



The Everglades National Park and Big Cypress National Preserve Vegetation Mapping Project

Interim Report—Southeast Saline Everglades (Region 2), Everglades National Park

Natural Resource Report NPS/SFCN/NRR—2017/1494



ON THE COVER

Photograph of southern Taylor Slough, Everglades National Park, taken by Pablo L. Ruiz on 19 June 2015.

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Acronyms and Abbreviations

2D	two dimensional
3D	three dimensional
AA	Accuracy Assessment Point
BICY	Big Cypress National Preserve
BT	Botanical Training Point
CERP	Comprehensive Everglades Restoration Plan
CIR	color infrared
cm	centimeters
EVER	Everglades National Park
FGDC	Federal Geographic Data Committee
GE	Greater Everglades
GPS	Global Positioning System
ha	Hectare
km	Kilometers
m	meter
MAP	Monitoring and Assessment Plan
msl	mean sea level
NAD	North American Datum
NIR	near-infrared
NPS	National Park Service
RECOVER	REstoration COordination and VERification
RMSE	Root Mean Square Error
SESE	Southeast Saline Everglades
SFWMD	South Florida Water Management District
TP	Training Point
USACE	United States Army Corps of Engineers
VCSF	Vegetation Classification System for South Florida Natural Areas
VMI	Vegetation Mapping Inventory Program
VP	Verification Point
WCA	Water Conservation Areas
WRDA	Water Resource Development Act

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Summary

The Everglades National Park (EVER) and Big Cypress National Preserve (BICY) vegetation mapping project is part of the Comprehensive Everglades Restoration Plan (CERP). It is a cooperative effort between the South Florida Water Management District (SFWMD), the United States Army Corps of Engineers (USACE), and the National Park Service (NPS) Vegetation Mapping Inventory Program (VMI). The goal of this project is to produce a spatially and thematically accurate vegetation map of EVER and BICY prior to the completion of restoration efforts. The vegetation map will serve as a record of baseline conditions to: (1) document changes to the spatial extent, pattern, and proportion of plant communities within these two federally managed units as they respond to hydrologic modifications resulting from the implementation of CERP; and (2) provide vegetation and land-cover information to NPS park managers and scientists for use in park management, resource management, research, and monitoring.

This project covers an area of approximately 7,400 square kilometers (1.84 million acres [ac]) and consists of seven mapping regions: four regions in EVER, Regions 1–4; and three in BICY, Regions 5–7 (Figure 1). The report that follows focuses on the mapping effort associated with Region 2, the Southeast Saline Everglades (SESE); an area that is geographically centered on southern Taylor Slough in Everglades NP. Region 2 encompasses a total area of 591.4 square kilometers (228.2 square miles [mi²] and 146,138 ac) and is bounded by Shark River Slough/Long Pine Key (Region 1) to the north, U.S Highway 1 to the east, Florida Bay to the south, and Flamingo (Region 3) to the west.

Photo-interpretation was performed by superimposing a 50 × 50 meter (164 × 164 feet [ft] or .25 hectare [.61 ac]) grid cell vector matrix over stereoscopic, 0.30 centimeter (11.8 inches [in]) spatial resolution, color-infrared aerial imagery on a digital photogrammetric workstation. Photo-interpreters identified the dominant community in each cell by applying majority rule algorithms, recognizing community specific spectral signatures alongside an aerial photograph interpretation key, and referencing an extensive ground-truth database. The dominant vegetation community within in each grid cell was classified using a hierarchical classification system developed specifically for this project. In addition, at each grid cell photo-interpreters noted any evidence of disturbance as either anthropogenic, fire, freeze, or windstorm and categorized the absolute cover of cattail (*Typha* sp.) and any exotic species present as either: Sparse (10–49%), Dominant (50–89%), or Monotypic (90–100%).

A total of 129 unique vegetation classes were identified within Region 2. The most common vegetation type was Red Mangrove Scrub-Open Marsh. This community accounted for approximately 17.3% of the map area. Other notable classes include Short Sawgrass Marsh-Dense (8.6%), Transitional Bayhead Shrubland (7.2%), Red Mangrove Scrub-Sawgrass Marsh (5.4%), Red Mangrove Scrub-Spikerush Marsh (4.6%), Spikerush Marsh (3.5%), and Transitional Bayhead Swamp Scrub-Sawgrass Marsh (2.5%). These seven classes and water (23.0%) account for 72.2% of the entire area mapped within Region 2. Based on 229 randomly selected points, the Region 2 map accuracy was determined to be 88.6% with a lower 90th percentile confidence level of 84.6%.

This report and the geospatial products developed in the preparation of the SESE, Region 2, vegetation map of EVER are stored on the Vegetation Map of the Southeast Saline Everglades (Region 2), Everglades National Park DVD. Stored items include:

- This vegetation inventory report that includes the methods, results, accuracy assessment, and the vegetation classification and photo-interpretation keys;
- An ESRI ArcGIS v10.4 geodatabase containing the SESE, Region 2, vegetation map;
- An ESRI ArcGIS v10.4 geodatabase containing all of the vegetation data collected and a library of oblique aerial photos captured at each vegetation point;
- The metadata for all spatial data; and
- An ESRI ArcGIS symbology legend file.

