercus nigra Ruderal Forest (CEGL004638)
Ruderal Bottomland Hardwood Forest
FXBD - Ruderal Bottomland Deciduous Forest
Ruderal Mixed Deciduous Forest [Park Special] (CEPS004809)
Quercus texana - *Celtis laevigata* - *Ulmus* (*americana*, *crassifolia*) - (*Gleditsia triacanthos*) Floodplain Forest (CEGL004619)
FXSB - Coastal Plain Ruderal Sugarberry Forest
Celtis laevigata Coastal Plain Ruderal Forest (CEGL004854)
Ruderal Chinese Tallow Forest
FXCT - Ruderal Chinese Tallow Forest
Triadica sebifera Ruderal Forest (CEGL007037)
Triadica sebifera Ruderal Wet Forest (CEGL007412)
Ruderal Swamp & Spoil Forest
FXMS - Ruderal Mixed Spoil Bank Forest
Ruderal Mixed Spoil Bank Forest [Park Special] (CEPS009725)
FXWD - Disturbed Woody Wetland
Disturbed Woody Wetland [Park Special] (CEPS006671)
FXWL - Ruderal Black Willow / Wax-myrtle Wet Forest
Salix nigra / *Morella cerifera* Ruderal Wet Forest (CEGL007437)
Mixed Hardwood Swamp Forest
FDBS - Delta Backslope Swamp Forest
Acer rubrum - (*Fraxinus profunda*) / *Sabal minor* Swamp Forest (CEGL007229)
Ilex cassine - *Morella cerifera* / *Woodwardia areolata* - *Sphagnum* sp. Flotant Shrub Swamp (CEGL007093)

*The bold headings within the table (above the map classes) are map-class categories to organize the map classes. All USNVC names and codes (below the map classes) are association vegetation types unless otherwise noted.

**Provisional vegetation type.

List E–1 (continued). List of map-class codes and names, with crosswalk to vegetation types in the U.S. National Vegetation Classification for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.*

Bald-cypress Swamp Forest
FBCF - Bald-cypress - Tupelo Flooded Forest
Taxodium distichum - (*Nyssa aquatica*) / *Forestiera acuminata* - *Planera aquatica* Floodplain Forest (CEGL002421)
Taxodium distichum - *Nyssa aquatica* - *Acer rubrum* / *Itea virginica* Floodplain Forest CEGL007422)

Bald-cypress Marsh Woodland
WBCM - Bald-cypress Wooded Marsh
Taxodium distichum / *Morella cerifera* / *Thelypteris palustris* Tidal Woodland (CEGL007065)
Taxodium distichum - *Salix nigra* / *Morella cerifera* / *Thelypteris palustris* Woodland [Park Special] (CEPS009724)

Ruderal Shrub Marsh
SXSM - Ruderal Shrub Marsh
Baccharis halimifolia Ruderal Shrubland (CEGL004657)
Sesbania drummondii Ruderal Shrubland (CEPP007085)**

Wax-myrtle Shrub Marsh
SWMM - Wax-myrtle Shrub Marsh
Morella cerifera / *Typha domingensis* - *Sagittaria lancifolia* - *Eleocharis* spp. Tidal Marsh (CEGL007241)
Morella cerifera - *Panicum hemitomon* Floating Marsh (CEGL007834)

Cordgrass Marsh
HSCM - Mississippi River Deltaic Plain Saltmeadow Cordgrass - Cowpea Intermediate Marsh
Spartina patens - *Vigna luteola* Mississippi River Deltaic Plain Tidal Marsh (CEGL007888)

Arrowhead - Spikerush - Maidencane Marsh
HASM - Arrowhead - Spikerush - Maidencane Marsh
Panicum hemitomon Marsh (CEGL004665)
Eleocharis rostellata - *Sagittaria lancifolia* Oligohaline Tidal Marsh (CEGL007886)
Sagittaria lancifolia Mississippi River Deltaic Plain Tidal Marsh (CEGL007889)

*The bold headings within the table (above the map classes) are map-class categories to organize the map classes. All USNVC names and codes (below the map classes) are association vegetation types unless otherwise noted.

**Provisional vegetation type.

List E–1 (continued). List of map-class codes and names, with crosswalk to vegetation types in the U.S. National Vegetation Classification for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.*

Bulrush - Spikerush Marsh
HBSM - Bulrush - Spikerush Marsh
Bacopa monnieri - *Eleocharis* spp. Thin Floating Marsh (CEGL007081)
Schoenoplectus americanus - (*Spartina patens*) - *Typha* spp. Salt Marsh (CEGL008476)
HCBM - Gulf Coast California Bulrush Freshwater Marsh
Schoenoplectus californicus Tidal Marsh (CEGL003985)
Common Reed - Sawgrass Marsh
HRSM - Common Reed - Sawgrass Marsh
Phragmites australis ssp. *berlandieri* - (*Sagittaria platyphylla*, *Vigna luteola*) Tidal Marsh (CEGL007891)
Cladium mariscus ssp. *jamaicense* Tidal Salt Marsh (CEGL004178)
Cattail Marsh
HCFM - Southern Cattail - American Cupscale - Bull-tongue Arrowhead Louisiana Freshwater Marsh
Typha domingensis - *Sacciolepis striata* - *Sagittaria lancifolia* Marsh (CEGL007235)
HCTM - Southern Cattail Tidal Marsh
Typha domingensis Tidal Marsh (CEGL008456)
Cutgrass Slough Marsh
HCSM - Coastal Plain Giant Cutgrass Slough Marsh
Zizaniopsis miliacea Coastal Plain Slough Marsh (CEGL004139)
Floating & Submerged Aquatic Marsh
HFSM - Floating & Submerged Aquatic Marsh
Bidens laevis - *Hydrocotyle ranunculoides* Floating Marsh (CEGL007076)
Potamogeton perfoliatus - (*Stuckenia pectinata*, *Zannichellia palustris*) Tidal Marsh (CEGL007689)
Nuphar advena - *Nymphaea odorata* Aquatic Vegetation (CEGL002386)
Nelumbo lutea Aquatic Vegetation (CEGL004323)
Alternanthera philoxeroides Ruderal Aquatic Vegetation (CEGL003858)
Oxycaryum cubense - *Salvinia molesta* Exotic Floating Mat (CEGL007075)
Eichhornia crassipes Southeast Temperate Ruderal Aquatic Vegetation (CEGL007671)

*The bold headings within the table (above the map classes) are map-class categories to organize the map classes. All USNVC names and codes (below the map classes) are association vegetation types unless otherwise noted.

**Provisional vegetation type.

List E–1 (continued). List of map-class codes and names, with crosswalk to vegetation types in the U.S. National Vegetation Classification for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.*

Ruderal Herbaceous Vegetation
HXAV - Eastern North American Ruderal Aquatic Vegetation
Eastern North American Ruderal Aquatic Vegetation Group (G595)
HXGR - Eastern Ruderal Grassland
Andropogon virginicus - *Ambrosia artemisiifolia* - *Conyza canadensis* Eastern Ruderal Grassland Alliance (A3321)
Cultural Vegetation
CDVA - Developed Area
Herbaceous & Woody Developed Vegetation Cultural Subclass (CSC03)
Water
NWTR - Open Water
Open Water (non-USNVC)

*The bold headings within the table (above the map classes) are map-class categories to organize the map classes. All USNVC names and codes (below the map classes) are association vegetation types unless otherwise noted.

**Provisional vegetation type.

List E–2. List of map classes set into the hierarchy of the U.S. National Vegetation Classification for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

1. Forest & Woodland Class
  1.B. Temperate & Boreal Forest & Woodland Subclass
    1.B.1. Warm Temperate Forest & Woodland Formation
      1.B.1.Na. Southeastern North American Forest & Woodland Division
        M305. Southeastern North American Ruderal Forest Macrogroup
          G029. Southeastern Exotic Ruderal Forest Group
            A3233 *Albizia julibrissin* - *Broussonetia papyrifera* - *Triadica sebifera* Ruderal Forest Alliance
              CEGL007037 *Triadica sebifera* Ruderal Forest Association
                FXCT - Ruderal Chinese Tallow Forest*
          G031. Southeastern Native Ruderal Forest Group
            A3232 *Liquidambar styraciflua* - *Celtis laevigata* - *Quercus nigra* Ruderal Forest Alliance
              CEGL004854 *Celtis laevigata* Coastal Plain Ruderal Forest Association
                FXSB - Coastal Plain Ruderal Sugarberry Forest
              CEGL004638 *Quercus nigra* Ruderal Forest Association
                FXWO - Ruderal Water Oak Forest
              CEPS004809 Ruderal Mixed Deciduous Forest [Park Special]
                FXBD - Ruderal Bottomland Deciduous Forest*
              CEPS009725 Ruderal Mixed Spoil Bank Forest [Park Special]
                FXMS - Ruderal Mixed Spoil Bank Forest
    1.B.3. Temperate Flooded & Swamp Forest Formation
      1.B.3.Nb. Southeastern North American Flooded & Swamp Forest Division
        M310. Southeastern North American Ruderal Flooded & Swamp Forest Macrogroup
          G762. Southeastern Exotic Ruderal Flooded & Swamp Forest Group
            A3339 *Triadica sebifera* - *Melaleuca quinquenervia* - *Schinus terebinthifolius* Ruderal Flooded & Swamp Forest Alliance
              CEGL007412 *Triadica sebifera* Ruderal Wet Forest Association
                FXCT - Ruderal Chinese Tallow Forest*
          G553. Southeastern Native Ruderal Flooded & Swamp Forest Group
            A3343 *Acer rubrum* - *Liriodendron tulipifera* Ruderal Flooded & Swamp Forest Alliance
              CEGL007437 *Salix nigra* / *Morella cerifera* Ruderal Wet Forest Association
                FXWL - Ruderal Black Willow / Wax-myrtle Wet Forest
              CEPS006671 Disturbed Woody Wetland [Park Special]
                FXWD - Disturbed Woody Wetland

*Map class also represents other USNVC types.

**Provisional vegetation type.

List E–2 (continued). List of map classes set into the hierarchy of the U.S. National Vegetation Classification for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

M031. Southern Coastal Plain Floodplain Forest Macrogroup
G033. Bald-cypress - Tupelo Floodplain Forest Group
A3592 *Acer rubrum - Gleditsia aquatica - Fraxinus profunda* Swamp Forest Alliance
CEGL007229 *Acer rubrum* - (*Fraxinus profunda*) / *Sabal minor* Swamp Forest Association
FDBS - Delta Backslope Swamp Forest*
A3594 *Taxodium distichum - Nyssa aquatica - Nyssa biflora* Floodplain Forest Alliance
CEGL002421 *Taxodium distichum* - (*Nyssa aquatica*) / *Forestiera acuminata - Planera aquatica* Floodplain Forest Association
FBCF - Bald-cypress - Tupelo Flooded Forest*
CEGL007422 *Taxodium distichum - Nyssa aquatica - Acer rubrum* / *Itea virginica* Floodplain Forest Association
FBCF - Bald-cypress - Tupelo Flooded Forest*
A3595 *Taxodium distichum - Nyssa biflora* Tidal Swamp Forest Alliance
CEPS009724 Taxodium distichum - Salix nigra / Morella cerifera / *Thelypteris palustris* Woodland [Park Special]
WBCM - Bald-cypress Wooded Marsh*
CEGL007065 *Taxodium distichum* / *Morella cerifera* / *Thelypteris palustris* Tidal Woodland Association
WBCM - Bald-cypress Wooded Marsh*
G034. Oak - Sweetgum Floodplain Forest Group
A3634 *Quercus virginiana - Quercus pagoda - Quercus nigra* Coastal Plain Swamp Forest Alliance
CEGL004648 *Quercus virginiana - Celtis laevigata - Quercus pagoda* / *Sabal minor* Swamp Forest Association
FLOF - Natural Levee Live Oak Forest
G759. Southern Ash - Elm - Willow Floodplain Forest Group
A3709 *Ulmus americana - Ulmus crassifolia - Celtis laevigata* West Gulf Coastal Plain Floodplain Forest Alliance
CEGL004619 *Quercus texana - Celtis laevigata - Ulmus* (*americana*, *crassifolia*) - (Gleditsia triacanthos) Floodplain Forest Association
FXBD - Ruderal Bottomland Deciduous Forest*

*Map class also represents other USNVC types.

**Provisional vegetation type.

List E–2 (continued). List of map classes set into the hierarchy of the U.S. National Vegetation Classification for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

2. Shrub & Herb Vegetation Class
2.B. Temperate & Boreal Grassland & Shrubland Subclass
2.B.2. Temperate Grassland & Shrubland Formation
2.B.2.Ne. Southeastern North American Grassland & Shrubland Division
M307. Southeastern Ruderal Grassland & Shrubland Macrogroup
G583. Southeastern Ruderal Grassland & Shrubland Group
A3321 *Andropogon virginicus* - *Ambrosia artemisiifolia* - *Conyza canadensis* Eastern Ruderal Grassland Alliance
HXGR - Eastern Ruderal Grassland
A3322 Rubus spp. - *Prunus* spp. - *Cornus drummondii* Eastern Ruderal Shrubland Alliance
CEGL004657 *Baccharis halimifolia* Ruderal Shrubland Association
SXSM - Ruderal Shrub Marsh*
CEPP007085 *Sesbania drummondii* Ruderal Shrubland**
SXSM - Ruderal Shrub Marsh*
2.C. Shrub & Herb Wetland Subclass
2.C.4. Temperate to Polar Freshwater Marsh, Wet Meadow & Shrubland Formation
2.C.4.Ne. Atlantic & Gulf Coastal Marsh, Wet Meadow & Shrubland Division
M066. Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh Macrogroup
G110. Atlantic & Gulf Coastal Fresh-Oligohaline Tidal Marsh Group
A0806 *Morella cerifera* - *Rosa palustris* Tidal Freshwater Shrubland Alliance
CEGL007093 *Ilex cassine* - *Morella cerifera* / *Woodwardia areolata* - *Sphagnum* sp. Flotant Shrub Swamp Association
FDBS - Delta Backslope Swamp Forest*
CEGL007241 *Morella cerifera* / *Typha domingensis* - *Sagittaria lancifolia* - Eleocharis spp. Tidal Marsh Association
SWMM - Wax-myrtle Shrub Marsh*
A3578 *Panicum hemitomon* Floating Marsh Alliance
CEGL007834 *Morella cerifera* - *Panicum hemitomon* Floating Marsh Association
SWMM - Wax-myrtle Shrub Marsh*
CEGL004665 *Panicum hemitomon* Marsh Association
HASM - Arrowhead - Spikerush - Maidencane Marsh*
A1987 *Sagittaria lancifolia* Gulf Coast Tidal Freshwater Marsh Alliance
CEGL007886 *Eleocharis rostellata* - *Sagittaria lancifolia* Oligohaline Tidal Marsh Association
HASM - Arrowhead - Spikerush - Maidencane Marsh*

*Map class also represents other USNVC types.

**Provisional vegetation type.

List E–2 (continued). List of map classes set into the hierarchy of the U.S. National Vegetation Classification for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

CEGL007891 *Phragmites australis* ssp. *berlandieri* - (*Sagittaria platyphylla*, *Vigna luteola*) Tidal Marsh Association
HRSM - Common Reed - Sawgrass Marsh*
CEGL007889 *Sagittaria lancifolia* Mississippi River Deltaic Plain Tidal Marsh Association
HASM - Arrowhead - Spikerush - Maidencane Marsh*
A3580 *Schoenoplectus californicus* Gulf Coast Tidal Freshwater Marsh Alliance
CEGL003985 *Schoenoplectus californicus* Tidal Marsh Association
HCBM - Gulf Coast California Bulrush Freshwater Marsh
A3581 *Stuckenia pectinata - Zannichellia palustris - Ceratophyllum demersum* Freshwater Subtidal Marsh Alliance
CEGL007689 *Potamogeton perfoliatus* - (*Stuckenia pectinata*, *Zannichellia palustris*) Tidal Marsh Association
HFSM - Floating & Submerged Aquatic Marsh*
A4015 *Typha domingensis - Eleocharis rostellata* Gulf Coastal Plain Oligohaline Tidal Marsh Alliance
CEGL007888 *Spartina patens - Vigna luteola* Mississippi River Deltaic Plain Tidal Marsh Association
HSCM - Mississippi River Deltaic Plain Saltmeadow Cordgrass - Cowpea Intermediate Marsh
CEGL007235 *Typha domingensis - Sacciolepis striata - Sagittaria lancifolia* Marsh Association
HCFM - Southern Cattail - American Cupscale - Bull-tongue Arrowhead Louisiana Freshwater Marsh
CEGL008456 *Typha domingensis* Tidal Marsh Association
HCTM - Southern Cattail Tidal Marsh
A4220 Gulf Coastal Plain Floating Marsh Alliance
CEGL007081 *Bacopa monnieri - Eleocharis* spp. Thin Floating Marsh Association
HBSM - Bulrush - Spikerush Marsh*
CEGL007076 *Bidens laevis - Hydrocotyle ranunculoides* Floating Marsh Association
HFSM - Floating & Submerged Aquatic Marsh*

*Map class also represents other USNVC types.