Please do not redistribute this report without a copy of the accompanying DVD (The Vegetation Map of the Southeast Saline Everglades [Region 2], Everglades National Park). Additional copies of the DVD are available from the NPS South Florida Caribbean Network or by contacting the author.

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Introduction

Everglades National Park & Big Cypress National Preserve Vegetation Mapping Project

The Everglades National Park (EVER) and Big Cypress National Preserve (BICY) vegetation mapping project is a component of the Comprehensive Everglades Restoration Plan (CERP). It is a cooperative effort between the South Florida Water Management District (SFWMD), the United States Army Corps of Engineers (USACE), and the National Park Service (NPS) Vegetation Mapping Inventory Program (VMI). The goal of the project is to produce a spatially and thematically accurate vegetation map of EVER and BICY. The vegetation map will serve as a record of baseline conditions to: (1) document changes to the spatial extent, pattern, and proportion of plant communities within these two federally managed units as they respond to management driven hydrologic modifications resulting from the implementation of CERP; and (2) provide vegetation and land-cover information to NPS park managers and scientists for use in park management, resource management, research, and monitoring.

This project covers an area of approximately 7,400 square kilometers (2,857 mi² or 1.84 million ac) and consists of seven mapping regions: four regions in EVER, Regions 1–4, and three in BICY, Regions 5–7 (Figure 1). This project was initiated in 2006 with a subcontract to Avineon, Inc. to map one-third of BICY (Region 7; 891 square kilometers [344 mi²] or 220,292 ac) and the NW corner of Region 4 in EVER (Figure 1). The SFWMD completed a 406 square kilometers (156.7 mi² or 100,378 ac) section of Region 1 in 2010 that included the northernmost portion of Region 1 (Figure 1). Upon completion of this initial section, the photo-interpretation portion of the EVER and BICY mapping effort was transferred to the USACE Jacksonville District office in Jacksonville, Florida, and project data collection and field support were delegated to the South Florida Caribbean Network (SFCN) in south Florida. In 2015, the SFCN took on the mapping responsibilities associated with Regions 2–6 of this project. This change allowed the project to take advantage of the SFCN's institutional knowledge of botany, community ecology, and remote sensing as well as efficiencies afforded by the network's proximity to EVER and BICY. USACE priorities then shifted towards the completion of Region 1 and assisting the SFCN with the final QA/QC of mapped products.

This report focuses on the mapping effort associated with Region 2, the Southeast Saline Everglades (SESE), a 591.4 square kilometers (228.2 mi² or 146,138 ac) area geographically centered on southern Taylor Slough in EVER. Shark River Slough/Long Pine Key (Region 1) bound it to the north, U.S Highway 1 to the east, Florida Bay to the south, and Cape Sable/Flamingo (Region 3) to the west (Figure 1).

Everglades National Park Greater Everglades Mapping Module

National Park Service
U.S. Department of the Interior

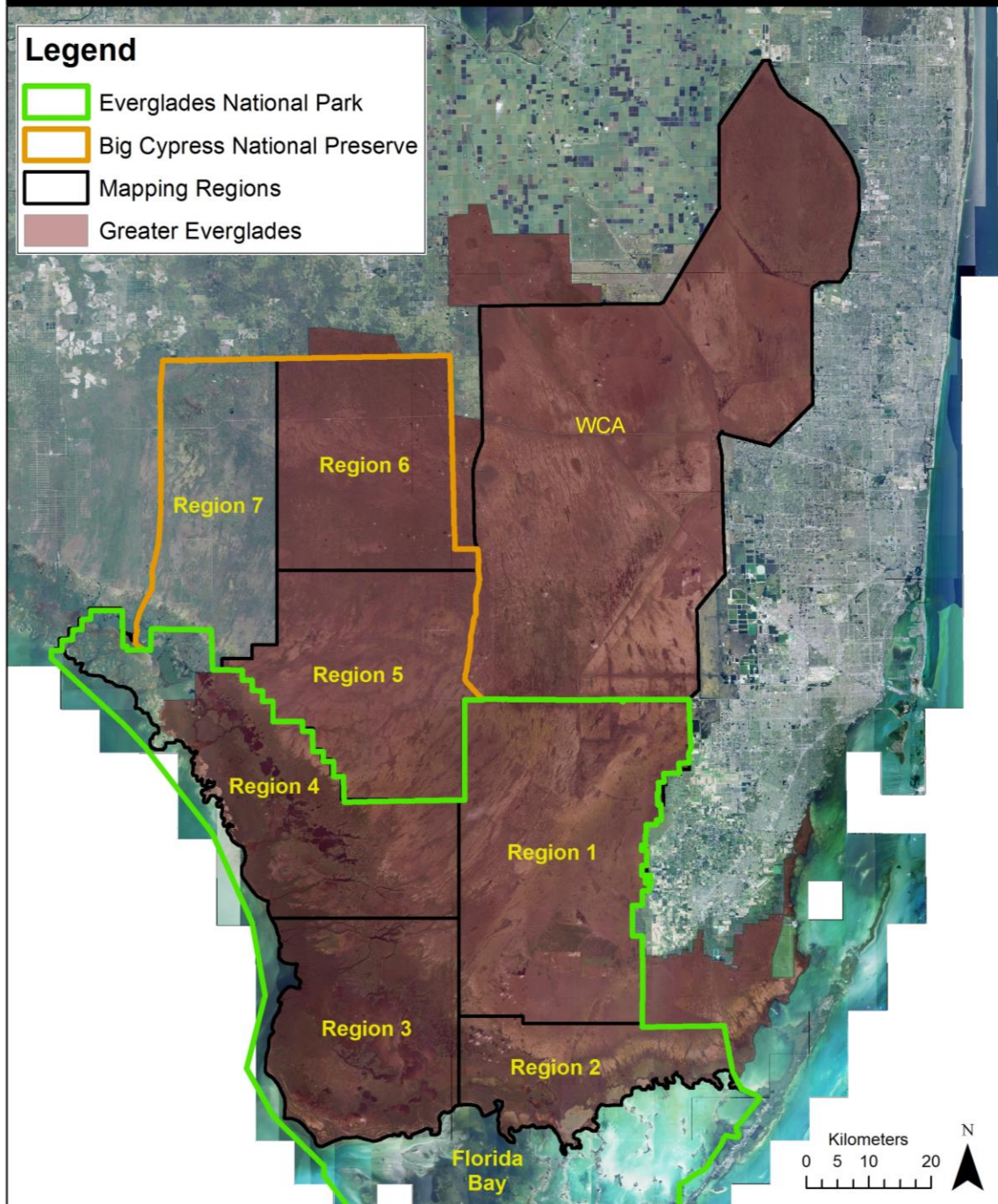


Figure 1. Greater Everglades mapping module and location of mapping regions within Everglades National Park and Big Cypress National Preserve.

Comprehensive Everglades Restoration Plan

Title VI Sec 601 of the Water Resource Development Act (WRDA) of 2000 authorized the CERP as the framework for the modifications and operational changes needed to restore, preserve, and protect the south Florida ecosystem (Water Resource Development Act 2000). As part of CERP, congress authorized the **RE**storation **CO**ordination and **VER**ification (RECOVER) program to: (1) organize and provide scientific and technical support to the interagency body of scientists and managers implementing the CERP, and (2) provide a mechanism, through the Monitoring and Assessment Plan (MAP), for assessing the performance of the CERP (RECOVER 2004). The goal of the CERP MAP is to have a system-wide monitoring and assessment plan that is supported and used by all CERP participants including tribal nations to track and measure system wide responses to the implementation of the CERP (RECOVER 2004).

The MAP consists of six monitoring modules designed to document and establish pre-restoration reference conditions for the Greater Everglades (GE) region, which includes EVER and BICY (Figure 1). MAP Module Number 3.1.3.4 specifically calls for the creation of a spatially and thematically accurate vegetation map of the entire GE project area that would serve, along with other metrics, as baseline conditions to assess the system wide performance of the CERP over the next several decades (RECOVER 2004).

For more information regarding CERP, please visit <http://141.232.10.32/pm/recover/recover.aspx>

The National Park Service Vegetation Mapping Inventory Program

The National Park Service Vegetation Mapping Inventory Program (NPS VMI) is a national program designed to classify, describe, and map the vegetation communities within all US national park units except Alaska¹. The design of the NPS VMI program is to address the local management needs of each park unit and provide vegetation inventory data for regional and national level management decisions. This program sets guidelines by which all park service vegetation mapping products must adhere. This ensures consistency throughout all park units and that all VMI mapping projects meet Federal Geographic Data Committee (FGDC) standards on vegetation classification system, metadata, minimum mapping unit, spatial accuracy, and minimum acceptable map accuracy (Owens 1999, Studd et al. 2013).

The NPS Biological Resource Management Division located in Fort Collins, Colorado manages the VMI and maintains a collaborative partnership with the United States Geological Survey Center for Biological Informatics, which provides scientific and technical oversight (Owens 1999). Since its inception in 1992, the NPS VMI has overseen 185 NPS VMI mapping projects. All NPS VMI mapping products are expected to be completed by 2022. For more information regarding the NPS VMI program, please visit <http://science.nature.nps.gov/im/inventory/veg/>

¹ National parks in Alaska are being mapped by the Alaska Landcover Inventory Program (<http://science.nature.nps.gov/im/units/akro/inventory/landcover.cfm>).