**Provisional vegetation type.

List E–2 (continued). List of map classes set into the hierarchy of the U.S. National Vegetation Classification for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

M067. Atlantic & Gulf Coastal Plain Wet Prairie & Marsh Macrogroup
G188. Atlantic & Gulf Coastal Plain River & Basin Freshwater Marsh Group
A3404 *Zizaniopsis miliacea* - *Zizania aquatica* - *Pontederia cordata* Southeastern Floodplain Marsh Alliance
CEGL004139 *Zizaniopsis miliacea* Coastal Plain Slough Marsh Association
HCSM - Coastal Plain Giant Cutgrass Slough Marsh
2.C.5. Salt Marsh Formation
2.C.5.Nb. North American Atlantic & Gulf Coastal Salt Marsh Division
M079. North American Atlantic & Gulf Coastal Salt Marsh Macrogroup
G120. Atlantic & Gulf Coastal Brackish Salt Marsh Group
A4013 *Spartina alterniflora* - *Spartina cynosuroides* Brackish Tidal Marsh Alliance
CEGL004178 *Cladium mariscus* ssp. jamaicense Tidal Salt Marsh Association
HRSM - Common Reed - Sawgrass Marsh*
CEGL008476 *Schoenoplectus americanus* - (*Spartina patens*) - *Typha* spp. Salt Marsh Association
HBSM - Bulrush - Spikerush Marsh*
5. Aquatic Vegetation Class
5.B. Freshwater Aquatic Vegetation Subclass
5.B.2. Temperate to Polar Freshwater Aquatic Vegetation Formation
5.B.2.Na. North American Freshwater Aquatic Vegetation Division
M108. Eastern North American Freshwater Aquatic Vegetation Macrogroup
G114. Eastern North American Freshwater Aquatic Vegetation Group
A4064 *Nymphaea odorata* - *Nuphar* spp. - *Brasenia schreberi* Aquatic Vegetation Alliance
CEGL004323 *Nelumbo lutea* Aquatic Vegetation Association
HFSM - Floating & Submerged Aquatic Marsh*
CEGL002386 *Nuphar advena* - *Nymphaea odorata* Aquatic Vegetation Association
HFSM - Floating & Submerged Aquatic Marsh*
M401. North American Temperate Ruderal Aquatic Vegetation Macrogroup
G595. Eastern North American Ruderal Aquatic Vegetation Group
HXAV - Eastern North American Ruderal Aquatic Vegetation
A4219 *Eichhornia crassipes* - *Alternanthera philoxeroides* Ruderal Aquatic Vegetation Alliance
CEGL003858 *Alternanthera philoxeroides* Ruderal Aquatic Vegetation Association
HFSM - Floating & Submerged Aquatic Marsh*

*Map class also represents other USNVC types.

**Provisional vegetation type.

List E–2 (continued). List of map classes set into the hierarchy of the U.S. National Vegetation Classification for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

CEGL007671 *Eichhornia crassipes* Southeast Temperate Ruderal Aquatic Vegetation Association
HFSM - Floating & Submerged Aquatic Marsh*
CEGL007075 *Oxycaryum cubense* - *Salvinia molesta* Exotic Floating Mat Association
HFSM - Floating & Submerged Aquatic Marsh*
7. Agricultural & Developed Vegetation Cultural Class
7.C. Herbaceous & Woody Developed Vegetation Cultural Subclass
CDVA - Developed Area - Open Space
Non-USNVC
Open Water (<1% vegetation)
NWTR - Open Water

*Map class also represents other USNVC types.

**Provisional vegetation type.

Page Reference to Map-Class Descriptions

Page

FLOF – Natural Levee Live Oak Forest E-17

FXWO – Ruderal Water Oak Forest E-19

FXBD – Ruderal Bottomland Deciduous Forest E-21

FXSB – Coastal Plain Ruderal Sugarberry Forest E-23

FXCT – Ruderal Chinese Tallow Forest E-24

FXMS – Ruderal Mixed Spoil Bank Forest E-26

FXWD – Disturbed Woody Wetland E-27

FXWL – Ruderal Black Willow / Wax-myrtle Wet Forest E-28

FDBS – Delta Backslope Swamp Forest E-29

FBCF – Bald-cypress - Tupelo Flooded Forest E-30

WBCM – Bald-cypress Wooded Marsh E-31

SXSM – Ruderal Shrub Marsh E-32

SWMM – Wax-myrtle Shrub Marsh E-33

HSCM – Mississippi River Deltaic Plain Saltmeadow Cordgrass - Cowpea Intermediate Marsh E-34

HASM – Arrowhead - Spikerush - Maidencane Marsh E-35

HBSM – Bulrush - Spikerush Marsh E-37

HCBM – Gulf Coast California Bulrush Freshwater Marsh E-39

HRSM – Common Reed - Sawgrass Marsh E-40

HCFM – Southern Cattail - American Cupscale - Bull-tongue Arrowhead Louisiana Freshwater Marsh E-41

HCTM – Southern Cattail Tidal Marsh E-42

HCSM – Coastal Plain Giant Cutgrass Slough Marsh E-43

HFSM – Floating & Submerged Aquatic Marsh E-44

HXAV – Eastern North American Ruderal Aquatic Vegetation E-46

HXGR – Eastern Ruderal Grassland E-47

CDVA – Cultural Vegetation E-48

NWTR – Open Water E-49

FLOF – Natural Levee Live Oak Forest

The Natural Levee Live Oak Forest (FLOF) map class represents the *Quercus virginiana* - *Celtis laevigata* - *Quercus pagoda* / *Sabal minor* Swamp Forest Association (CEGL004648) in the USNVC. This map class represents wet forests dominated by live oak (*Quercus virginiana*) located on wet-mesic to saturated uplands in the Park. The FLOF map class is common within the Park covering 147.0 ha (1.3% of the Park).

This map class is defined by a canopy with at least 40% live oak canopy cover mixed with other primarily upland tree species such as sweetgum (*Liquidambar styraciflua*), water oak (*Quercus nigra*), and sugarberry (*Celtis laevigata*). On occasion, this forest has a canopy with nearly 100% live oak forming a broad cathedral of branches over the dense ground layer of dwarf palmetto (*Sabal minor*). This map class generally presents in the aerial imagery as a mature upland forest that consists of very large, dark red oaks, representing the evergreen live oak, mixed in with a variety of other upland hardwood trees in a mix of duller reds and pinks. This map class exists in the Park on natural benches and levees formed by historic riverine outwash and sedimentation. Historically a closed canopy forest, the areas of the Park where this map class is present experienced substantial (circa 50%) canopy loss following hurricanes Cindy and Katrina in 2005 (J. Whitbeck, written commun., 2017). The 2004 U.S. Geological Survey digital orthophoto quadrangle (DOQ) leaf-off imagery was used to help refine the mapping of FLOF because this imagery set allowed for a much more reliable signature for the evergreen live oak.

The AA results indicate that FLOF was mapped well with a 93% users' accuracy and an 82% producers' accuracy. The AA determined only a few instances where FLOF was mapped too aggressively, to the FXBD and FXWO map classes. In these instances, the cover of live oak was overestimated as was the intactness of the forest. The AA also determined that the several instances where FLOF was mapped too conservatively also happened to be the FXBD and FXWO map classes. In these instances, the cover of live oak was underestimated as was the intactness of the forest. This underestimation indicates minor, but consistent, confusion between the FLOF map class and the FXBD and FXWO map classes.



An example of the FLOF map class showing several very large live oak (*Quercus virginiana*) towering over the characteristic dense ground layer of dwarf palmetto (*Sabal minor*).

FXWO – Ruderal Water Oak Forest

The Ruderal Water Oak Forest (FXWO) map class represents the *Quercus nigra* Ruderal Forest Association (CEGL004638) in the USNVC. This map class represents mesic to dry-mesic upland forests dominated by ruderal water oak (*Quercus nigra*). The FXWO map class is uncommon within the Park covering 51.5 ha (0.5% of the Park).

This map class is defined by a canopy with at least 50% water oak canopy cover mixed with other primarily ruderal upland tree species such as sweetgum (*Liquidambar styraciflua*), American elm (*Ulmus americana*), and sugarberry (*Celtis laevigata*). Generally associated with disturbance in the Park, such as roads, powerline corridors, and historic farming, this map class also occurs as a consequence of live oak (*Quercus virginiana*) death in the FLOF map class. This map class generally presents in the aerial imagery as a middle-aged to mature upland forest that consists of pink oaks, representing the water oak, mixed in with a variety of other upland hardwood trees in a mix of duller reds and pinks and often a few remnant large, dark red live oak. Importantly, the 2004 U.S. Geological Survey DOQ leaf-off imagery leaf-off imagery was used to help refine the mapping of FXWO as this imagery set allowed for a much more reliable signature for the tardily deciduous (losing leaves in very late fall to early winter) water oak.

The AA results indicate that FXWO was mapped with a 67% (90% confidence interval of 51–82%) users' accuracy and an 87% producers' accuracy. The AA determined several instances where FXWO was mapped too aggressively primarily to FLOF and FXBD. These instances were a result of an overestimation of water oak cover. Additional rare confusion was with four other forest map class driven by underestimation of the wetland characteristic of the sites. The AA did determine that FXWO was generally mapped too conservatively from two other forest map classes. In these instances, the cover of water oak was generally underestimated.



An example of the FXWO map class showing a ruderal canopy dominated by water oak (*Quercus nigra*).

FXBD – Ruderal Bottomland Deciduous Forest

The Ruderal Bottomland Deciduous Forest (FXBD) map class represents the *Quercus texana* - *Celtis laevigata* - *Ulmus* (*americana*, *crassifolia*) - (*Gleditsia triacanthos*) Floodplain Forest Association (CEGL004619) and the Ruderal Mixed Deciduous Forest [Park Special] vegetation type (CEPS004809) in the USNVC. This map class represents wet-mesic to dry-mesic forests dominated by mixed ruderal and remnant bottomland forest located on uplands in the Park. The FXBD map class is common within the Park covering 225.9 ha (2.0% of the Park).

Initially, the forest vegetation types that make up this map class were mapped separately. Based on field data and imagery signature, mappers believed that these forests could be reliably mapped apart. The AA, however, determined that confusion between these two forest map classes were consistent and substantive; therefore, the map classes were merged into a single map class.

This map class is defined by a deciduous hardwood trees species canopy with a consistent mix of sugarberry (*Celtis laevigata*), sweetgum (*Liquidambar styraciflua*), elm (*Ulmus* spp.), and water oak (*Quercus nigra*); with the occasional Nuttall's oak (*Quercus texana*), live oak (*Quercus virginiana*), and pecan (*Carya illinoinensis*). Generally associated with disturbance in the Park, this map class is wide spread along the historic distributary system where farming and clearing occurred. This map class generally presents in the aerial imagery as a very mixed species forest with an often open and degraded canopy with no clearly dominant species.

The FXBD is the result of the merging of two map classes. Initial results indicated substantive and consistent confusion between these two map classes, warranting the merger into a single map class. Decisions with JELA staff resulted in accepting the collapse of these map classes together in order to boost accuracy results. Information on this decision is in "Appendix H: Accuracy Assessment Reconciliation."

The AA results indicate that FXBD was mapped well with a 71% (90% confidence interval of 59–84%) users' accuracy and a 70% (90% confidence interval of 57–82%) producers' accuracy. The AA determined several instances where FXBD was mapped too aggressively to seven map classes. These instances can be broken down into three general groups in which either the degree of disturbance in the forest was overestimated, the mix of the forest canopy was overestimated, or the cover of ruderal trees was overestimated. The AA also determined several instances where FXBD was mapped too conservatively from six map classes. These instances also can be broken down into three general groups in which either the degree of disturbance in the forest was underestimated, the mix of the forest canopy was underestimated, or the cover of ruderal trees was underestimated.




Examples of the FXBD map class showing the more broken, but mature canopy of association CEGL004619 (left) compared to the younger more closed canopy of park-special vegetation type CEPS004809 (right).

FXSB – Coastal Plain Ruderal Sugarberry Forest

The Coastal Plain Ruderal Sugarberry Forest (FXSB) map class represents the *Celtis laevigata* Coastal Plain Ruderal Forest Association (CEGL004854) in the USNVC. This map class represents mesic to dry-mesic forests dominated by ruderal sugarberry (*Celtis laevigata*) located on uplands in the Park. The FXSB map class is rare within the Park covering only 1.8 ha (0.017% of the Park), making it the rarest map class in the Park.

This map class is defined by a canopy with at least 50% sugarberry canopy cover mixed with other primarily ruderal upland tree species such as water oak (*Quercus nigra*) and the occasional live oak (*Quercus virginiana*). Associated with disturbance in the Park, this map class is limited to only a few locations in the Park where significant dredge spoil was piled along the Gulf Intracoastal Waterway. This map class generally presents in the aerial imagery as a bright pink and fluffy canopied monoculture of sugarberry.

The AA results indicate that FXSB was mapped very well with both a 100% users' and producers' accuracy. The AA determined that the FXSB map class did not have any unmapped examples and that all areas mapped as FXSB were mapped correctly.



An example of the FXSB map class showing a ruderal canopy dominated by sugarberry (*Celtis laevigata*).

FXCT – Ruderal Chinese Tallow Forest

The Ruderal Chinese Tallow Forest (FXCT) map class represents the *Triadica sebifera* Ruderal Forest Association (CEGL007037) and the *Triadica sebifera* Ruderal Wet Forest Association (CEGL007412) in the USNVC. This map class represents ruderal forests dominated by the nonnative and invasive Chinese tallow (*Triadica sebifera*) located throughout the Park. The FXCT map class is common within the Park covering 126.7 ha (1.1% of the Park).

Initially, the forest associations that make up this map class were mapped separately. Based on field data, mappers believed that these forests could be reliably mapped apart based solely upon landscape position. The AA, however, determined that confusion between these two forest map classes was consistent and substantive; therefore, the map classes were merged into a single map class.

This map class is defined by a ruderal forest dominated by Chinese tallow. Often, the stand is so dense that it excludes other tree species from the canopy forming a near monoculture. This map class is often in areas with disturbed soils and can colonize open marsh where seasonal drying permits germination. This map class generally presents in the aerial imagery as a light-pink to yellow to white monoculture of short to medium statured trees with a fuzzy or diffuse appearance. This map class commonly is along levee tops.

The FXCT is the result of the merger of two map classes. Initial results indicated substantive and consistent confusion between these two map classes, warranting the merger into a single map class. Decisions with JELA staff resulted in accepting the collapse of these map classes together in order to boost accuracy results. Information on this decision is in “Appendix H: Accuracy Assessment Reconciliation.”

The AA results indicate that FXCT was mapped well with a 77% (90% confidence interval of 64–90%) users’ accuracy and an 82% producers’ accuracy. The AA determined several instances where FXCT was mapped too aggressively to three map classes. These instances result from an overestimation of Chinese tallow cover. The AA also determined several instances where FXCT was mapped too conservatively from four map classes. These instances result from an underestimation of Chinese tallow cover. In all but one instance, the FXCT map class was confused with other ruderal forest map classes that also contain Chinese tallow on a regular basis.




Examples of the FXCT map class showing the wetter ruderal Chinese tallow forest of association CEGL007037 (left) compared to the dryer ruderal Chinese tallow forest of association CEGL007412 (right).

FXMS – Ruderal Mixed Spoil Bank Forest

The Ruderal Mixed Spoil Bank Forest (FXMS) map class represents the Ruderal Mixed Spoil Bank Forest [Park Special] vegetation type (CEPS009725) in the USNVC. This map class represents ruderal forests dominated by a mix of species and limited to narrow and linear spoil banks placed in wetland habitat. The FXMS map class is common within the Park covering 111.4 ha (1.0% of the Park).

This map class is defined by a ruderal forest not dominated by any single species occurring on spoil banks next to canals and channels dug through open marsh. These "upland" forests contain tree species of almost any sort growing next to each other with the wet margins supporting bald cypress (*Taxodium distichum*) and water tupelo (*Nyssa aquatica*), whereas the highest central point may support live oak (*Quercus virginiana*) and sweet gum (*Liquidambar styraciflua*) all in a stretch of 5–10 meters. These features are very linear in the marsh generally no more than 10 meters across, but often several kilometers long and only 1–2 meters above the water level. These spoil banks were often dominated by a single species, such as Chinese tallow (*Triadica sebifera*), and in these instances, the map class representing the single species was used. This map class generally presents in the aerial imagery as a very narrow and long forested feature in an otherwise wetland setting dominated by a mix of tree species with an often broken or degraded canopy.

The AA results indicate that FXMS was mapped well with a 93% users' accuracy and a 71% (90% confidence interval of 58–84%) producers' accuracy. The AA determined only two instances where FXMS was mapped too aggressively to the FXWD and FDBS map class. In these instances, either the degree of canopy heterogeneity was overestimated (FXWD) or the degree of disturbance was overestimated (FDBS). The AA determined several instances where FXMS was mapped too conservatively from four map classes, with the majority of the confusion from FXCT and FXWL. In these instances, the degree of canopy homogeneity was underestimated.



Examples of the FXMS map class showing the very narrow and humped spoil bank (left) and the very mixed and broken canopy structure common to the map class (right).

FXWD – Disturbed Woody Wetland

The Disturbed Woody Wetland (FXWD) map class represents the Disturbed Woody Wetland [Park Special] vegetation type (CEPS006671) in the USNVC. This map class represents wet-mesic to inundated forests dominated by a mix of water-tolerant ruderal tree species. The FXWD map class is uncommon within the Park covering 34.8 ha (0.3% of the Park).

This map class is defined by a mixed ruderal tree canopy that consists of species with a high tolerance for wet soils. Often associated with subsidence or with shallow spoil deposition in open marsh, this map class was generally along the interface between historic distributaries and herbaceous marsh. This map class commonly is in the same topographic position as the FDBS map class, but in areas with a more intensive disturbance history that has generally reduced or eliminated the cover of dwarf palmetto (*Sabal minor*). This map class generally presents in the aerial imagery as a young mixed species forest with obvious evidence of wetland influence.

The AA results indicate that FXWD was mapped with a 56% (90% confidence interval of 34–78%) users' accuracy and a 53% (90% confidence interval of 31–74%) producers' accuracy. For both accuracies, this map class does not meet VMI Programmatic standards. Decisions with JELA staff resulted in accepting the lower accuracies of this map classes. Information on this decision is in "Appendix H: Accuracy Assessment Reconciliation." The AA determined broad and shallow confusion for both users' and producers' accuracy with no clear trend in the confusion. The primary reason for this confusion likely results from an inability to consistently estimate site hydrology with a secondary cause of overestimation and underestimation of tree canopy dominance.



An example of the FXWD map class showing a ruderal canopy dominated by a mix of tree species over disturbed wet ground.

FXWL – Ruderal Black Willow / Wax-myrtle Wet Forest

The Ruderal Black Willow / Wax-myrtle Wet Forest (FXWL) map class represents the *Salix nigra* / *Morella cerifera* Ruderal Wet Forest Association (CEGL007437) in the USNVC. This map class represents ruderal wet forests dominated by black willow (*Salix nigra*). The FXWL map class is common within the Park covering 167.8 ha (1.5% of the Park).

This map class is defined by a tree canopy dominated by black willow, but often in combination with other ruderal tree species with a high tolerance for wet soils. Although possible anywhere in the Park with wet soils, the FXWL map class commonly is near the Park boundary and along unmaintained levees. This map class generally presents in the aerial imagery as an even-aged fluffy pink and low-growing tree or very tall shrub over soils near the water level.

The AA results indicate that FXWL was mapped with a 55% (90% confidence interval of 38–72%) users' accuracy and an 84% producers' accuracy. The AA determined broad confusion for the users' accuracy among six wetland forest and woodland map classes that indicate a generally overaggressive application with no clear trend in the confusion. The reasons for this confusion likely are twofold, with a combination of overestimation of black willow cover and the potential confusion of the black willow signature with other wet, ruderal tree species. The producers' accuracy indicates only a slightly conservative application among three map classes. This slightly conservative application likely was caused by the misidentification of the dominant tree species in the canopy. Decisions with JELA staff resulted in accepting the lower users' accuracy of this map classes. Information on this decision is in "Appendix H: Accuracy Assessment Reconciliation."



An example of the FXWL map class showing a ruderal canopy dominated by black willow (*Salix nigra*) over a diverse and weedy understory.

FDBS – Delta Backslope Swamp Forest

The Delta Backslope Swamp Forest (FDBS) map class represents the *Ilex cassine* - *Morella cerifera* / *Woodwardia areolata* - *Sphagnum* sp. Flotant Shrub Swamp Association (CEGL007093) and the *Acer rubrum* - (*Fraxinus profunda*) / *Sabal minor* Swamp Forest Association (CEGL007229) in the USNVC. This map class represents wet-mesic to inundated tall shrublands and forests dominated by mixed swamp shrub and tree species. The FDBS map class is common within the Park covering 306.4 ha (2.8% of the Park).

An initial effort was made to keep the two vegetation associations in this map class separate, but field reconnaissance data indicated excessive overlap in canopy cover and composition to reliably distinguish the two associations apart. This map class is defined by a deciduous hardwood trees species canopy with a consistent mix of red maple (*Acer rubrum*) and pumpkin ash (*Fraxinus profunda*) over a mixed shrub layer often dominated by dwarf palmetto (*Sabal minor*). Generally associated with the marsh edge of the Park's remnant distributary systems, large patches of this map class exist along the edges of the natural levee of Bayou des Families. The FDBS map class generally presents in the aerial imagery as a moderately mixed species tall shrub to short forest dominated by wetland deciduous trees often with an open canopy over shallow water along the edges of natural levees.

The AA results indicate that FDBS was mapped well with an 82% users' accuracy and a 79% (90% confidence interval of 65–93%) producers' accuracy. The AA determined several instances where FDBS was mapped too aggressively to four map classes. These instances result from an overestimation of the intactness of the forest. The AA also determined several instances where FDBS was mapped too conservatively from six map classes. These instances result from either an underestimation of the intactness of the forest or an underestimation of canopy cover.



Examples of the FDBS map class showing the very tall and open shrub dominated canopy of association CEGL007093 (left) compared to the short and open tree canopy of association CEGL007229 (right).

FBCF – Bald-cypress - Tupelo Flooded Forest

The Bald-cypress - Tupelo Flooded Forest (FBCF) map class represents the *Taxodium distichum* - (*Nyssa aquatica*) / *Forestiera acuminata* - *Planera aquatica* Floodplain Forest Association (CEGL002421) and the *Taxodium distichum* - *Nyssa aquatica* - *Acer rubrum* / *Itea virginica* Floodplain Forest Association (CEGL007422) in the USNVC. This map class represents inundated to flooded forests dominated by bald cypress (*Taxodium distichum*). The FBCF map class is very common within the Park covering 888.5 ha (8.0% of the Park).

This map class is defined by forests (at least 60% canopy cover) dominated by bald cypress. Generally associated with the marsh edge of the Parks remnant distributary systems, large patches of this map class exist along the outer-most edges of the natural levee of Bayou des Families where the historic drought and flood cycle allowed bald cypress to become established. This map class generally presents in the aerial imagery as a near monotypic stand of often massive bald cypress with towering, fuzzy pink crowns with a distinctive ball-shaped crown.

The AA results indicate that FBCF was mapped well with a 100% users' accuracy and a 97% producers' accuracy. The AA determined that the only instance of confusion was from an area mapped as the FXWL map class where young and vibrant bald cypress were mistaken for ruderal black willow (*Salix nigra*).



Examples of the FBCF map class showing the towering closed canopy of bald cypress (*Taxodium distichum*) distinctive of the map class with association CEGL002421 having a high cover of floating aquatic vegetation and low shrub cover (left) compared to the shrubbier and relatively drier association CEGL007422 (right).

WBCM – Bald-cypress Wooded Marsh

The Bald-cypress Wooded Marsh (WBCM) map class represents the *Taxodium distichum* / *Morella cerifera* / *Thelypteris palustris* Tidal Woodland Association (CEGL007065) and the *Taxodium distichum* - *Salix nigra* / *Morella cerifera* / *Thelypteris palustris* Woodland [Park Special] vegetation type (CEPS009724) in the USNVC. This map class represents inundated to flooded woodland dominated by bald cypress (*Taxodium distichum*). The WBCM map class is very common within the Park covering 926.8 ha (8.4% of the Park).

This map class is defined by woodlands (25-60% canopy cover) dominated by bald cypress. Generally associated with the marsh edge of the Park's remnant distributary systems, large patches of this map class exist along the outer-most edges of the natural levee of Bayou des Families beyond the FBCF map class where subsidence and storm damage have resulted in the decline of bald cypress forest into woodland. This map class generally presents in the aerial imagery as an open and broken canopy of pink, fuzzy, ball-shaped bald cypress with other water-tolerant tree species, such as red maple (*Acer rubrum*) and black willow (*Salix nigra*), colonizing the gaps. Often, ample dead and dying bald cypress are visible in the area.

The AA results indicate that WBCM was mapped well with a 90% users' accuracy and a 96% producers' accuracy. The AA determined only rare confusion among the FXWL, FDBS, and SWMM map classes, primarily resulting from a misestimation of canopy closure or openness.



Examples of the WBCM map class showing the broken, open, and young canopy of bald cypress (*Taxodium distichum*) distinctive of the map class with association CEGL007065 generally lacking black willow (*Salix nigra*) (left), whereas park-special vegetation type CEPS009724 is somewhat more disturbed and does have black willow (right).

SXSM – Ruderal Shrub Marsh

The Ruderal Shrub Marsh (SXSM) map class represents the *Baccharis halimifolia* Ruderal Shrubland Association (CEGL004657) and the *Sesbania drummondii* Ruderal Shrubland provisional vegetation type (CEPP007085) in the USNVC. This map class represents ruderal shrublands located in the wetlands around the Park. The SXSM map class is uncommon within the Park covering 31.6 ha (0.3% of the Park).

Initially, the shrub vegetation types that make up this map class were mapped separately. Based on field data and imagery signature, mappers believed that these shrublands could be reliably mapped apart. The AA, however, determined that confusion between these two shrub map classes was consistent and substantive; therefore, the map classes were merged into a single map class. Decisions with JELA staff resulted in accepting the collapse of these map classes together in order to boost accuracy results. Information on this decision is in "Appendix H: Accuracy Assessment Reconciliation."

This map class is defined by ruderal shrublands growing in the marsh and at the marsh-swamp ecotone in the Park. Most often dominated by groundsel-tree (*Baccharis halimifolia*), this map class tends to favor the disturbed edges of levees in the Park. This map class generally presents in the aerial imagery as a dull pinkish-grey to bright-pink monoculture of densely packed shrubs.

The AA results indicate that SXSM was mapped with a 74% (90% confidence interval of 54–93%) users' accuracy and an 82% producers' accuracy. The AA determined several instances where SXSM was mapped too aggressively to three map classes. The most common of these instances was to the SWMM map class where groundsel-tree cover was overestimated or the signature was confused with that of wax-myrtle (*Morella cerifera*). The AA also determined a few instances where SXSM was mapped too conservatively from three map classes with no clear pattern of confusion.



Examples of the SXSM map class showing the groundsel-tree dominated of association CEGL004657 (left) compared to the poison-bean and mixed ruderal shrub dominated provisional vegetation type CEPP007085 (right).

SWMM – Wax-myrtle Shrub Marsh

The Wax-myrtle Shrub Marsh (SWMM) map class represents the *Morella cerifera* / *Typha domingensis* - *Sagittaria lancifolia* - *Eleocharis* spp. Tidal Marsh Association (CEGL007241) and the *Morella cerifera* - *Panicum hemitomon* Floating Marsh Association (CEGL007834) in the USNVC. This map class represents wax-myrtle (*Morella cerifera*) dominated shrublands located in the wetlands around the Park. The SWMM map class is very common within the Park covering 881.3 ha (8.0% of the Park).

This map class is defined by wet shrublands dominated by the evergreen wax-myrtle. Wax-myrtle is very water tolerant and spreads through underground (or water) runners creating large clonal patches throughout the marsh. The SWMM map class generally presents in the aerial imagery as dark-red to purple monoculture of densely packed small to large shrubs over herbaceous marsh.

The AA results indicate that SWMM was mapped well with a 93% users' accuracy and an 82% producers' accuracy. The AA determined a few instances where SWMM was mapped too aggressively to the FDBS and SXSM map classes. These instances likely were because of either an underestimation of tree canopy or the misinterpretation of the shrub species. The AA also determined several instances where SWMM was mapped too conservatively from three map classes. These instances primarily result from overestimating tree canopy, in the case of FXWD and WBCM, and from the confusion of signatures with the SXSM map class.



Examples of the SWMM map class showing the dominant wax-myrtle (*Morella cerifera*) canopy with association CEGL007241 having an herbaceous layer dominated by aquatic herbaceous vegetation (left) compared to the maidencane (*Panicum hemitomon*) dominated herb layer of association CEGL007834 (right).

HSCM – Mississippi River Deltaic Plain Saltmeadow Cordgrass - Cowpea Intermediate Marsh

The Mississippi River Deltaic Plain Saltmeadow Cordgrass - Cowpea Intermediate Marsh (HSCM) map class represents the *Spartina patens* - *Vigna luteola* Mississippi River Deltaic Plain Tidal Marsh Association (CEGL007888) in the USNVC. This map class represents herbaceous marsh dominated by saltmeadow cordgrass (*Spartina patens*). The HSCM map class is common within the Park covering 463.2 ha (4.2% of the Park).

This map class is defined by open marsh dominated by saltmeadow cordgrass. Sometimes forming broad monocultures, the relatively tall and wispy saltmeadow cordgrass will form large hummocky mounds of dead vegetation with new growth growing up around the edges and through the mound. This mounding provides the map class with a distinctive wavy or lumpy appearance. This map class presents in the aerial imagery as tan to light-pink mounds intermixed with the obvious bent over, bright-red blades of new cordgrass.

The AA results indicate that HSCM was mapped with a 73% (90% confidence interval of 58–88%) users' accuracy and a 92% producers' accuracy. The AA determined several instances where HSCM was mapped too aggressively, to the HASM and HBSM map classes. In these instances, the cover of saltmeadow cordgrass was overestimated or spikerush (*Eleocharis* spp.) was misidentified as saltmeadow cordgrass. The AA determined two instances where HSCM was mapped too conservatively from the HBSM map class. In these instances, the cover of saltmeadow cordgrass was underestimated or saltmeadow cordgrass was misidentified as spikerush.



An example of the HSCM map class showing a large expanse of association CEGL007888, with the herbaceous marsh dominated by saltmeadow cordgrass (*Spartina patens*).

HASM – Arrowhead - Spikerush - Maidencane Marsh

The Arrowhead - Spikerush - Maidencane Marsh (HASM) map class represents the following three associations in the USNVC:

- *Panicum hemitomon* Marsh Association (CEGL004665),
- *Eleocharis rostellata* - *Sagittaria lancifolia* Oligohaline Tidal Marsh Association (CEGL007886), and
- *Sagittaria lancifolia* Mississippi River Deltaic Plain Tidal Marsh Association (CEGL007889).

This map class represents herbaceous marsh dominated by some combination of primarily bull-tongue arrowhead (*Sagittaria lancifolia*) and spikerush (*Eleocharis* spp.) and occasionally by areas of maidencane (*Panicum hemitomon*). The HASM map class is very common within the Park covering 4,622.4 ha (41.8% of the Park), making it the most common map class in the Park.

This is a map class with many different signatures in the imagery and a highly-variable presentation in the field; all defined by varying degrees of dominance among bull-tongue arrowhead, spikerush, and maidencane. Most confusing in this mix is that often identical vegetation is distinguished by the species of spikerush present, and these species may only be positively identifiable at certain times of the year. The end result is an inability by mappers to reliably split these overlapping, cryptic, and exceedingly common vegetation associations into more than one map class.

The signature of this map class in the aerial imagery was as varied as the composition on the ground. In some instances, near monotypic beds of bull-tongue arrowhead would present as broad plains of bright red, slightly raised marsh vegetation. In instances where spikerush dominates the map class, the map class presents as tufted and lumpy white to tan senesced spikerush intermixed with bright-red channels of new growth. In other areas undergoing spikerush regeneration, this map class presents as a fuzzy pink mat. In between these distinctive and definable areas is a heterogeneous mix of complex signatures that represent a varied mix of vegetation housed in this map class.

The AA results indicate that HASM was mapped with a 97% users' accuracy and a 73% (90% confidence interval of 60–85%) producers' accuracy. The AA determined only one instance where HASM was mapped too aggressively to the HBSM map class, a map class that may also be dominated by yet other species of spikerush. The AA determined several instances where HASM was mapped too conservatively from four other herbaceous marsh map classes. In these instances, the dominance of bull-tongue arrowhead was likely underestimated, whereas the dominance of another species, such as southern cattail (*Typha domingensis*) or saltmeadow cordgrass (*Spartina patens*), was overestimated.



Different views of the HASM map class showing a maidencane (*Panicum hemitomon*) dominated association CEGL004665 (upper left) next to a mixed bull-tongue arrowhead (*Sagittaria lancifolia*) and maidencane (*Panicum hemitomon*) association CEGL004665 (upper right), a beaked spikerush (*Eleocharis rostellata*) dominated association CEGL007886 (center left) next to a bull-tongue arrowhead association CEGL007886 (center right), and a pale spikerush (*Eleocharis macrostachya*) dominated association CEGL007889 (lower left) next to a bull-tongue arrowhead dominated association CEGL007889 (lower right).

HBSM – Bulrush - Spikerush Marsh

The Bulrush - Spikerush Marsh (HBSM) map class represents the *Bacopa monnieri* - *Eleocharis* spp. Thin Floating Marsh Association (CEGL007081) and the *Schoenoplectus americanus* - (*Spartina patens*) - *Typha* spp. Salt Marsh Tidal Marsh Association (CEGL008476) in the USNVC. This map class represents herbaceous marsh dominated by spikerush (*Eleocharis* spp.) and chairmaker's bulrush (*Schoenoplectus americanus*) often in areas effected by nutria (*Myocastor coypus*) herbivory. The HBSM map class is common within the Park covering 210.4 ha (1.9% of the Park).