Everglades National Park and Big Cypress National Preserve

Everglades National Park

Everglades National Park is the third-largest national park within the contiguous United States, and the largest east of the Mississippi River. Congress authorized the establishment of EVER in 1934 to protect an ecosystem threatened by drainage, poaching, agricultural development, and urbanization. This was the first time that Congress authorized a national park for the protection of an ecosystem and its biological value, rather than a geographic feature.

Located on the southern tip of the Florida peninsula at about 2° north of the Tropic of Cancer (25.5° N Latitude), the climate of EVER is more similar to those of tropical regions than that of the continental United States (Duever et al. 1994). Mean daily temperatures typically range from 17–25°C (62.6–77°F) with average mean daily temperatures rarely falling below 10°C (50°F) during the winter months (Duever et al. 1994; Obeysekera et al. 1999). However, temperatures at or below freezing do occur. Freeze events in the interior Everglades may occur as frequently as once every two or three years (Ross et al. 2009). There is a well-defined rainy season, May through October; and a dry season, November through April. Rainfall during the summer rainy season typically accounts for nearly 60% of the annual rainfall, which ranges between 119–157 centimeters (46.8–61.8 inches [in]) per year (Duever et al. 1994).

Ground surface elevations within the park range from at or below mean sea level (msl) near the coast, to 4.3 meters (14.1 feet [ft]) above msl in the interior forests and tree islands. Vegetation communities are arranged along this narrow elevation gradient creating a patch mosaic of mangrove swamps, graminoids marshes and prairies, hammocks and pine forest, where elevational differences in millimeters not only determine inundation frequency and duration, but also the community type.

Because of its geographic location and mild climate, EVER is home to a unique assemblage of both tropical and temperate species. It is the only place in the world where alligators (*Alligator mississippiensis*) and crocodiles (*Crocodylus acutus*) coexist. It is home to 400 species of birds, 800 species of vertebrates, 1,600 species of vascular plants, and 125 species of fish (Patterson et al. 2008). Of these, 202 are federal- or state-listed species (Patterson et al. 2008).

Many of the external pressures and challenges which triggered the creation of EVER are present today. Management decisions and restoration efforts are tied to water quantity and quality issues. Additional stresses from exotic species like the Burmese Python (*Python bivittatus*) and Brazilian pepper (*Schinus terebinthifolius*), climate change and sea-level rise, and a host of others issues continue to challenge park managers and biologists.

Big Cypress National Preserve

Big Cypress National Preserve was officially established in 1974 to conserve and protect natural resources, ecological functionality, and recreational and native tribal land uses. Its designation as a preserve was the culmination of advocacy from groups of hunters, conservationists, native tribes, and regional water managers. The preserve was established to protect the biodiversity within it, as well as the watershed that provides freshwater to the downstream estuaries along EVER gulf coast. The preserve is connected to the Water Conservation Areas (WCA) to the east, the Gulf of Mexico to the

west, and EVER to the south (Figure 1). It is connected to several other natural areas that are managed to conserve and protect natural resources and endangered species like the Florida panther (*Puma concolor coryi*).

The vegetation communities of BICY are a mosaic of hardwood hammocks, pine woodlands, swamp forests including cypress domes, strand, and scrub communities, freshwater marshes and prairies, and coastal marshes and mangroves forests. These communities contain a high level of both plant and animal biodiversity including 122 federal or state listed species (Patterson et al. 2008). Hydroperiod, water depth, and water quality (including nutrients and salinity), as well as natural perturbations like fires and windstorms, are the primary drivers shaping the community structure and species composition across the preserve landscape.

The climate of the preserve is typical for south Florida. Mean annual temperature is about 23°C (73.4°F) and ranges from about 14°C (57.2°F) in the winter to as high as 28°C (82.4°F) in the summer (Duever et al. 1986). The rainy season is well defined, May through October, with mean annual precipitation averaging 136 centimeters (53.5 in; see Duever et al. 1986).

Ground elevations in the preserve range from 7 meters (22.9 ft) above msl in the northern portions of the preserve to 0.3 meters (.98 ft) above msl along the southern edge of the preserve (Duever et al. 1986). Like EVER, subtle differences in elevation typically lead to the presence of contrasting vegetation types within a few meters of each other.

Methods

Study Area

The SESE, Region 2, is geographically centered on southern Taylor Slough in EVER. It covers an area of 591.3 square kilometers (228.3 square miles [mi²]; see Figure 1). Shark River Slough/Long Pine Key (Region 1) bounds it to the north, U.S. Highway 1 on the east, Florida Bay to the south, and Flamingo (Region 3) to the west (Figure 1). The vegetation of the SESE is largely composed of short hydroperiod prairies, freshwater marsh, tree islands, short-statured mangrove swamps, coastal hammocks, mangrove forests, and salt marshes.