Initially, the marsh associations that make up this map class were mapped separately. Based on field data and imagery signature, mappers believed that these marshes could be reliably mapped apart. The AA, however, determined that confusion between these two herbaceous marsh map classes was consistent and substantive; therefore, the map classes were merged into a single map class. This confusion may be the result of a seasonal shift in imagery signature not detected during the mapping field reconnaissance.

This map class is defined as herbaceous marsh dominated by some combination of chairmaker's bulrush and spikerush, often with many other associated herbaceous marsh species such as bull-tongue arrowhead (*Sagittaria lancifolia*), saltmeadow cordgrass (*Spartina patens*), Herb-of-Grace (*Bacopa monnieri*), and Virginia saltmarsh mallow (*Kosteletzkya virginica*). Evidence of active nutria herbivory was recorded at many sites mapped as HBSM with the potential that some successional relation may exist between associations CEGL007081 and CEGL008476. In the aerial imagery, this map class generally presents three signatures. The first signature, generally linked to association CEGL007081, is a highly variable mix of vegetation with patches of open water and evident nutria mounds. The second signature, generally linked to association CEGL008476, is a flat, wispy brownish-grey mat with light-tan and white streaks. The third signature, linked to both vegetation associations, is a bright-pink to red mat.

The AA results indicate that HBSM was mapped very well with both a 93% users' and producers' accuracy. The AA determined only occasional confusion with HASM and HSCM. The confusion likely was caused by the misestimation of the degree of disturbance.



Examples of the HBSM map class showing association CEGL007081 dominated by a near monoculture of Herb-of-Grace (*Bacopa monnieri*) (upper left), association CEGL007081 dominated by a disturbed mix of marsh species (upper right), association CEGL008476 dominated by new growth of chairmaker's bulrush (*Schoenoplectus americanus*) (lower left), and association CEGL008476 dominated by a mix of living and senesced chairmaker's bulrush.

HCBM – Gulf Coast California Bulrush Freshwater Marsh

The Gulf Coast California Bulrush Freshwater Marsh (HCBM) map class represents the *Schoenoplectus californicus* Tidal Marsh Association (CEGL003985) in the USNVC. This map class represents herbaceous marsh dominated by California bulrush (*Schoenoplectus californicus*). The HCBM map class is rare within the Park covering 5.6 ha (0.05% of the Park).

This map class is defined by open marsh dominated by California bulrush, a native to the Park. Sometimes forming broad monocultures, this relatively tall and wispy graminoid will grow to more than 3 meters tall with a small inflorescence on top. This provides the HCBM map class with a distinctive filmy or semitransparent appearance in the aerial imagery with greyish tops floating over bright-red bottoms (the stalks) all over standing water.

The AA results indicate that HCBM was mapped well with a 100% users' accuracy and an 83% producers' accuracy. The AA determined only one instance where the HCBM map class was mapped too conservatively from HCSM when California bulrush was mistaken for giant cutgrass (*Zizaniopsis miliacea*), another tall graminoid that favors open water.



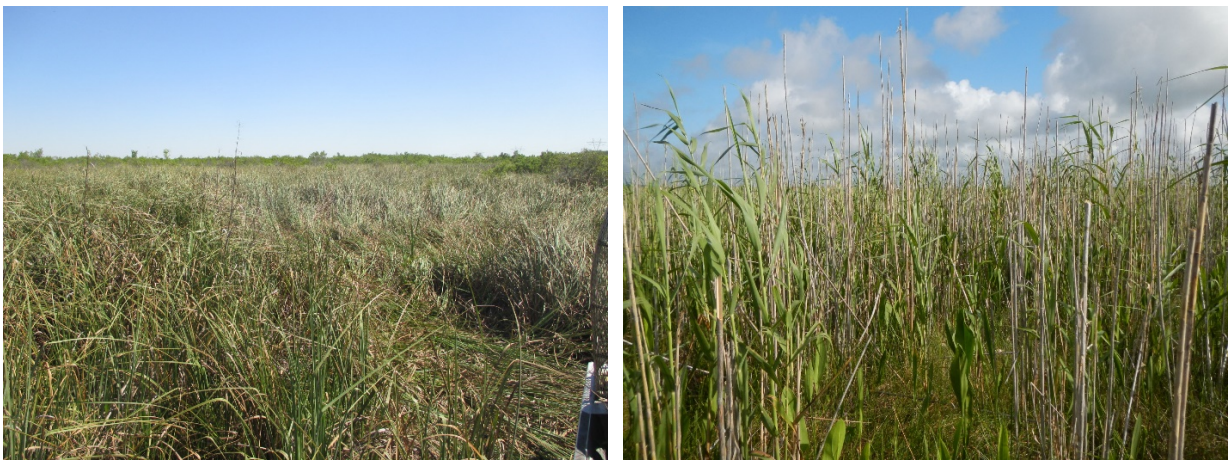
An example of the HCBM map class showing the dominance of the very tall California bulrush (*Schoenoplectus californicus*) of association CEGL003985.

HRSM – Common Reed - Sawgrass Marsh

The Common Reed - Sawgrass Marsh (HRSM) map class represents the *Cladium mariscus* ssp. *jamaicense* Tidal Salt Marsh Association (CEGL004178) and the *Phragmites australis* ssp. *berlandieri* - (*Sagittaria platyphylla*, *Vigna luteola*) Tidal Marsh Association (CEGL007891) in the USNVC. This map class represents herbaceous marsh dominated by either common reed (*Phragmites australis*) or swamp sawgrass (*Cladium mariscus*). The HRSM map class is uncommon within the Park covering 30.2 ha (0.3% of the Park).

This map class is defined herbaceous marsh dominated by either common reed or swamp sawgrass. As initially conceived, this map class only contained association CEGL007891 because association CEGL004178 was not known from the Park. However, during AA, association CEGL004178 was determined to be in the HRSM map class and subsequently added. In general, this map class is almost exclusively dominated by association CEGL007891 with the rare patch of CEGL004178. Both of these vegetation associations are dominated by near monocultures of very tall and distinctive graminoids. This map class generally presents in the aerial imagery as tan to grey fuzz of standing dead stalks over the underlying bright-red leaves of new growth.

The AA results indicate that HRSM was mapped very well with both a 100% users' and producers' accuracy. The AA determined that the HRSM map class did not have any unmapped examples and that all areas mapped as HRSM were mapped correctly.



Examples of the HRSM map class showing the swamp sawgrass dominated association CEGL004178 (left) compared to the common reed dominated association CEGL007891 (right).

HCFM – Southern Cattail - American Cupscale - Bull-tongue Arrowhead Louisiana Freshwater Marsh

The Southern Cattail - American Cupscale - Bull-tongue Arrowhead Louisiana Freshwater Marsh (HCFM) map class represents the *Typha domingensis* - *Sacciolepis striata* - *Sagittaria lancifolia* Marsh Association (CEGL007235) in the USNVC. This map class represents herbaceous marsh dominated by southern cattail (*Typha domingensis*) mixed with other herbaceous marsh vegetation. The HCFM map class is common within the Park covering 188.7 ha (1.7% of the Park).

This map class is defined by open marsh dominated by southern cattail mixed with broad array of other herbaceous marsh species such as bull-tongue arrowhead (*Sagittaria lancifolia*); spikerush (*Eleocharis* spp.); and, very often, alligator weed (*Alternanthera philoxeroides*). Easy to confuse with other marsh vegetation given the prevalence of southern cattail, this map class required a minimum of 60% cattail cover, but standing dead cattail was counted as total cattail cover. This map class generally presents in the aerial imagery as a grainy stand of medium-tall graminoid vegetation over an underlying layer of herbaceous marsh. Often, patches of open water (usually covered in floating aquatic vegetation) and standing dead cattail, with a bright grey to white signature, were present in this map class.

The AA results indicate that HCFM was mapped well with a 90% users' accuracy and an 87% producers' accuracy. The AA determined only one map class that HCFM was mapped too aggressively, to the HASM map class. These instances likely were because of an overestimation of southern cattail cover. The AA determined several instances where HCFM was mapped too conservatively from two map classes. In these instances, the likely cause was an underestimation of cattail cover or significant cattail growth between the imagery acquisition and the AA.



Examples of the HCFM map class represented by association CEGL007235 showing an early spring version before the southern cattail (*Typha domingensis*) has grown (left) compared to a mid-summer version after the southern cattail is much more established.

HCTM – Southern Cattail Tidal Marsh

The Southern Cattail Tidal Marsh (HCTM) map class represents the *Typha domingensis* Tidal Marsh Association (CEGL008456) in the USNVC. This map class represents herbaceous marsh completely dominated by southern cattail (*Typha domingensis*). The HCTM map class is rare within the Park covering 14.1 ha (0.1% of the Park).

This map class is defined by open marsh completely dominated by southern cattail with cover of living and standing dead cattail greater than 90% cover. This map class presents in the aerial imagery as a distinctive bright-red and upright graminoid signature with patches of open water with floating aquatic vegetation. This map is limited to two known locations in the Park.

The AA results indicate that HCTM was mapped very well with both a 100% users' and producers' accuracy. The AA determined that the HCTM map class did not have any unmapped examples and that all areas mapped as HCTM were mapped correctly.



An example of the HCTM map class showing a large expanse of association CEGL008456, with the herbaceous marsh dominated exclusively by southern cattail (*Typha domingensis*).

HCSM – Coastal Plain Giant Cutgrass Slough Marsh

The Coastal Plain Giant Cutgrass Slough Marsh (HCSM) map class represents the *Zizaniopsis miliacea* Coastal Plain Slough Marsh Association (CEGL004139) in the USNVC. This map class represents herbaceous marsh dominated by giant cutgrass (*Zizaniopsis miliacea*). The HCSM map class is uncommon within the Park covering 29.1 ha (0.3% of the Park).

This map class is defined by open marsh dominated by giant cutgrass growing over shallow open water most often along the edges of canals and channels. The HCSM map class generally presents in the aerial imagery as a linear strip of tall reddish-purple graminoid along the edges of channels and canals either over open water or over bright-pink floating aquatic vegetation.

The AA results indicate that HCSM was mapped with a 59% (90% confidence interval of 36–81%) users' accuracy and a 91% producers' accuracy. The AA determined many instances where HCSM was mapped too aggressively, to four map classes. In these instances, the most likely explanation is an overestimation of giant cutgrass cover with a secondary potential of mistaking giant southern cattail (*Typha domingensis*) or California bulrush (*Schoenoplectus californicus*). However, a portion of this error may be from the extreme linearity of this map class and AA crews drawing in too much vegetation from outside the edge of the polygon. The AA determined only one instance of HCSM being mapped too conservatively from the HXAV map class where giant cut grass cover was underestimated.



An example of the HCSM map class showing association CEGL004139 with dominant giant cutgrass (*Zizaniopsis miliacea*) over floating aquatic vegetation along the edge of a canal.

HFSM – Floating & Submerged Aquatic Marsh

The Floating & Submerged Aquatic Marsh (HFSM) map class represents the following seven associations in the USNVC:

- *Nuphar advena* - *Nymphaea odorata* Aquatic Vegetation (CEGL002386),
- *Alternanthera philoxeroides* Ruderal Aquatic Vegetation (CEGL003858),
- *Nelumbo lutea* Aquatic Vegetation (CEGL004323),
- *Oxycaryum cubense* - *Salvinia molesta* Exotic Floating Mat (CEGL007075),
- *Bidens laevis* - *Hydrocotyle ranunculoides* Floating Marsh (CEGL007076),
- *Eichhornia crassipes* Southeast Temperate Ruderal Aquatic Vegetation (CEGL007671), and
- Potamogeton perfoliatus - (Stuckenia pectinata, Zannichellia palustris) Tidal Marsh (CEGL007689).

This map class represents herbaceous floating aquatic and submerged marsh located in JELA. The HFSM map class is very common within the Park covering 872.1 ha (7.9% of the Park).

This is a map class with many different signatures in the imagery and a highly-variable presentation in the field connected by the presence of floating aquatic and submerged vegetation. Initially, mappers expected to be able to separate some of the associations in the map class given the very different signatures present among this group. However, mapping field reconnaissance revealed that the vegetation associations within this map class are highly mobile in the Park, spatially and temporally. Areas obviously dominated by one association in our imagery were dominated by a different association during the mapping field reconnaissance on such a regular basis that the mapping team was left with only one option—to group these mobile and changing vegetation associations into a single overarching map class.

The signature of HFSM in the aerial imagery is as varied as the composition on the ground. In some instances, near monotypic beds of nonnative invasive common water hyacinth (*Eichhornia crassipes*), alligatorweed (*Alternanthera philoxeroides*), or Cuban bulrush (*Oxycaryum cubense*) stand out distinctly as flat red, pink, or orange mats, respectively, on the water. In other instances, beds of floating marshpennywort (*Hydrocotyle ranunculoides*) form dark-red crinkly mats on the surface. Intermixed with the floating marshpennywort (*Hydrocotyle ranunculoides*) are native beds of American white waterlily (*Nymphaea odorata*) and American lotus (*Nelumbo lutea*) that present as round red disks either floating on the water surface, as in the case of the waterlily, or above the water, as in the case of the lotus. Finally, submersed vegetation presents as a soft to bright red glow below the surface. With such distinct signatures, mappers hoped to provide a more detailed map of floating and aquatic vegetation in the Park, but were unable to do so because of the vegetation's ability to move about over open water and because of the vegetation's propensity to change from year to year.

The AA results indicate that HFSM was mapped very well with both a 97% users' and producers' accuracy. The AA determined only one instance where HFSM was mapped too aggressively, to the HXAV map class in which a borrow pit with floating aquatic vegetation was mistaken for HFSM. The AA determined only one instance where HFSM was mapped too conservatively, from the

FXWD map class in which the overarching canopy was given too much precedence over the floating aquatic vegetation below.



Examples of the HFSM map class showing American white waterlily (*Nymphaea odorata*) dominated association CEGL002386 (upper left), American lotus (*Nelumbo lutea*) dominated association CEGL004323 (upper right), Cuban bulrush (*Oxycaryum cubense*) dominated association CEGL007075 (center left), floating marshpennywort (*Hydrocotyle ranunculoides*) dominated association CEGL007076 (center right), common water hyacinth (*Eichhornia crassipes*) dominated association CEGL007671 (lower left), and a submerged vegetation dominated CEGL007689 with a young American alligator (*Alligator mississippiensis*) (lower right).

HXAV – Eastern North American Ruderal Aquatic Vegetation

The Eastern North American Ruderal Aquatic Vegetation (HXAV) map class represents the Eastern North American Ruderal Aquatic Vegetation Group (G595) in the USNVC. This map class represents ruderal herbaceous wetland vegetation located in borrow pits around the edges of the Park. The HXAV map class is rare within the Park covering 12.4 ha (0.1% of the Park).

This map class is defined by ruderal, nonaquatic wetland vegetation growing along the margins of borrow pits associated with levee construction around the edges of the Park. The aquatic centers of these borrow pits were mapped as HFSM. This map class generally presents in the aerial imagery as a highly variable and dynamic signature based on small patches of many vegetation types with patches of dull pink, bright pink, bright red, and grey intermixed.

The AA results indicate that HXAV was mapped with an 86% users' accuracy and a 55% (90% confidence interval of 25–84%) producers' accuracy. (With the rarity of this map class, the number of potential AA sites was restricted, resulting in a wide range in confidence intervals.) The AA determined only one instance where HXAV was mapped too aggressively to the HCSM map classes, likely due to the overestimation of disturbance at this site. The AA determined several instances where HXAV was mapped too conservatively from four map classes. In these instances, proximity to old levees was not noted by mappers, and the HXAV concept was not applied correctly.



An example of the HXAV map class showing the mixed herbaceous wetland vegetation of group G595 around the edge of the borrow pit.

HXGR – Eastern Ruderal Grassland

The Eastern Ruderal Grassland (HXGR) map class represents the *Andropogon virginicus* - *Ambrosia artemisiifolia* - *Conyza canadensis* Eastern Ruderal Grassland Alliance (A3321) in the USNVC. This map class represents ruderal upland herbaceous vegetation along managed right-of-ways in the Park. The HXGR map class is rare within the Park covering 7.4 ha (0.07% of the Park).

This map class is defined by ruderal upland vegetation growing in areas managed to maintain herbaceous vegetation such as powerline or pipeline right-of-ways. When these right-of-ways enter the herbaceous marsh and are no longer managed, the right-of-ways are no longer mapped as the HXGR map class. This map class generally presents in the aerial imagery as patches of even upland herbaceous vegetation with a bright-red lumpy appearance.

The AA results indicate that HXGR was mapped with a 60% (90% confidence interval of 14–106%) users' accuracy and a 100% producers' accuracy. (With the rarity of this map class, the number of potential AA sites was restricted, resulting in a wide range in confidence intervals.) The AA determined only two instances where HXGR was mapped too aggressively, both to the HXAV map class. These instances most likely arose from the misidentification of upland ruderal maintained right-of-way instead of wetland ruderal maintained right-of-way.



An example of the HXGR map class showing the mixed herbaceous upland vegetation of alliance A3321 along a powerline right-of-way.

CDVA – Cultural Vegetation

The Cultural Vegetation (CDVA) map class represents unvegetated lands with maintained and impervious surface in the Park. The CDVA map class is common within the Park covering 215.3 ha (1.9% of the Park).

This map class is defined by developed areas where people reside, work, or recreate. This map class is generally permanent in nature, though management choices to reduce impervious surface coverage could be initiated.

Because the CDVA map class is a cultural vegetation map class, the class was not assessed for accuracy.

At the request of Park staff, all instances of CDVA, irrespective of area, were mapped in the Park to allow Park staff a better accounting of developed areas in the Park.



Examples of the CDVA map class showing a large maintained levee along the northern boundary of the Park (left) and a hunting shack out in the central marsh (right).

NWTR – Open Water

The Open Water (NWTR) map class represents unvegetated water in the Park. The NWTR map class is common within the Park covering 486.1 ha (4.4% of the Park).

This map class is defined by areas of open water having less than 1% cover of wetland or aquatic vegetation. Wetland vegetation—aquatic or emergent, or both—may be present (usually in shallow waters close to shorelines), but the vegetation should contribute less than 1% cover; however, small areas (below the MMU) of wetland vegetation having greater than 10% cover—including herbaceous vegetation, shrubs, and trees—may be present. Aquatic and wetland vegetation types were mapped when the vegetation types were distinct from the immediate surroundings and were in patches less than the size of the standard MMU (e.g. small islands). Given the very low reflectivity of water, this map class generally presents as a very dark and completely flat area.

Because the NWTR map class is an unvegetated map class, the class was not assessed for accuracy.



A view of the Gulf Intracoastal Waterway along the south end of the Barataria Preserve in the Park near sunrise exemplifying the NWTR map class.

Table E–2. Map classification listing, sorted alphabetically by map-class code, used for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

Map-class code	Map-class name
CDVA	Cultural Vegetation
FBCF	Bald-cypress - Tupelo Flooded Forest
FDBS	Delta Backslope Swamp Forest
FLOF	Natural Levee Live Oak Forest
FXBD	Ruderal Bottomland Deciduous Forest
FXCT	Ruderal Chinese Tallow Forest
FXMS	Ruderal Mixed Spoil Bank Forest
FXSB	Coastal Plain Ruderal Sugarberry Forest
FXWD	Disturbed Woody Wetland
FXWL	Ruderal Black Willow / Wax-myrtle Wet Forest
FXWO	Ruderal Water Oak Forest
HASM	Arrowhead - Spikerush - Maidencane Marsh
HBSM	Bulrush - Spikerush Marsh
HCBM	Gulf Coast California Bulrush Freshwater Marsh
HCFM	Southern Cattail - American Cupscale - Bull-tongue Arrowhead Louisiana Freshwater Marsh
HCSM	Coastal Plain Giant Cutgrass Slough Marsh
HCTM	Southern Cattail Tidal Marsh
HFSM	Floating & Submerged Aquatic Marsh
HRSM	Common Reed - Sawgrass Marsh
HSCM	Mississippi River Deltaic Plain Saltmeadow Cordgrass - Cowpea Intermediate Marsh
HXAV	Eastern North America Ruderal Aquatic Vegetation
HXGR	Eastern Ruderal Grassland
NWTR	Open Water
SWMM	Wax-myrtle Shrub Marsh
SXSM	Ruderal Shrub Marsh
WBCM	Bald-cypress Wooded Marsh

Appendix F: Accuracy Assessment Form

NPS VEGETATION MAPPING PROGRAM: ACCURACY ASSESSMENT POINT FORM

Park: **JELA** State: __LA__ AA Point Code: _____ GPS Point Code: _____

Survey Date ___/____/ 2016 **AA Point Time:** _____ am/pm **Field Team:**_____

Photo of Form Y / N Photo #s _____ [*Photo of Form, N, E, S, W, then 1or more representative of MMU*]

NAD83 UTM ZONE 15 **WAAS enabled? Y N Averaging? Y N iterations/GPS score**_____

UTM X __ __ __ __ __ __ m E **UTM Y** __ __ __ __ __ __ __ m N **#of sats**:_____ **Accuracy (m)** _____

GPS Model: Garmin_____ **GPS Unit #**_____

If GPS Point is an *intentional* offset from the AA Point, circle the explanation & illustrate relationships in sketch below:

a. **Physical constraints in reaching waypoint** (*list direction and estimated distance from new GPS point to the area observed and describe any other relevant details)*:
b. **Other** (*explain in notes below*):

ENVIRONMENTAL DESCRIPTION

1. Elevation _____**(m)** **Elevation Source**: GPS (on ground)/DRG/other:_____

2. Unvegetated Surface Substrate
(*estimate percentage of applicable covers;* ***should total 100%***):
____ leaf litter / organic matter
____ decaying wood
____ water
____ mineral soil / sand
____ other (*specify*)

3. Slope _____
A – 0-3% (0-2^0) (level or nearly level)
B – 3-9% (2-5^0) (gentle)
C – 9-16% (5-9^0) (sloping/rolling)
D – 16-31% (9-17^0) (moderate/hilly)

4. Aspect _____
F (flat)
V (variable)
N 338-22^0 NE 23-67^0
E 68-112^0 SE 113-157^0
S 158-202^0 SW 203-247^0
W 248-292^0 NW 293-337^0

Topographic position
____ Upland/slope
____ Low level (terrace)
____ Channel bed

5. Environmental Comments: (*Characteristics that affect vegetation –e.g., if site is a wetland, indicate type of hydrology, e.g., seepage wetland, temporarily flooded stream bottom, seasonally flooded pond, etc.; topographic position, landform, evidence of natural and human disturbance, successional status, stand maturity, etc.*)

6. SKETCH OF OBSERVATION AREA
(aerial view or transect view or both): indicate north arrow, where GPS positions were collected, whether an offset point was needed, locations and bearings of photopoints, plot orientation, roads, trails, as well as distinctive features of the vegetation, e.g., transitions to different vegetation types, or landscape features, etc. Use the symbols in the key below for GPS points and photos. *Site need not be circular if constrained by map guidelines.*

.

⊗	GPS position
○→	Photo # and direction

VEGETATION STRUCTURE: AA Point Code: _____

Stratum	Strata max. height (select one from right)	Cover values by strata (upper value of range = 5, 10, 20, 30, 40, 50, 60, 70, 80, 90, or 100%)	Strata Heights (max. defaults)
Canopy (T2)			20 m, 35 m, or > 35 m
Subcanopy (T3)			10 m, 20m
Shrub (S1)			2 m, or 5 m
Herbaceous (H)			0.5 m, 1 m, or 2 m
Emergent Aquatic (A1)			
Floating-leaved/Submersed Aquatic (A2)			
NonVascular and/or Epiphytes (NV/E)			

VEGETATION COMPOSITION: (list all dominant and diagnostic species for each stratum (one species per row)
Record total cover, then record the cover class for each species in all strata in which that species is dominant or diagnostic.
Use the following cover classes for all cover estimates: **P < 5%; 01 = 5-15%; 02 = 15-25%; 03 = 25-35%; 04 = 35-45%; 05 = 45-55%; 06 = 55-65%; 07 = 65-75%; 08 = 75-85%; 09 = 85-95%; 10=>95%**

SPECIES **Write out full name or use code from approved list** *E.g.:* CORNFLO [= *Cornus florida*]	**Diagn. species (X)**	**Total cover for assessed area**	**T2**	**T3**	**S1**	**H**	**A1**	**A2**	**NV/E**	**Specimen Collected (Y), Confidence in ID (C, P, U)**
Plants Reference: USDA Plants										

POINT ASSESSMENT: Is the **MMU 0.25 ha or 0.5 ha**: (circle one) *consult map for MMU size at this point*

Representativeness: Is the area of the vegetation being assessed around the point at least equivalent to 1 MMU? **Y N**
Is the vegetation homogeneous, very patchy, or does it appear to be transitional between two types? (circle one)
Please note adjacent vegetation communities.

Fit (does MMU key easily to an association?): **H M L** Your **confidence** in determination: **H M L**
Provide additional comments about problems or ease applying the key at this site, rationale for choice of association, if there was doubt, etc.

FIELD CLASSIFICATION: Primary Field Call (*Name & Code in Key*):_____ **CEGL00**_____
Secondary Field Call *(if there is doubt about first call)*:_____ **CEGL00**_____
OFFICE CLASSIFICATION: Reviewer Name:_____ Review Date:_____ **Final CEGL00** _____
Final Common Name:_____ If final call differs from original, give reason why:

Appendix G: Accuracy Assessment Field Manual

FIELD MANUAL FOR ACCURACY ASSESSMENT SAMPLING

NPS VEGETATION MAPPING INVENTORY PROGRAM

JEAN LAFITTE NATIONAL HISTORICAL PARK AND PRESERVE SPRING/SUMMER 2016

Prepared for
U.S. Department of the Interior
U.S. Geological Survey and
National Park Service

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Contents

Page

A. THE BASIC FRAMEWORK FOR VEGETATION DESCRIPTION G-5
Vegetation Physiognomy, Floristics, and Environment G-5
Cover of Species, Including by Strata G-5
Environmental Factors G-5
B. PROJECT AND AA SITE DESCRIPTION OVERVIEW G-6
Field Sampling Strategy G-6
Recognizing Strata and Growth Forms G-7
Measuring Species Abundance and Strata Using Percent Cover G-8
C. ACCURACY ASSESSMENT FORM G-9
The Basics G-9
Getting There G-9
Once There: the Basic Procedures for Field Data Collection G-11
Before Leaving Each AA Site… G-15
Before Leaving the Field Each Day… G-15
Final Steps Including Turning in Data Each Week G-15
Detailed Contents of the Field Form G-16
D. CHECKLISTS FOR FIELD TEAMS G-21
Planning for the Day G-21
Planning for the Week G-21
Final Steps at Week's End G-22
Materials G-22

A. THE BASIC FRAMEWORK FOR VEGETATION DESCRIPTION

Vegetation Physiognomy, Floristics, and Environment

The U.S. National Vegetation Classification (USNVC) is a vegetation classification that integrates floristic and physiognomic criteria, along with some environmental criteria, to define vegetation units. The upper levels of the USNVC hierarchy use formation concepts which are based on dominant and diagnostic growth forms that reflect environment at global to continental scales. The formation concept has a long tradition in vegetation classification. In the revised USNVC, it is treated primarily as a physiognomic unit guided by ecological considerations, but importantly, it is open to some floristic input from lower levels. The mid-levels are based on dominant and diagnostic growth forms and compositional similarity reflecting biogeography and continental to regional environmental factors. The lower levels (L7 and L8) are based on diagnostic and/or dominant species and compositional similarity reflecting local to regional environmental factors. The field sampling design emphasizes collecting data on all three sets of criteria. Field teams gather data on 1) dominant species, 2) dominant growth forms, and 3) environmental factors. Physiognomic and structural information are needed for the dominant and uppermost layers of vegetation. Location and environmental data are needed to confirm or explain floristic classification decisions.

Floristic information is the leading criteria for the alliance and association units that are being used to check the vegetation map at Jean Lafitte National Historic Park and Preserve (JELA, also referred to as the "Park"). These units are based on total species composition of a stand, as represented by a sampling unit. Thus, floristics and physiognomy must be described across all strata (or layers) of vegetation. Information on dominant and diagnostic species is collected across these layers to confirm the classification of the vegetation at accuracy assessment (AA) observation sites.

Cover of Species, Including by Strata

In addition to the simple presence of growth forms and species in an AA site, we need a measure of their abundance or dominance. The USNVC gives consideration both to the presence and the abundance of species and growth forms. Percent cover is the most widely accepted measure of species abundance or dominance because a) it can be applied to all species, whether aquatic, herb, grass, shrub, or tree, b) it is relatively easy to estimate in the field, and c) it is a reliable and accurate measure for the purposes of classification.

Because the USNVC is an integrated physiognomic-floristic hierarchy, information on species percent cover should be collected within the context of the vertical strata in the AA site. In this way, we can link major species dominants to the dominant growth forms, and we can assess diagnostic species patterns in the different layers of vegetation. In addition, older datasets that only contain information on a single stratum (e.g., only tree layer data) can still be compared to the percent cover data of that stratum.

Environmental Factors

Although primary classification decisions are based on floristic composition and physiognomy, final decisions about vegetation classes are often made in the context of information on environmental or local site factors. Indeed, habitat features are often valuable in making decisions about the diagnostic value of species and they are useful in completing descriptions of vegetation types and using those

descriptions to answer management or research questions (e.g., their value as habitat to certain species or suitability for trails). They may help explain the vegetation pattern or provide additional criteria for keys to vegetation types. For this reason, we recommend that data on a variety of ecological or habitat factors be collected, including at minimum, slope, elevation and aspect, topographic position, and evidence of disturbances. Wherever possible, we provide "picklists" to ensure consistency and ease of data entry. The information is rarely technical in nature, thus facilitating its collection in the field.

B. PROJECT AND AA SITE DESCRIPTION OVERVIEW

This section provides field teams with general instructions and guidelines for conducting fieldwork for a given project area. It gives the "how-to" for decision making in collecting data. Detailed, field-by-field coding conventions are provided for each of the primary data forms.

Field Sampling Strategy

Field sites are pre-selected based on the total area of each map class and corresponding vegetation types. Sites are selected randomly using Geospatial Modeling Environment suite of tools and are spaced according to the minimum mapping unit (MMU) of a particular map class. Up to three AA observation sites are permissible in any single mapped polygon. Sampling will be done after navigating to the pre-selected AA points. Once at the site, the field crew should make sure to consider an area equal to the MMU when making classification decisions. The MMU for the JELA vegetation mapping project is 0.5 ha (~1.2 acres) for most map units and 0.25 ha (~0.6 acres) for some (the MMU for each site will be noted on the field maps and within the AA point file attribution for the GPS unit). **The mapping team has not mapped vegetation units at scales smaller than 0.25 hectares and thus it is critical that the AA field team does not consider smaller vegetation units either.** A circle with a radius of 40 m is 0.5 ha; a circle with a radius of 28 m is 0.25 ha. Once the field team is at the correct site and has scouted out an area equal to the MMU they will begin to collect field data.

It is helpful to remember that map classes are not necessarily the same thing as vegetation types. Map polygons are drawn and AA points are selected based on map classes. The field crew will assess the vegetation at an AA site and assign it to a vegetation type based on the JELA vegetation field key. At JELA, many, but not all, map classes are equivalent to vegetation types. In most cases, this difference will not be important, or even apparent, to the field crews. One possible result of the difference that will affect the crews is that AA points may occasionally encompass more than one vegetation type. If a map class consists of two similar vegetation types, an AA point may be chosen that falls entirely within that single map class but on the border of two vegetation types. In this event, field crews should not move the AA point but should record data as normal and note that two vegetation types are present, or that the site is intermediate between two and they are not confident only one fits the site best (accomplished by recording both a primary and secondary best fit vegetation-type name and corresponding 4-digit code on the data sheet and recording information on "confidence" and "fit" of the primary call).

Recognizing Strata and Growth Forms

A comprehensive vegetation description requires information on physiognomy, floristics, and environment. To standardize the collection of physiognomic information, we collect information on the principal strata of vegetation, including a list of species present in those strata. Because of the importance of using a standard approach to sampling vegetation strata, we discuss this issue in some detail here, to ensure that subsequent discussions of field data collection are clear. A stratum is a layer of vegetation that includes all plant growth forms that occur within it. Plants are assigned to strata based on their predominant position or height in the stand, not by their taxonomy or mature growth form. Consequently, a tree species that has both seedlings and saplings in an AA site will be listed in several strata. In describing the vegetation physiognomy of an AA site for classification purposes, it is only necessary to capture the main features of the often-complex stand conditions, rather than to describe the layering in the greatest possible detail.

In terrestrial environments, four basic vegetation strata should be recognized whenever they are present: tree, shrub, herb, and moss (sensu Fosberg 1961; the ground layer of mosses, liverworts, lichens, and algae). In aquatic environments, floating, and submerged strata should be recognized where present. These six strata are needed to convey both the vertical distribution of overall cover and the predominant growth forms. Additionally, they may be used to convey the abundance of each species in each stratum so as to provide a more detailed record of vegetation composition by strata. The six strata are defined as follows (see Figure 1 for an example):

Tree stratum (T2/T3): includes tall trees (single-stemmed woody plants, generally more than 5 m in height at maturity under optimal growing conditions). Very tall shrubs with tree-like form may also be included here, as may other growth forms, such as lianas and epiphytes, and their contribution to the stratum can be further specified using the "growth form" field. For the **JELA field form, this stratum is broken down into two substrata: canopy and sub-canopy.** Field teams should use the Height Scale and Cover Scale on the form. Estimate the stratum heights to the nearest height from the options provided, Canopy (20 m, 35 m, >35 m), and Subcanopy (10 m, 20 m).

Shrub stratum (S1): includes shrubs (multiple-stemmed woody plants, generally less than 5 m in height at maturity under optimal growing conditions) and shorter trees (saplings) less than 5 m in height. As with the tree stratum, other growth forms present in this stratum may also be included; however, herbaceous growth forms should be excluded, as their stems often die back annually and do not have as consistent a height as woody growth forms. Field teams should use the Height Scale and Cover Scale on the form. Estimate the stratum heights to the nearest height from the options provided, Shrub (2 m, or 5 m). It should be noted that some other projects differentiate tall shrub and short shrub strata.