Harshberger (1914) broadly characterized and mapped the SESE as a coastal prairie consisting of a vast sawgrass (*Cladium jamaicense*) marsh with open pools and dotted with tree islands. He considered it a distinct phytogeographic region, separate from the GE because of the tidal influence and the presence of low statured red mangroves (*Rhizophora mangle*). In 1943, John Henry Davis (1943) mapped and described this region as a coastal marsh prairie consisting of shallow to deep marl and muck soils. However, he provided very little information about the floristic nature of the region except to say that it contained salt and brackish-water marshes and mangrove swamps.

A decade later, Egler (1952) described the area as an endless prairie dotted with numerous tree islands and referred to it as the Southeast Saline Everglades. Egler characterized the region into seven latitudinal belts (or ecotones) ordered from north to south. Belts 1 and 2, the northern most, which are outside the mapping footprint for Region 2, coincided with pinelands (Belt 1) and *Aristida* prairies (Belt 2). Belts 3 through 7, which fell exclusively within the mapping footprint of Region 2, represent the transitional zone between interior freshwater dominated marshes and prairies with numerous tree islands (Belts 3 and 4) and coastal marshes and swamps dominated by mangroves (Belts 5 through 7). Egler considered the region as “fossil,” lagging and slowly responding to a general decrease in fire frequency, a lower water table, and higher pore water salinities. He noted the encroachment of red mangrove into freshwater graminoid communities. Moreover, he foresaw their continued landward migration in response to the absence of fire and an increase in salt-water intrusion resulting from sea level rise and upstream anthropogenic modifications to the natural sheet-flow of freshwater throughout the SESE.

Egler describe the dominant belt in the SESE, Belt 3, as a vast and flat sawgrass marsh with numerous hammocks (tree islands) dominated by red bay (*Persea borbonia*). He went on to describe Belt 4 as a sparsely vegetated sawgrass marsh interspersed with pockets of Gulf Coast spikerush (*Eleocharis cellulosa*), emergent short-statured (typically less than 1 meter [3.2 ft] tall) red mangroves, and tree islands similar in composition and structure to those found in Belt 3. He noted that this belt had a white appearance on the aerial imagery² he analyzed Egler went on to described Belts 5 and 6 as being very similar to each other; a complicated patch mosaic of graminoid swamps, open water, and mangrove forests dominated by red mangrove, intermixed with black (*Avicennia*

² 1940 B&W 1:40,000 scale U.S. Department of Agriculture, Soil Conservation Service aerial imagery.

germinans) and white (*Laguncularia racemosa*) mangroves. The only difference, he noted, was the absence and replacement of sawgrass in Belt 6 by salt-tolerant species like seashore dropseed (*Sporobulus virginicus*), black rush (*Juncus roemerianus*), saltwort (*Batis maritima*), perennial glasswort (*Sarcocornia perennis*), and sea oxeye daisy (*Borrchia frutescens*) among others. The coastal southernmost belt, Belt 7, he described as a floristically simple and segregated coastal mangrove band dominated by red mangrove.

Five decades later Ross et al. (2000) found the SESE zonally arranged into four nearly parallel bands or groupings³. Ross et al. described the first grouping as a sawgrass marsh compositionally similar to Egler's Belt 3. Group 2 was a sawgrass-Gulf Coast spikerush marsh with short, statured red mangrove, in almost equal abundance and analogous to Egler's Belt 4. In addition, they documented that the interior boundary of Egler's Belt 4, the "White Zone," west of U.S. Highway 1, had shifted landward by nearly 1 kilometer (.62 mi) and that the vegetation composition of Egler's Belt 4 had changed to a monodominant red mangrove scrub community. The remaining two groups, Group 3 and Group 4, were equivalent to Egler's Belts 5, 6, and 7. Group 3 they described as a red mangrove scrub underlain by a sparse, salt-tolerant, graminoid community, while Group 4 was characterized by the presence of red mangrove interspersed by white mangrove and buttonwood (*Conocarpus erectus*) with an understory of halophytic herbs.

As part of the same study, Ross et al. (2013) characterized the tree islands within this region as Freshwater Swamps, Mixed Swamps, Mixed Mesic Forest, and Coastal Swamps. The Freshwater Swamp and Mixed Swamp tree island types share many of the same freshwater swamp species and are very similar to the tree islands described by Egler (1952). The only difference being the low relative abundance of pond cypress (*Taxodium distichum* var. *imbricarium*), Coastal Plain willow (*Salix caroliniana*), pond apple (*Annona glabra*) and sweet bay (*Magnolia virginiana*) found within Mixed Swamp tree islands (Ross et al. 2013). Mixed Mesic tree islands have a heterogeneous mixture of species with their center of distribution much more tropical in nature than the Freshwater Swamp and Mixed Swamp tree islands, e.g., poisonwood (*Metopium toxiferum*), spicewood (*Calyptanthes pallens*), pigeon plum (*Coccoloba diversifolia*), and several species of stopper (*Eugenia* sp.). The last type, the Coastal Swamp Forest consists of woody halotolerant species like buttonwood, and red, black, and white mangroves. Not surprisingly, these tree islands were found closest to the coast.