Herb stratum (H): (also referred to as field or ground stratum) includes herbs (plants generally without woody stems and often dying back annually), often in association with low creeping semi-shrubs, vines, and nonwoody brambles (such as raspberries), as well as tree seedlings <1 m tall. Estimate the stratum heights to the nearest height from the options provided, Herbaceous (0.5 m, 1 m, or 2 m). Where herbs are entirely absent, it is still possible to

recognize this stratum if other very low woody or semi-woody growth forms are present. Prostrate shrubs are also included in this category (woody stemmed).

Nonvascular stratum (NV/E): (also referred to as moss, bryoid, or ground stratum): is defined entirely by mosses, lichens, liverworts, and algae which are growing on the ground. Ground-creeping vines, prostrate shrubs and herbs should be treated in the herb stratum.

Emergent aquatic stratum (A1): includes emergent plants with most of their biomass at a height above the water surface (e.g., *Sagittaria lancifolia*, *Typha* sp., *Phragmites australis*).

Floating-leaved/submersed aquatic stratum (A2): floating aquatic vegetation includes rooted or drifting plants that float on the water surface (e.g., duckweed, water-lily). Submersed aquatic vegetation includes rooted or drifting plants that by-and-large remain submerged in the water column or on the aquatic bottom (e.g., *Ceratophyllum demersum*). The focus is on the overall strata arrangement of these aquatic plants.

Epiphytes, vines, and lianas are treated where they are present within the strata defined above, not as separate strata.

Within the tree stratum, separate out canopy and subcanopy substrata. (See Recognizing Strata and Growth Forms, pg. G-7–8; and Complete Vegetation Description, pg. G-12–13).

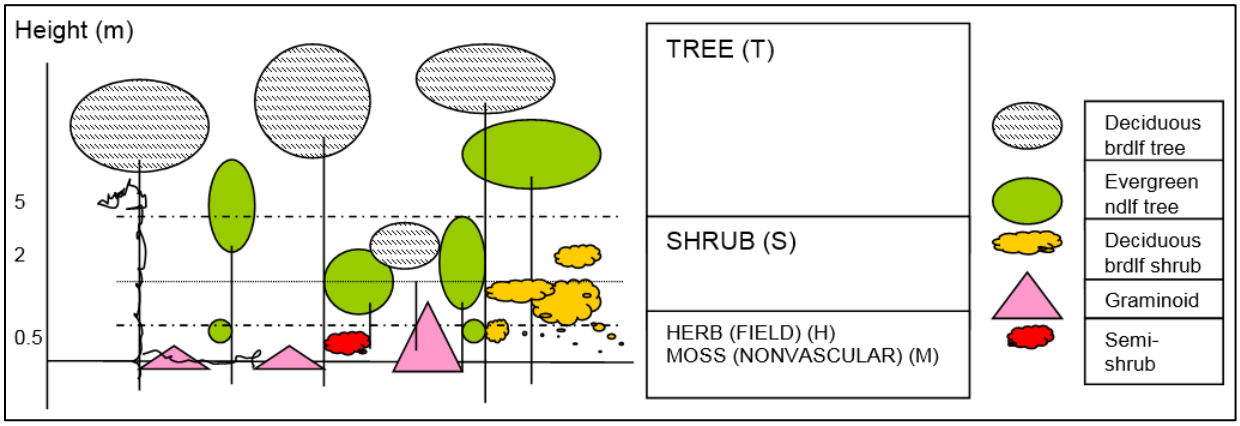


Figure G–1. Major strata (layers) recognized in terrestrial vegetation. Shown here are typical strata found in forests. Additional strata found in stands of aquatic vegetation are floating aquatic and submerged aquatic.

Measuring Species Abundance and Strata Using Percent Cover

Percent cover is a meaningful attribute for nearly all plant growth forms and allows their abundances to be evaluated in comparable terms. Percent cover can be defined generically as "the vertical projection of the crown or shoot area to the ground surface expressed as … percent of the reference area" (Mueller-Dombois and Ellenberg 1974). For our purposes, percent cover based on crown or shoot area is applied as canopy cover, rather than foliar cover. Canopy cover is the percentage of ground covered by a vertical projection of the outermost perimeter of the natural spread of foliage of plants. Small openings within the canopy are included.

Canopy cover is the preferred method of collecting cover because it better estimates the "area that is directly influenced by the individuals of each species" (Daubenmire 1968), is easier than foliar cover to estimate from aerial photos, and is more likely to correlate with satellite image analysis. A classification based on canopy cover is better suited for mapping vegetation than one based on foliar cover. Strata cover should always be estimated on an absolute basis, and individual species cover should also be estimated as absolute cover rather than relative cover, which is taken relative to the absolute cover of the strata. If relative species cover is needed for later analysis, there is a very easy conversion (relative cover for a species within a stratum = absolute cover for that species in that stratum/absolute cover for the stratum).

C. ACCURACY ASSESSMENT FORM

The Basics

AA sites are not marked by defined boundaries. AA points are randomly selected (using Geospatial Modeling Environment in correlation with ArcGIS suite of products) in advance by UMESC Geospatial Staff. Field teams navigate to the point using GPS, scout out the area briefly to get a feel for what it is like, and record some general data to characterize it on an AA form.

Getting There

The team may have a variety of base maps to work with to locate AA sites. Field teams at JELA will have, at a minimum, an aerial photo with the AA points that they need to navigate to and visit/sample. Polygons to be assessed will either be at a radius of 28 m (0.25 ha MMU) or 40 m (0.5 ha MMU). Linework between polygons will not generally appear on the maps, except in cases where the chosen AA point has a lower than typical buffer from the adjacent polygon. The team will navigate to each selected area using maps, the aerial photo(s), and GPS. If AA point maps are provided to the field crew(s), these maps may have roads, trails, levees, bayou names, etc. highlighted on them to help the team as well.

Before leaving for your site each week... Submit Barataria Preserve Field Work Plan at least 24 hours prior to first day of each fieldwork session by emailing the plan to jela_research@nps.gov.

Check that the team has all the materials needed to complete the fieldwork (see Section D: Checklists for Field Teams).

Every morning... Open fieldwork plan for the day by calling 1-855-289-7412 and give the operator the group leader's name, mention that you are opening a field/float plan, give them a cell phone number where you can be reached, and tell them the location you will be leaving from. Check the GPS receiver to make sure it is set to North American Datum of 1983 (NAD 83), that the batteries are charged or a sufficient amount, replacement batteries are brought along, and the storage memory is sufficient for the day's work. Check the camera to ensure there is space for the day's work. If you are using a digital camera, verify that batteries and memory are sufficient.

Location of the AA site… navigate to the exact coordinates of the target AA point. If it is not safe to position yourself at the exact coordinates (and assuming there is a clear line of sight to the AA point and that you can easily key the community type out and take data with a reasonable level of

confidence), then get as close as possible, record the Universal Transverse Mercator (UTM) coordinates and UTM zone of your actual position, and then record the offset. The offset should be recorded as a direction (azimuth) and distance (in meters) from the UTM coordinates where you are standing to the target point for which you were originally aiming.

Acceptable reasons for dismissing an AA point (and information on how to document this) is as follows:

Most AA sites at JELA will be challenging to access, and most will need to be accessed by airboat or canoe. These sites will be difficult due to any one of the following conditions: vegetative or topographic constraints, limited/difficult access, AA points that end up being too close to roads, AA points that are in or on the opposite side of an isolated water body that cannot be easily crossed, and AA points that fall on private land that is marked with no trespassing signs, fenced, or may have other issues related to safety). If possible, every attempt to reach AA sites with limited/difficult access should be made. If an AA site cannot physically be reached, the AA point may be dismissed or replaced with an additional AA point. In order to determine whether you can dismiss/replace a point, please ask the following questions. If you answer yes to any of these questions, you should go to the second set of questions below:

- Does anyone on the team feel that accessing the AA site will be an unacceptable risk to their personal safety?
- To access the AA site, will you need to cross land marked as “no trespassing”?
- Will accessing the AA site require you to climb a fence (e.g., no access through gates)?
- Will accessing the AA site require you to navigate through water above your knees and are there no other means available to efficiently access the site (boat, airboat, etc.)?
- Are dangerous animals, reptiles, etc. impeding access to the AA site?

If you answered yes to any of these questions, please answer the following questions to determine whether you can dismiss the AA point:

- Without traveling to the center of the AA site, do you have clear line of sight to the AA point and can you easily key the community type out and take data with a reasonable level of confidence, keeping in mind that vegetation in JELA may appear to be a monotype of a single vegetation type from an offset but in reality is less homogenous when analyzed from site center?
- Are you confident in your AA determination (keep in mind the effect/impact your field call(s) may have on the final vegetation map and classification within the Park, please be confident)?

If you answered “no” to one of the last two questions, then dismiss/abandon the AA point and site.

VERY IMPORTANT: AS SOON AS YOU DISMISS/ABANDON AN AA POINT, PLEASE TEXT, CALL, OR EMAIL NATURESERVE STAFF LISTED BELOW WITH THE POINT NAME, REASON FOR DISMISSING IT, AND ANY OTHER USEFUL INFORMATION SO

THAT WE CAN WORK WITH UMESC TO ASSIGN A NEW AA POINT TO REPLACE THIS ONE AS SOON AS POSSIBLE.

In 2016, the NatureServe contacts will be: Rickie White (Rickie_white@natureserve.org) and **Carl Nordman** (carl_nordman@natureserve.org). **Please contact them both just in case one is out of the office on the day you call.**

If you answered one of the first five questions "yes", but also answered the last question "yes" or "high confidence", then you can still proceed with collecting AA site data remotely, but will need to make some notes in the sketch. Also, you will need to take the GPS data from where you are standing and need to explain in the notes that the GPS data is where you observed the AA site, not at the intended site center.

Further, certain AA field sites may necessitate that site data be taken from an offset (as noted on the field maps). This may be necessary if you are able to navigate to the edge of an observation site area, but not likely be able to enter it. Please make every effort to collect data for these sites, however, the aforementioned rules in regard to abandoning/replacing AA field sites still apply (Note: please remember to analyze an entire MMU for AA field sites that necessitate site data to be taken from an offset).

Once There: the Basic Procedures for Field Data Collection

Determine and record the AA site location

Using the GPS receiver, field teams determine the UTM coordinates and UTM zone and record the coordinates under the **UTM X** and **UTM Y** blanks on the AA site form. Field teams also record the GPS estimated error. If the team cannot get a GPS reading with sufficient accuracy (estimated error at or below 10 m), they should make note of this and any discernable site features (distance and direction in relation to those features) on the AA field form and drawing (as to give USGS UMESC personnel a better understanding of the true AA site center location). Don't forget to record whether the GPS was WAAS enabled, whether you used averaging, and the accuracy in meters as well as # of satellites and the GPS score (developed when averaging).

Identifiers/Locators

Complete the information for any fields that are not already completed. The AA point code is pre-determined by the mapping group and should be recorded on the form. The GPS point code, on the other hand, is assigned by the fieldworker, should begin with the letter "J" and the numbering should match the AA point code (for example, if the AA point code is "0001" the GPS point code should be recorded as "J0001").

Taking vegetation photographs

Teams should take 6 photos at each AA site. The first photo is of the AA field form after, at a minimum, the AA point code, GPS point code, and UTM coordinates and pertinent offset information have been written down. The next four photos should be in the four cardinal directions (N, E, S, W), starting with north. Since the photos taken in the cardinal directions may not capture the feel of the area, take one photo that best represents the sample area. Make sure and mark on the

field form the photo #s or the order of the photos taken in the blank marked "photo #s" (order of photos should be "photo of form, N, E, S, W, representative photo).

When taking field photos for AA sites analyzed at an offset, teams should take 2 photos at each AA site. The first photo is of the AA field form after, at a minimum, the AA point code, GPS point code, and UTM coordinates and pertinent offset information have been written down. The second photo should best represent the sample area that was viewed from the offset.

Record Environmental Description

Environmental information for AA sites is relatively simple. Record the elevation, slope angle, aspect (slope direction), topographic position, and environmental factors affecting the vegetation of the area. Instruments and their use will be covered during training so that all fieldworkers are collecting this data in the same way.

Sketch of Observation Area

The sketch is very important because it can often be used to help later reviewers better understand the environmental context and physical site location. With this information the reviewer may be able to give the final call a higher confidence value or conversely may use the information to make a different call than the original data collector. If possible, make sure that each AA site has a sketch, especially for areas where you perceive that there are multiple vegetation types in one MMU. This sketch may prove to be extremely important for sites analyzed either by choice or necessity from an offset. Any discernable features that would give context to the site as a whole, the site location, or the vegetation analyzed should be recorded in this sketch. Please be sure to follow sketch instructions found on the JELA AA field form.

Complete Vegetation Description

Substrata (e.g., canopy tree and subcanopy tree) are standard for the NPS VMI Program and are seated within the basic strata.

Provide the prevailing height of the top and of each stratum.

Having decided on the strata, record the species information in the following manner:

1. Begin by simply listing the dominant 1-4 species (plus any diagnostic species) observed in each of the main layers.
2. Collect any unknown dominant or diagnostic species (see details below), label each bag or sheet containing the specimen with the AA site code and a unique identifier corresponding to the code on the form (e.g. *Carex* #1, Fern #2).
3. When the list appears complete (including all the dominant plant species found in each stratum of the vegetation), begin estimating cover. For each stratum
    a. Estimate total absolute cover of the stratum (Tree Canopy, Herbaceous, etc.);
    b. Estimate individual species absolute canopy percent covers for the stratum (e.g., *Quercus virginiana* in the Tree Canopy);
    c. Add up species covers within the stratum, and compare to total stratum cover and sort out any discrepancies, recognizing that overlap can occur between species and layers

and that you are only recording cover of dominant species (e.g., cover of minor species will not appear on the data sheet and absolute cover of all dominant species may be lower or higher than total stratum cover in many cases);

d. Check boxes if you feel the species is "diagnostic" of the particular community type that you are standing in.

4. Check your list of species to be sure that each is clearly written out. Whenever possible, use the species names that match the taxonomic authority for your project.

Some guidance on estimating cover

The percent cover of the stratum is the total vertical projection of the canopy cover of all species collectively onto the ground, not the sum of the individual percent covers of all species in the stratum.

Plants are assigned to strata based on their predominant position or height in the stand, not by their taxonomy or mature growth form. Consequently, a tree species that has both seedlings and saplings in an AA site could be listed in several strata.

Epiphytes and lianas (E/NV) are handled by listing them in the strata in which they occur. Thus, they may also be listed on the field form in more than one stratum.

The nonvascular stratum (sometimes called moss, bryoid, or ground stratum) is reserved strictly for very low growing cryptogams (mosses, lichens, liverworts, algae, and bacteria), even where herbs or woody plants may be reduced to very short heights.

The herbaceous stratum (H) includes all low woody, semi-woody plants, or creeping vines, where these overlap in height with the herbs. This is a compromise between strata based strictly on height versus growth form.

The emergent aquatic stratum (A1) includes emergent plants with most of their biomass at a height above the water surface (e.g., *Sagittaria lancifolia*, *Typha* sp., *Phragmites australis*).

Floating-leaved/submersed aquatic stratum (A2): floating aquatic vegetation includes rooted or drifting plants that float on the water surface (e.g., duckweed, water-lily). Submersed aquatic vegetation includes rooted or drifting plants that by-and-large remain submerged in the water column or on the aquatic bottom (e.g., *Ceratophyllum demersum*). The focus is on the overall strata arrangement of these aquatic plants.

Collecting Specimens

Field teams should have sufficient botanical expertise to identify most species encountered in the project area. If this is not possible, an expert taxonomist should be identified early in the project. A large backlog of unidentified pressed specimens should be avoided, as storing and curating large numbers of specimens becomes inefficient. **Our permit for JELA specifies that all specimens should be destroyed once identification is complete, unless there is a specimen that we feel may be important for the Park. Exceptions of this type include species that might be new to the**

Park's species list as well as species that are potentially rare. If you encounter a plant like this, please notify the permit holder (Rickie White) and we will decide together whether or not to press and dry the plant so that it may later be turned over to Park staff. If the team cannot identify a plant to species, they should record it on the form as "unknown species 1," "unknown species 2," "unknown *Carex* sp. 1," etc. They can record associated cover class and other data for the unknown as they would for any other species. They can then do one of two things:

1. If the team needs the species identified right away because it appears to be dominant or diagnostic (they'll be seeing it all over the place or it's much more common in this particular vegetation type than in others), they can take a sample of the species with as much of the plant as possible, especially intact flower or fruiting parts, if present. Place the sample in a bag or on a sheet and label the bag or sheet with the AA site code and the name used on the data form (e.g., *Carex* sp.1). A member of the team should then try to key it out.
2. If specimens must be saved for identification beyond a few days, they must be dried and pressed but mounting is unnecessary unless they are to be housed in a herbarium. Aquatic plants should be handled as follows: place a mounting sheet at the bottom of a deep tray of water. Suspend the plant in the basin and arrange it as needed, then carefully remove from the basin. Place between blotters to dry. Mark the pressed specimen with the AA site code and the name used on the data form.

If possible, store specimens in a cool, dry place until ready to be pressed. Bagged specimens will keep fresh longer in the refrigerator or ice chest until pressed or identified. A judgment must be made early on regarding species that should be identified in the field versus those that can wait. Common plants recurring in many AA sites are best keyed in the field, whereas those encountered rarely or at very low cover may be keyed later, when manuals are likely to be readily accessible. A quick prioritization of what to key and what to press may be made based on the recurrence of the species in samples and on the cover-class estimate of the species in a particular AA site. Field teams should mark the specimen tag with its cover class estimate and any notes helpful in identification such as "shrub" or "wetland emergent plant", as well as its unique identifying number for the vegetation sample. This use of an identifying number is particularly important if more than one unknown from a particular genus is collected in a plot. If pressed specimens begin to build up, teams should let their project supervisor know. The supervisor/coordinator can then take steps to have some of them identified.

Classifying the AA Site

Once all data have been collected at an AA site, the field team needs to provide a classification name for the vegetation. Field teams will have a vegetation key for use in making this determination. Typically, physiognomy and floristics will both be important to place a community within the USNVC. If there is confusion about how to classify the AA site or if the vegetation key does not work well, that should be noted on the AA Form. The concepts of "confidence" and "fit" allow users to record how confident they are that the call they made is the correct call based on their experience in the field as well as how well the vegetation type "keyed out" (or fit). Additionally, if the vegetation key does not work well at a specific site, the AA crew should still record a best fit

vegetation type based on the field key, again, noting that the vegetation type assigned to the site is the "best fit" and scoring the fit as low and the confidence as high, medium, or low depending upon their professional opinion.

If the key fails repeatedly in one area, please look at and make notes on how the key may be improved to provide the best outcome and suggest changes to the project supervisor/coordinator.

Before Leaving Each AA Site…

Before heading off, be sure to check the forms over to be sure all of the categories have been completed. In particular:

1. Look over the various strata categories and be sure there are cover values for all strata and species within each stratum or substratum.
2. Look over the dominant species lists to be sure none were missed that were called out or observed.
3. Review the descriptive fields that summarize the overall impression of the stand (environmental comments, unvegetated surface, representativeness, adjacent vegetation communities, fit, confidence, and classification comments). If these haven't been filled out, now is a good time to do this.
4. Check the equipment list to be sure nothing is left behind and that any flagging has been cleaned up.

Before Leaving the Field Each Day…

Before heading out of the field at the end of each day, teams MUST call back in to "close" their fieldwork plan. This means they need to call 1-855-289-7412 and give their field leader name, mention that they are closing the field/float plan for the day, and give your cell phone number once more. This is very important to avoid unneeded Park staff time that will be triggered if you do not call in to mention you are leaving the field.

Final Steps Including Turning in Data Each Week

Perhaps the most important step, turning in data in a timely manner will help us complete the project on-time and on-budget. It will also keep loss of data down to a minimum since data that piles up can often disappear or get so disorganized as to create confusion and data loss. So, here are the key steps to complete before and during the handoff of data:

1. At the end of each week (or longer) stint of fieldwork, before leaving field, please immediately call, email, or text the name of each AA site that was visited during your field week to Rickie White and Carl Nordman at NatureServe.
2. At end of each week (once you get back to office), download all GPS points you collected as well as all field photos to your computer. Scan all data sheets as a backup and send originals via mail to Rickie White at NatureServe within 1 week of end of the field week (601A Foster Street, Durham, NC 27701).

3. Upload scanned field forms, field photos and GPS files for corresponding sites to the NatureServe transfer site using the instructions in the "Upload-instructions.doc" file that we have given you.

Detailed Contents of the Field Form

LOCATION INFORMATION

State
State code has been provided

AA Point Code
Number for the AA point, from AA map or from pre-loaded list in the GPS unit. In the GPS unit, these may be called RndID projected in NAD83 UTM Zone 15.

GPS Point Code
Code for the coordinates saved in the GPS. At JELA, we are using "J" plus a four-digit number. The numbering should match the AA point code (for example, if the AA point code is "0001" the GPS point code should be recorded as "J0001").

Survey Date
Record the date the survey was taken; month and day, year has been provided.

AA Point Time
Record the time data collection was started at the site.

Field Team
Record the names of surveyors, with team leader listed first. The team leader is the person most responsible for the quality of the data recorded on the form and the first person to which questions about the data will be addressed. Full names should be recorded (full first and last name).

Photo of Form
Circle whether or not photos of the first page of the AA form were taken.

Photo Numbers
Record the individual photo numbers or range of photo numbers, as listed in the camera, taken at each specific site. For AA sites analyzed from the intended site center, there should be six photos. The first photo is of the AA field form after, at a minimum, the AA point code, GPS point code, and UTM coordinates and pertinent offset information have been written down. The next four photos should be in the four cardinal directions (N, E, S, W), starting with north. Since the photos taken in the cardinal directions may not capture the feel of the area, take one photo that best represents the sample area. Make sure and mark on the field form the photo #s or the order of the photos taken in the blank marked "photo #s" (order of photos should be "photo of form, N, E, S, W, representative photo).

When taking field photos for AA sites analyzed at an offset, teams should take 2 photos at each AA site. The first photo is of the AA field form after, at a minimum, the AA point code, GPS point code, and UTM coordinates and pertinent offset information have been written down. The second photo should best represent the sample area that was viewed from the offset.

Datum/UTM Zone
For the JELA project, the datum should be NAD 83. Garmin units automatically choose the UTM Zone (in the case of JELA, Zone 15 North) in which positional data is being collected.

WAAS Enabled
Is the WAAS system available and enabled on your GPS unit? Wide Area Augmentation System (WAAS) is an air navigation aid developed by the Federal Aviation Administration to augment the Global Positioning System (GPS), with the goal of improving its accuracy, integrity, and availability.

GPS Accuracy
Note the accuracy of your GPS Unit (in meters) and whether GPS averaging was used.

UTM X
Record UTM X coordinates, also called "easting", using a GPS unit.

UTM Y
Record UTM Y coordinates, also called "northing" using a GPS unit.

No. of Satellites
Record the number of satellites available to your GPS unit when recording the site location.

Iterations/GPS Score
Averaging GPS points is generally advisable. If you average, please do so ideally for 100 iterations.

GPS Point is Intentionally Offset
If the crew cannot reach the pre-set coordinates of the AA point, note the reason (e.g., dangerous slope, water, private property) then record the azimuth and estimated distance to the pre-set coordinates. If the assessment area around the original coordinates is visible and the crew feels they can accurately classify the vegetation (binoculars may be useful for this) they may continue with the analysis.

If the site has been assigned as a required offset on the field map, and the intended site center cannot be reached, please select "other" and note the site as a required offset (Note: all required offset AA sites may still be analyzed from the intended site center if said center can be reached by the field crew).

ENVIRONMENTAL DESCRIPTION
Elevation
Record the elevation (m) at which the GPS point was recorded. Note the source used to calculate elevation. The GPS unit is preferred as a source for elevation over the DRG maps, but the latter can

be used if necessary. If the GPS was not placed at ground level when recording, subtract the height (in meters) that the GPS was at when recording to get the correct elevation for that location.

Unvegetated Surface Substrate

Estimate ground or surface cover to the nearest percentage by each category, including woody stem basal area (Table 1). For surface features not provided on this list, use the "other" category, and note the feature. Cover estimates should sum to 100%. In cases where moss, lichen, sand or litter thinly covers the rock, ignore the less significant cover and record the total cover of rock. Rock and sand definitions are from Brady and Weil (2002).

Table G –1. Percent value descriptions to record unvegetated surface values within an accuracy assessment site.

Value	Description
Percent Leaf Litter / Organic Matter	Percent of surface that is litter
Percent Decaying Wood	Percent of surface that is wood >1 cm diameter
Percent Water	Percent of surface that is covered in water
Percent Mineral Soil / Sand	Percent of surface that is occupied by bare mineral soil or eolian or alluvial sand deposits (0.05 mm to 2.0 mm)
Other	Specify "Other" with brief note next to category

Slope

Measure the slope in degrees using a clinometer (exact measurement may not be possible/necessary for most AA sites in JELA but a value should always be recorded) or estimate using a compass that contains a slope-measuring device. Circle the appropriate slope degree that best describes each site.

Aspect

Measure the slope aspect (direction of slope) using a compass (be sure to correct for the magnetic declination). Note: all compasses should be pre-set to an average declination for JELA and thus, readings from the compasses carried by the field teams may be directly noted. Circle the aspect that best describes the site (again, this may not be possible/necessary for most AA sites in the Park but a value should always be recorded).

Topographic Position

Take a second to observe where the AA site is on the landscape, then choose one of the following categories: Upland/slope, Low level (terrace), or Channel bed.

Environmental Comments

Enter any additional noteworthy comments on the environmental setting. This field can be used to describe stand history such as flood or insect events (approximate date since last flood or insect event) as well as other disturbance or stand regeneration factors. Characteristics that affect vegetation, e.g., if site is a wetland (and for JELA it probably will be), indicate type of hydrology,

e.g., seepage wetland, temporarily flooded stream bottom, seasonally flooded pond, etc.; topographic position (circle the appropriate value), landform, evidence of natural and human disturbance, successional status, stand maturity, etc.

Sketch of Observation Area
Draw a sketch of the observation area, using aerial view or transect view or both: indicate north arrow, where GPS coordinates were collected, whether an offset point was needed, locations and bearings of photo points, AA site orientation, roads, trails, levees, bayous, as well as distinctive features of the vegetation, e.g., transitions to different vegetation types, or landscape features, etc. Site need not be circular if constrained by map guidelines. If site is not circular (constrained by map guidelines) please draw actual analysis area in the sketch.

VEGETATION STRUCTURE
Stratum, Strata Maximum Height, Cover Values by Strata
For all of the strata that are present, record the height and total cover. You should use the Height Scale and Cover Scale on the form. Estimate the stratum heights to the nearest height from the options provided.

Record the maximum cover class for each vertical vegetation stratum indicated on the table. The heights in the right column indicate the maximum height accepted for each stratum, Canopy (20 m, 35 m, >35 m), and Subcanopy (10 m, 20 m), Shrub (2 m, 5 m), Herbaceous (0.5 m, 1 m, or 2 m). The lowest stratum contains all woody plants <0.5 m tall and all herbaceous plants, regardless of height. Choose a default maximum height for each stratum.

VEGETATION COMPOSITION
List the absolute cover of all species with a cover value of more than 10% with a special emphasis on the species that you would consider to be characteristic of the vegetation at the AA site. You may list additional species which are present at lower cover if they are deemed to be diagnostic. Write the species in the “Species” column; indicate whether you consider it a diagnostic species for the purpose of classification, note if you have collected it for further ID work. Record species cover in the following cover classes:

P < 5%; 01 = 5-15%; 02 = 15-25%; 03 = 25-35%; 04 = 35-45%; 05 = 45-55%; 06 = 55-65%; 07 = 65-75%; 08 = 75-85%; 09 = 85-95%; 10=>95%

Species
Record the full taxon name or use the code from the list supplied by NatureServe.

Diagnostic Species
Place a check mark or X if the taxon is diagnostic of the vegetation community. A diagnostic taxon is any species whose relative constancy or abundance differentiates one vegetation type from another.

Total Cover
Record the total cover of the taxon throughout the entirety of the assessed area.

Canopy Layer (T2)
Record the total cover of the taxon in the tree canopy over the assessed area.

Subcanopy Layer (T3)
Record the total cover of the taxon in the subcanopy over the assessed area.

Shrub Layer (S1) [note: this field form only accommodates one shrub stratum]
Record the total cover of the taxon in the shrub stratum over the assessed area.

Herbaceous Layer (H)
Record the total cover of the taxon in the herbaceous layer over the assessed area.

Emergent Aquatic Layer (A1)
Record the total cover of the taxon in the emergent aquatic layer over the assessed area.

Floating-leaved/Submersed Aquatic (A2)
Record the total cover of the taxon in the floating-leaved/submersed aquatic layer over the assessed area.

Specimen Collected/Confidence in ID
Place a "Y" if a specimen was collected for this species.

Confidence in ID
Note the confidence in the identification of the taxon. H = High, M = Medium, L = Low.

POINT ASSESSMENT
MMU Size
Is the area of the vegetation being assessed equivalent to a 0.5 ha MMU or 0.25 ha MMU (Please circle)?

Representativeness
Is the area (AA site) of the vegetation being assessed around the AA point at least equivalent to one MMU? Indicate whether the vegetation is homogeneous, very patchy, or does it appear to be transitional between two types? Note whether there are other vegetation communities within or near the assessment area.

Fit
Rated as HIGH, MEDIUM, or LOW. Record both how easily the vegetation at the AA site keyed to a vegetation community AND how confident is the field crew that the vegetation types they keyed the site to actually fits the vegetation at the site. Vegetation at a site may fit the key well but the final classification may not match the community well or vice versa. IF you chose MEDIUM or LOW, record how well the key worked to classify the vegetation around the AA point. It is especially important to note any difficulties or questions encountered in classifying the AA site, either due to confusion with the vegetation key or disturbance/heterogeneity within the AA site.

Primary Field Call
This is the vegetation community that best fits the AA site, based on the vegetation key. Please use the Common Name of the vegetation type as listed in the vegetation key and record the ELCODE (e.g., CEGL00XXXX) of type that best fits the site.

Secondary Field Call
If the vegetation of the area at the AA site seems intermediary between two types or if there are two vegetation types prominent within the assessment area, record the second best fit in this field and record the ELCODE (e.g., CEGL00XXXX) and common name of that type as listed in the field key. Small inclusions of a second vegetation type in the assessment area are ignored.

D. CHECKLISTS FOR FIELD TEAMS

Planning for the Day

1. Safety and sustenance issues (plenty of food, water, proper clothing, first-aid kit, sun-screen)
2. Call in to 1-855-289-7412 to give them your plan for the day.
3. Check GPS (batteries, available memory, waypoints, below MMU assessment area polyline tracks, etc.)
4. Check digital camera (batteries, available memory)
5. Check list for all other field equipment
6. Plan day's mission before departure for day using hardcopy AA point map with flagged points. The goal should be completing 11 AA sites per full day in the field or 5–6 AA sites per half day in field.

Planning for the Week

1. Check for all appropriate maps, aerial imagery (if available), and AA point maps.
2. Develop an estimate of reasonable expectations of AA sites to choose for each team broken up by day and based on an estimate of individual team's travel logistics for the week. Goal for a one-week equivalent stretch should be 44 points/week or 88 points/week for a 2 week combined stretch.
3. Develop plan for the week to sample all AA points in work area.
4. Balance item 2 and 3 above with the expected work schedule of the teams and ensure adequate time off and reduce over-time concerns.
5. Check for all vital field materials; GPS units, camera, AA point maps, blank field forms, pencils, vegetation collection bags, etc.
6. Communication with management team and field teams.
   Submit fieldwork plan at least 24 hours prior to arriving at the Park by emailed it to jela_research@nps.gov
   All uncertainties dealt with (e.g., not able to get to some AA points, problems with interpreting PI information, personnel issues, problems in interpreting classification/key, Park-related logistics).
7. Organization of field teams:
   a. Gather Q.C.'ed field forms (allow time for Q.C. and resolving questions about the forms)
   b. Obtain all plants not identified (allow time for plant I.D.)

c. Were there any questions about the sites visited during the week?
d. What was accomplished, what was not accomplished?
e. Pass on the developments and questions to the management team on a regular basis. Don't let any issues build up too long.

Final Steps at Week's End

1. Compile list of AA sites sampled and send out to NatureServe immediately.
2. Upload all GPS point data and photo data to transfer site within 1 week of data collection.
3. Scan data sheets or create hardcopy backup prior to mailing them to 601A Foster Street, Durham, NC 27701 within 1 week of data collection.

Materials

- AA point maps
- road / trail maps / levee and bayou
- compass
- GPS receiver (checked daily to ensure that it is set correctly (to NAD 83)
- clinometer
- camera, batteries, extra batteries, and memory card (allow at least 6 exposures per AA site)
- baggies
- pencils, pens, permanent markers
- AA forms, including some on rite in the rain paper
- classification report for the project
- vegetation key
- field sampling manual
- loupe/magnifier for identifying plants
- botanical manuals

Appendix H: Accuracy Assessment Reconciliation

Contents

Page

Explanation of Accuracy Assessment Reconciliation H-4

A. FXMD and FOSB H-5

B. FXWD H-5

C. FXTF and FXTU H-5

D. HBCM and HWSM H-6

E. SXGM and SZZM H-6

F. FXWL H-6

G. CEGL004178 and HCRM H-7

Explanation of Accuracy Assessment Reconciliation

This appendix presents the steps used to reconcile the vegetation map layer following the accuracy assessment (AA) analysis for the Jean Lafitte National Historical Park and Preserve (JELA, also referred to as the "Park") vegetation mapping project. This process involved presenting to National Park Service (NPS) staff from JELA and Gulf Network (GULN) a review of how and why vegetation map classes did not meet NPS Vegetation Mapping Inventory (VMI) Program standards, providing a suggestion for how to remedy the issue, and explaining the benefits and consequences of accepting the suggestion.