The natural disturbance regime of the SESE includes fires, freezes, windstorms, and hurricanes. Historically, fires occurred more frequently than they do today (Egler 1952). Today, most fires in the region are limited to its western boundary near the main park road. Fires on this western edge are typically prescribe fires designed to control woody plant encroachment into the coastal marshes. Occasional lightning fires still occur. However, shrubs, sparse vegetation, and open marsh communities not conducive to the spread of fire, have replaced the historical vegetative communities that would have provided the necessary fuels to carry a fire throughout the region. Egler (1952)

³ Ross et al. (2000) excluded Egler's (1952) Belt 1 and 2 from their study.

theorized that fire was the main driver controlling the northern limit of red mangrove in the SESE. Currently, in the absence of fire, and perhaps in response to sea-level rise, red mangroves have been slowly, but steadily moving further inland.

Freeze events, though rare, are a driver of vegetation patterning in south Florida and can have deleterious effects on mangroves (Craighead 1971; Olmsted 1993; Ross et al. 2009). Mangrove species, in particular red mangrove, can die off following a freeze event (Craighead 1971; Ross et al. 2000; Ross et al. 2009). For example, a severe freeze during the winter of 1989 damaged and killed many of the short-statured red mangroves with the SESE (see Ross et al. 2009). Similarly, a hard freeze in January of 2010 killed or damaged thousands of hectares of mangrove north of Whitewater Bay (author's personal observation).

Windstorms and hurricanes, and the tidal surge that accompanies these storms, can have long-lasting effects on the landscape by shifting communities from one stable state to another. Alexander (1967) noted that following Hurricane Betsy in 1965, Gulf Coast spikerush dominated marshes replaced many of the sawgrass marshes within the SESE. Alexander attributed this shift in communities to an increase in soil chlorides (salts) resulting from the storm surge. The Labor Day Hurricane in 1935, and Hurricane Donna in 1960, did considerable damage to the mangrove forests and coastal hammocks found within this region as well (Olmsted et al. 1981; Craighead & Gilbert 1962). More recently, in 2005, Hurricane Katrina and Hurricane Wilma affected the area. The effects of these two storms on the coastal communities are still visible today; with many of the coastal hammocks still exhibiting open canopies or canopies overtopped with lianas (Photo 1).



Photo 1. Windstorm damage, defoliation, and tree mortality of coastal forests dominated by buttonwood (*Conocarpus erectus*) along Florida Bay, Everglades National Park. Photo taken in June 2015.

Imagery

The base imagery used for the EVER vegetation map consists of 0.30 meters (.98 ft) spatial resolution multispectral digital color-infrared imagery procured by SFWMD in April 2009. The imagery was acquired using a Microsoft UltraCam Vexcel large format digital aerial camera, which provides Level 3 frame images in panchromatic and multispectral bands; red, green, blue, and near-infrared. Images were acquired at an average flight altitude of 4,163 meters (13,658 ft or 2.6 mi), with an average forward overlap of 60% to allow for stereoscopic visualization and estimation of vegetation height through a digital photogrammetric workstation.

A network of aerial targets deployed throughout EVER was used to verify the accuracy of the Airborne Global Positioning System (GPS) and Internal Measurement Unit onboard the aircraft collecting the 2009 imagery. The horizontal and vertical location of each target was determined using standard static GPS observation methods. Each target was referenced relative to the North American Datum (NAD) 1983 High Accuracy Reference Network, State Plane Coordinate System, Florida East Zone 901, and North American Vertical Datum of 1988 (NAVD88). A correlation analysis between the horizontal and vertical location of each aerial target and the imagery indicated that the horizontal and vertical accuracy of the image dataset met or exceeded FGDC standards for horizontal Second Order Class II (Root Mean Square Error [RMSE] 0.445 m) and vertical Third Order (RMSE 0.372

m) control points. The National Geodetic Survey Online Positioning Users Service processed the static GPS data.

Two additional reference image datasets, CERP RECOVER 2003/04 1:24,000 analog color infrared (CIR) aerial imagery and Miami-Dade County 2012 1-meter (3.2-ft) spatial resolution digital CIR imagery were used to assist photo-interpreters in the identification of the vegetation communities within Region 2.

Photo-interpretation

This project employed a grid-based, 50 × 50 meter- (164 × 164 ft-) grid (.25-hectare [.61-ac]) cell, majority rule mapping approach (Rutchey et al. 2008). In contrast to traditional vector mapping methods, where vegetation communities are delineated based on observable boundaries and a set minimum mapping unit (e.g., 10 square meters [107.76 ft² or 50 square meters [538.1 ft²]), grid-based mapping relies on the determination of the dominant/majority community or land cover type present within each grid cell.