The standard set by the NPS VMI Program is that a map class be at least 80% accurate within the 90% confidence interval for the map class; the upper limit 90% confidence interval is abbreviated as (UL–CI). The map classes referenced in this appendix and what became of each class are listed in table H–1. The information listed in table H–1 helps to understand the process and maintain continuity with the final map classification for JELA. Please reference Table H–1 for map class acronyms in this appendix only.

Table H–1. Original map-class codes and names that existed prior to accuracy assessment map reconciliation, linked to current map-class codes and names.*

Original Map-Class Code	Original Accuracy				Vegetation Type Code(s)	New Map-Class Code	New Accuracy			
	Users'		Producers'				Users'		Producers'	
	Straight	UL–CI	Straight	UL–CI			Straight	UL–CI	Straight	UL–CI
FXMD	78%	95%	49%	64%	CEPS004809	FXBD	71%	84%	70%	82%
FOSB	32%	52%	100%	108%	CEGL004619					
FXWD	56%	78%	53%	74%	CEGL006671	FXWD	56%	78%	53%	74%
FXMD	78%	95%	49%	64%	CEPS004809	N/A	77%	86%	74%	84%
FOSB	32%	52%	100%	108%	CEGL004619					
FXWD	56%	78%	53%	74%	CEGL006671					
FXTF	53%	69%	81%	97%	CEGL007412	FXCT	77%	90%	82%	94%
FXTU	100%	117%	25%	50%	CEGL007037					
HBCM	90%	101%	51%	63%	CEGL008476	HBSM	93%	99%	93%	99%
HWSM	14%	26%	67%	107%	CEGL007081					
SXGM	69%	91%	73%	95%	CEGL004657	SXSM	74%	93%	82%	101 %
SZZM	33%	95%	100%	150%	CEPP007085					
FXWL	55%	72%	84%	101%	CEGL007437	FXWL	55%	72%	84%	101 %
HCRM	100%	103%	100%	103%	CEGL007891	HRSM	100%	103%	100%	103 %
N/A	-	-	-	-	CEGL004178					

*Vegetation types are presented by map class to complete the bridge between original and new map classes. UL–CI, Upper Limit–Confidence Interval

A. FXMD and FOSB

Confusion between the ruderal upland forest FXMD and remnant oak bottomland forest FOSB

Problem: In remnant oak bottomland forest areas that have lost all oak, these forests classify as ruderal upland hardwood forest.

Suggestion: Collapse FXMD and FOSB into a single map class, but provide Park staff with the original FOSB polygons for internal use only.

Consequences: While FOSB is an important map class from a managerial prospective, the AA results suggest it is more degraded or less widespread than mappers perceived. Consequentially, while the AA results suggest that all the FOSB in the Park is captured by the current FOSB mapping, a majority of the mapping is actually other upland forest vegetation types.

Park Staff Decision: Accept collapse of FXMD and FOSB, but maintain original polygons internally at the Park.

B. FXWD

FXWD has producers' and users' accuracy slightly below VMI Program standards

Problem: There was general confusion in mapping FXWD, a ruderal wetland forest. The confusion is broad and shallow for both producers' and users' accuracy, but generally limited to other wetland forest map classes. The map class has a UL–CI users' accuracy of 78% and a UL–CI producers' accuracy of 74%, which are below the VMI Program standard. Mathematically, the best solution is to combine FXWD with the new FXMD/FOSB map class (described in A.), but this results in the combination of upland and wetland forests and would introduce into the AA matrix significant confusion between upland and wetland forest map classes.

Suggestion: Accept a slightly lower accuracy on FXWD to preserve the FXMD/FOSB map class.

Consequences: FXWD will have accuracies slightly below the VMI Program standard, but will remain a primarily ruderal wetland forest map class.

Park Staff Decision: Accept lower accuracies.

C. FXTF and FXTU

Confusion between upland and wetland ruderal tallowtree forests

Problem: Initially, mappers expected to be able to distinguish between upland and wetland tallowtree (*Triadica sebifera*) forests based upon landscape cues and perceived elevation of the ground, but the AA process identified generalized confusion between FXTF and FXTU. We believe that the difference in elevation, while obvious for the higher and lower examples of these map classes, breaks down as elevation approaches sea level.

Suggestion: Collapse FXTF and FXTU into a single map class.

Consequences: Collapsing these into a single map class will reduce the resolution of the map for different types of tallowtree forest, but greatly increase the ability of the map to resolve the location of tallowtree in the Park.

Park Staff Decision: Accept collapse of FXTF and FXTU.

D. HBCM and HWSM

Significant confusion between HBCM and HWSM in areas impacted by nutria

Problem: Initially, mappers expected to be able to distinguish these two map classes based upon signature and the visual evidence of nutria (*Myocastor coypus*) disturbance. However, the AA process identified systematic confusion between HBCM and HWSM to such a degree that we believe there was an underlying issue. Options discussed include: an unrecognized signature for HBCM, the rapid succession of HWSM into HBCM, or difference in signature presentation between different sections of the marsh. Irrespective of the cause, the result is the inability to distinguish HBCM from HWSM.

Suggestion: Collapse HBCM and HWSM.

Consequences: Collapsing these map classes would result in the loss of the ability to discern nutria damage using the map (as this was primarily mapped HWSM). However, AA results suggest there is a strong relation between nutria damage and the HBCM map class so this combined HBCM/HWSM map class may still provide guidance for nutria damage.

Park Staff Decision: Accept collapse of HBCM and HWSM.

E. SXGM and SZZM

The very rare SZZM map class is mapped poorly

Problem: While the ruderal SZZM map class meets VMI Program standards, it only does so as an artifact of the statistical analysis caused by a low sample size. Because this map class is rare, only three AA sites were sampled and only one of those was correct. The SZZM map class was also identified to be confused with the SXGM, another ruderal shrub map class.

Suggestion: Collapse SZZM into SXGM.

Consequences: The one known location of SZZM has data from both the mapping field reconnaissance and the AA analysis. While SZZM will no longer exist in the map, the Park will maintain location data for the known instance of this vegetation type.

Park Staff Decision: Accept collapse of SXGM and SZZM.

F. FXWL

FXWL has users' accuracy below VMI Program standards

Problem: There was general confusion in mapping FXWL, a ruderal wetland forest dominated by willow (*Salix* spp.). The confusion is broad and shallow for users' accuracy, but generally limited to other wetland forest map classes. The map class has a UL–CI users' accuracy of 72%, which is

below the VMI Program standard. Unfortunately, the confusion does not present a simple way to bring the users' accuracy into compliance without grouping at least two other map classes together.

Suggestion: Accept a slightly lower accuracy on FXWL to preserve other, well-mapped map classes.

Consequences: Map user's will need to understand that while the FXWL map class does include most of the ruderal willow forest identified in the Park, it also contains a significant amount of other ruderal wetland forest map classes.

Park Staff Decision: Accept lower users' accuracy on FXWL.

G. CEGL004178 and HCRM

Discovery of CEGL004178 in HCRM

Problem: During the AA process, one instance of the association CEGL004178 was discovered. Mappers did not encounter CEGL004178 during the field reconnaissance efforts and interpreted the signature as an odd variant of HCRM. While ecologically different than the common reed (*Phragmites australis*) dominated HCRM, CEGL004178 is also dominated by the tall graminoid, sawgrass (*Cladium mariscus*). While not ideal, the AA process suggests that placing CEGL004178 in the HCRM map class is warranted given that it was not discovered in any other map class.

Suggestion: Add CEGL004178 to HCRM.

Consequences: Having a rare association of management interest mixed into a map class dominated by a much more common vegetation association.

Park Staff Decision: Accept addition of CEGL004178 to HCRM.

Appendix I: Accuracy Assessment Contingency Table

Explanation of the Contingency Table

The accuracy assessment (AA) contingency table (or matrix) for the Jean Lafitte National Historical Park and Preserve vegetation map layer is an array of numbers set out in rows and columns to compare results of vegetation types represented on the map layer to vegetation types as verified on the ground at AA sites. The AA matrix is graphically shown in Figure I–1, with kappa calculations (which accounts for chance agreements) presented in Figure I–2. Numbers listed within the green-shaded cells in Figure I–1 (listed collectively as a descending diagonal across the table from left to right) denote the number of agreements in classification between AA sites and the map layer. Contrary, numbers listed outside the green-shaded cells denote the number of disagreements and are placed in the matrix to indicate where the confusion to other map classes exists.

Map-class codes from this project are used in the matrix to identify vegetation types for ease of comparison during the analysis and are listed at the side of each row and the top of each column. A condensed crosswalk (cross-reference) between the map classes and the codes to vegetation types is provided within this appendix (Table I–1). This table lists the various vegetation types assigned to the map-class codes that are used to label vegetation types in this contingency table. For a comprehensive crosswalk between map classes and vegetation types, refer to the main report section or "Appendix E: Descriptions of Map Classes."

The columns present vegetation types, of which most are association types in the U.S. National Vegetation Classification. The vegetation types are listed by map-class codes of the map classes that represent the vegetation types. These columns tabulate the producer's accuracy by listing errors of exclusion (omission errors) present in the map. The rows present the map classes listed by their respective map-class codes. These rows tabulate the users' accuracy by listing errors of inclusion (commission errors) present in the map. Again, refer to the crosswalk for map-class names and links to vegetation types. Following the contingency table is another table listing the calculations for the kappa index, which provides for an adjustment for chance agreements.

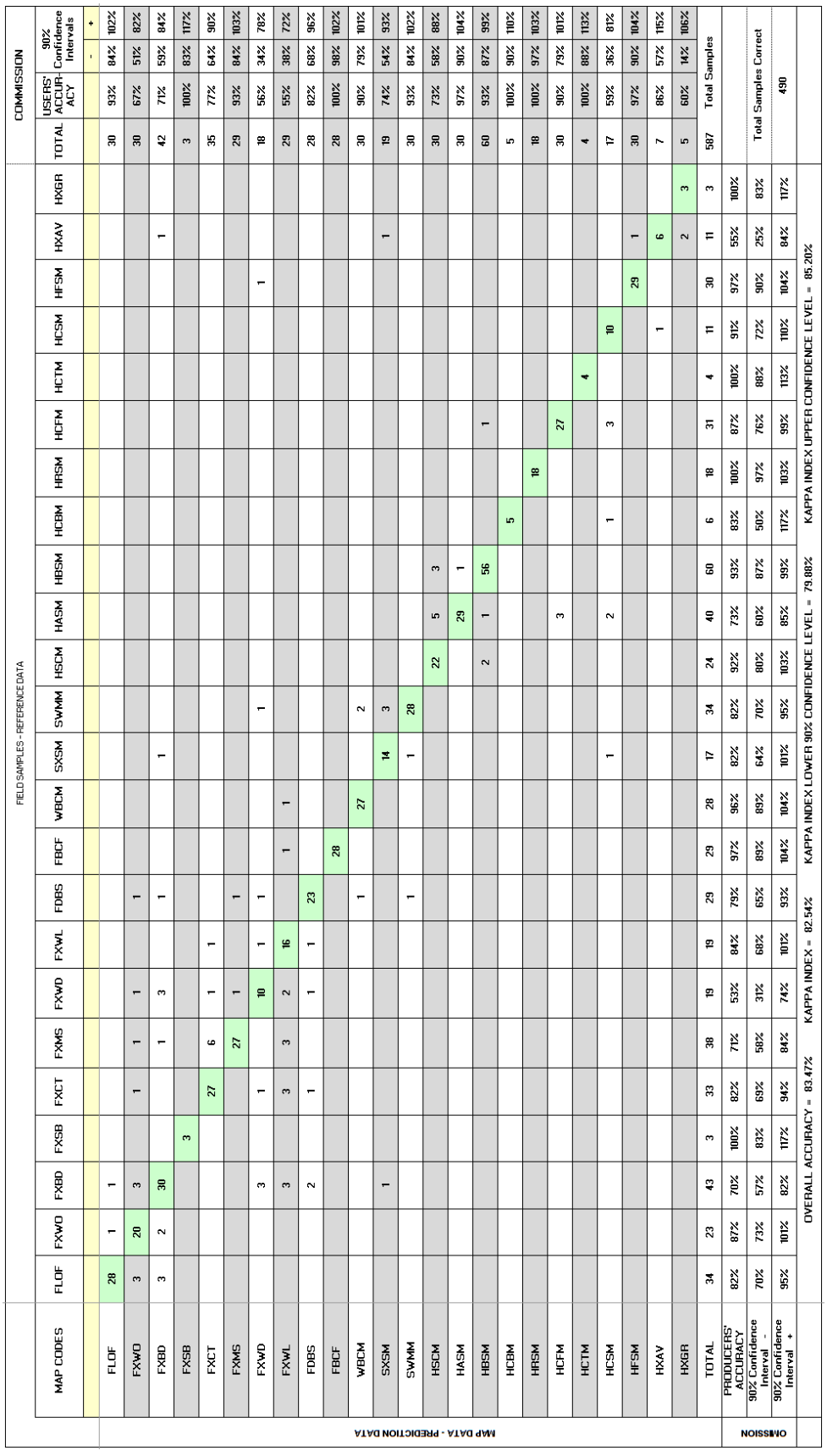


Figure I–1. Graphical presentation of the accuracy assessment contingency table for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

Code	P(row 1)	P(col i)	P(chance i)
FLOF	0.051107	0.057922	0.002960
FXWO	0.051107	0.039182	0.002003
FXBD	0.071550	0.073254	0.005241
FXSB	0.005111	0.005111	0.000026
FXCT	0.059625	0.056218	0.003352
FXMS	0.049404	0.064736	0.003198
FXWD	0.030664	0.032368	0.000993
FXWL	0.049404	0.032368	0.001599
FDBS	0.047700	0.049404	0.002357
FBCF	0.047700	0.049404	0.002357
WBCM	0.051107	0.047700	0.002438
SXSM	0.032368	0.028961	0.000937
SWMM	0.051107	0.057922	0.002960
HSCM	0.051107	0.040886	0.002090
HASM	0.051107	0.068143	0.003483
HBSM	0.102215	0.102215	0.010448
HCBM	0.008518	0.010221	0.000087
HRSM	0.030664	0.030664	0.000940
HCFM	0.051107	0.052811	0.002699
HCTM	0.006814	0.006814	0.000046
HCSM	0.028961	0.018739	0.000543
HFSM	0.051107	0.051107	0.002612
HXAV	0.011925	0.018739	0.000223
HXGR	0.008518	0.005111	0.000044
P(chance)	Total	1	0.053635

P(correct)	0.834753
P(chance)	0.053635
Kappa	0.825388
90%CI -	0.798760
90%CI+	0.852015

Figure I–2. Graphical presentation showing the kappa calculations for the accuracy assessment contingency table for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

Table I–1. Classification crosswalk (cross-reference) between map classes used in the accuracy assessment contingency table and the U.S. National Vegetation Classification codes to vegetation types for the Jean Lafitte National Historical Park and Preserve vegetation mapping project.

Map-Class Code	Map-Class Name	U.S. National Vegetation Classification Codes
FLOF	Natural Levee Live Oak Forest	CEGL004648
FXWO	Ruderal Water Oak Forest	CEGL004638
FXBD	Ruderal Bottomland Deciduous Forest	CEGL004619, CEGL004809
FXSB	Coastal Plain Ruderal Sugarberry Forest	CEGL004854
FXCT	Ruderal Chinese Tallow Forest	CEGL007037, CEGL007412
FXMS	Ruderal Mixed Spoil Bank Forest	CEPS009725
FXWD	Disturbed Woody Wetland	CEPS006671
FXWL	Ruderal Black Willow / Wax-myrtle Wet Forest	CEGL007437
FDBS	Delta Backslope Swamp Forest	CEGL007093, CEGL007229
FBCF	Bald-cypress - Tupelo Flooded Forest	CEGL002421, CEGL007422
WBCM	Bald-cypress Wooded Marsh	CEGL007065, CEPS009724
SXSM	Ruderal Shrub Marsh	CEGL004657, CEPP007085
SWMM	Wax-myrtle Shrub Marsh	CEGL007241, CEGL007834
HSCM	Mississippi River Deltaic Plain Saltmeadow Cordgrass - Cowpea Intermediate Marsh	CEGL007888
HASM	Arrowhead - Spikerush - Maidencane Marsh	CEGL004665, CEGL007886, CEGL007889
HBSM	Bulrush - Spikerush Marsh	CEGL007081, CEGL008476
HCBM	Gulf Coast California Bulrush Freshwater Marsh	CEGL003985
HRSM	Common Reed - Sawgrass Marsh	CEGL004178, CEGL007891
HCFM	Southern Cattail - American Cupscale - Bull-tongue Arrowhead Louisiana Freshwater Marsh	CEGL007235
HCTM	Southern Cattail Tidal Marsh	CEGL008456
HCSM	Coastal Plain Giant Cutgrass Slough Marsh	CEGL004139
HFSM	Floating & Submerged Aquatic Marsh	CEGL002386, CEGL003858, CEGL004323, CEGL007075, CEGL007076, CEGL007671, CEGL007689
HXAV	Eastern North America Ruderal Aquatic Vegetation	G595
HXGR	Eastern Ruderal Grassland	A3321

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U.S. Department of the Interior

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