At each grid cell photo-interpreters determine and classify the dominant vegetation community to species level, wherever possible, using the *Vegetation Classification System for South Florida Natural Areas* (Rutchey et al. 2006). In addition, at each grid cell photo-interpreters categorize the absolute cover of cattail (*Typha* sp.) and any exotic species present as either: Sparse (10–49%), Dominant (50–89%), or Monotypic (90–100%) and noted any evidence of disturbance as anthropogenic, fire, freeze, or windstorm. Grid cells heavily impacted by a disturbance event, like fire or windstorm, were classified by analyzing pre (2004) and post-disturbance (2012) imagery and site visits, whenever possible, to determine the original pre-disturbance community and if it had recovered. This was particularly effective when trying to classify the Coastal Hardwood Hammocks and Buttonwood Hammocks found along Florida Bay, which appeared heavily disturbed in the 2009 imagery.

Grid base mapping has significant advantages over the traditional vector mapping approach. For example it: (1) reduces mapping cost on a per-area basis; (2) reduces photo-interpreter variability; and (3) produces vegetation maps with more landscape heterogeneity since the photo-interpreter must view and classify the dominant vegetation or land cover type within each cell individually and independently of its neighbors (Rutchey and Godin 2009). In addition, grid-based maps are generally better suited for vegetation change analysis and complex map algebra than vector maps (Rutchey and Godin 2009). However, because of the aggregative nature of the majority rule, dominant vegetation classes tend to increase in overall abundance while minor classes tend to decrease in overall abundance becoming less common within the map (He et al. 2002). Consequently, if a grid cell contained two or more community types of nearly equal cover, the less abundant, rare community within the region is selected over a more common community. For example, in Shark River Slough, American white waterlily (*Nymphaea odorata*) sloughs are less abundant than sawgrass marshes or Gulf Coast spikerush sloughs. Thus, a split cell containing waterlily and another community type like sawgrass or Gulf Coast spikerush, having equal cover within the grid cell, is classified as waterlily to ensure that this community would not be underrepresented or missed entirely from the mapping product. Similarly, grid cells dominated by non-vegetative or exotic classes like water, mud, tidal

flat, Australian pine (*Casuarina equisetifolia*) or Brazilian pepper, for example, with at least 40% (natural) vegetation cover were classified based on the natural vegetation class and not the dominant non-vegetated or exotic class within the cell. Lastly, grid cells containing linear features like roads and canals were classified based on the vegetation community directly to the east of the non-vegetative feature within the grid cell. This ensured consistency between neighboring grid cells and across the entire map.

Photogrammetric Workstation

Photo-interpreters used a digital photogrammetric workstation running Summit Evolution v7.3 to analyze the 2009 CIR aerial imagery (Photo 2). Summit Evolution is a software package designed for viewing, capturing, and analyzing three-dimensional (3D) information from stereoscopic imagery. This photogrammetric software package integrates seamlessly with ESRI ArcGIS allowing for, but not limited to, the two-dimensional (2D) visualization of 3D data, vector data visualization and editing, and attribute population.

Spectral Channels

Photo-interpreters analyzed the spectral signature of each grid cell using one of 11 different customizable spectral channels in Summit Evolution (Table 1). Spectral channels 0, 1, 3, and 5, were the most frequently used to differentiate community types and species within each grid cell. For instance, spectral channel 0 was effective at indicating the presence of buttonwood within a grid cell; spectral channel 3 was effective in the identification of Transitional Bayhead Swamp Forest or Transitional Bayhead Swamp Shrubland communities; and, spectral channel 5 excelled at identifying red mangrove within a grid cell.

Vegetation Cover Estimation

Vegetation cover for each discrete community type present within a grid cell was determined by partitioning the photogrammetric workstation's cursor into 100 equal-sized squares, each 25 square meters (269 ft²) or 1% of the entire .25-hectare (.61-ac) grid cell. The parameters for the photogrammetric workstation cursor were set to: Grid size = 16.25; Columns = 11; and Rows = 11. This cursor arrangement allows photo-interpreters to count the total number of 25 square meter (269 ft²) squares occupied by each discrete community type within each grid cell and determine the dominant/majority class present within the grid cell.

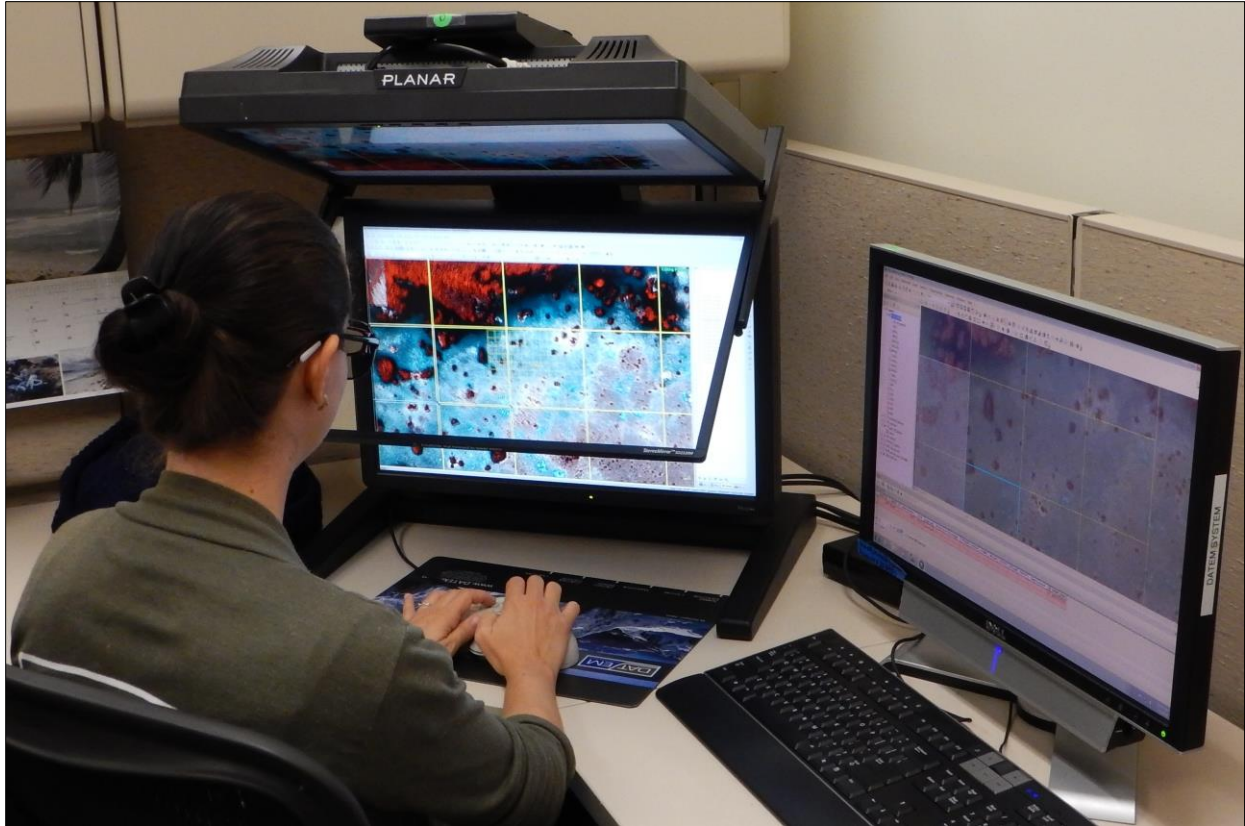


Photo 2. Photo-interpreter working on a Summit Evolution photogrammetric workstation.

Table 1. Designation of spectral channels and their corresponding spectral band (RGB-NIR) combination used in the Summit Evolution photogrammetric workstation to identify vegetation communities. Numbers in parenthesis correspond to the Summit Evolution assigned image band number.

Spectral Channel	Band Combination
0	Red(0), Green(1), Blue(2)
1	NIR(3), Red(0), Green(1)
2	NIR(3), Green(1), Blue(2)
3	NIR(3), Red(0), Blue(2)
4	Red(0), NIR(3), Green(1)
5	NIR(3), Blue(2), Green(1)
6	Red(0), Blue(2), Red(0)
7	Blue(2), NIR(3), Red(0)
8	NIR(3), Green(1), NIR(3)
9	Red(0), Blue(2), NIR(3)
10	NIR(3), Red(0), Red(0)

Canopy Height Estimation

Mean vegetation height for the dominant community type within each grid cell was determined by setting the map scale on the photogrammetric workstation to 1:100 and determining the canopy heights at a minimum of 10 randomly located points within the dominant community type found in each grid cell. The map scale in Summit Evolution is set to 1:100 to ensure consistency in height estimation across all workstations since 3D photogrammetric height estimates of digital images are scale-dependent due to the way the imagery is stored as hierarchical, low to high resolution, copies or image pyramids.

Vegetation Map

The SESE vegetation feature class consists of 236,578 .25-hectare (.61-ac) grid-cells. This feature class along with the Region 2 mapping boundary, a dissolve of the vegetation map based on vegetation classes, and a cross-reference table linking the vegetation code to the class name and levels within the classification system are stored in an ESRI ArcGIS v10.4 personal geodatabase. All geospatial data are referenced to the Universal Transverse Mercator (UTM) Zone 17N, North American Datum of 1983 (NAD83).

The SESE vegetation feature class contains nine attributes of which seven are photo-interpreter populated. The vegetation map dissolve feature class contains six attributes. The cross-reference table contains 11 attributes. Please see the metadata in the DVD for descriptions of the feature class attributes.

Vegetation Data Collection

Vegetation data collection on this project included Accuracy Assessment (AA) data points, discussed later in this document, Training Points (TP), Botanical Training (BT), and Verification Points (VP). A total of 2,559 TP, BT, and VP data points were collected within Region 2 (Figure 2).

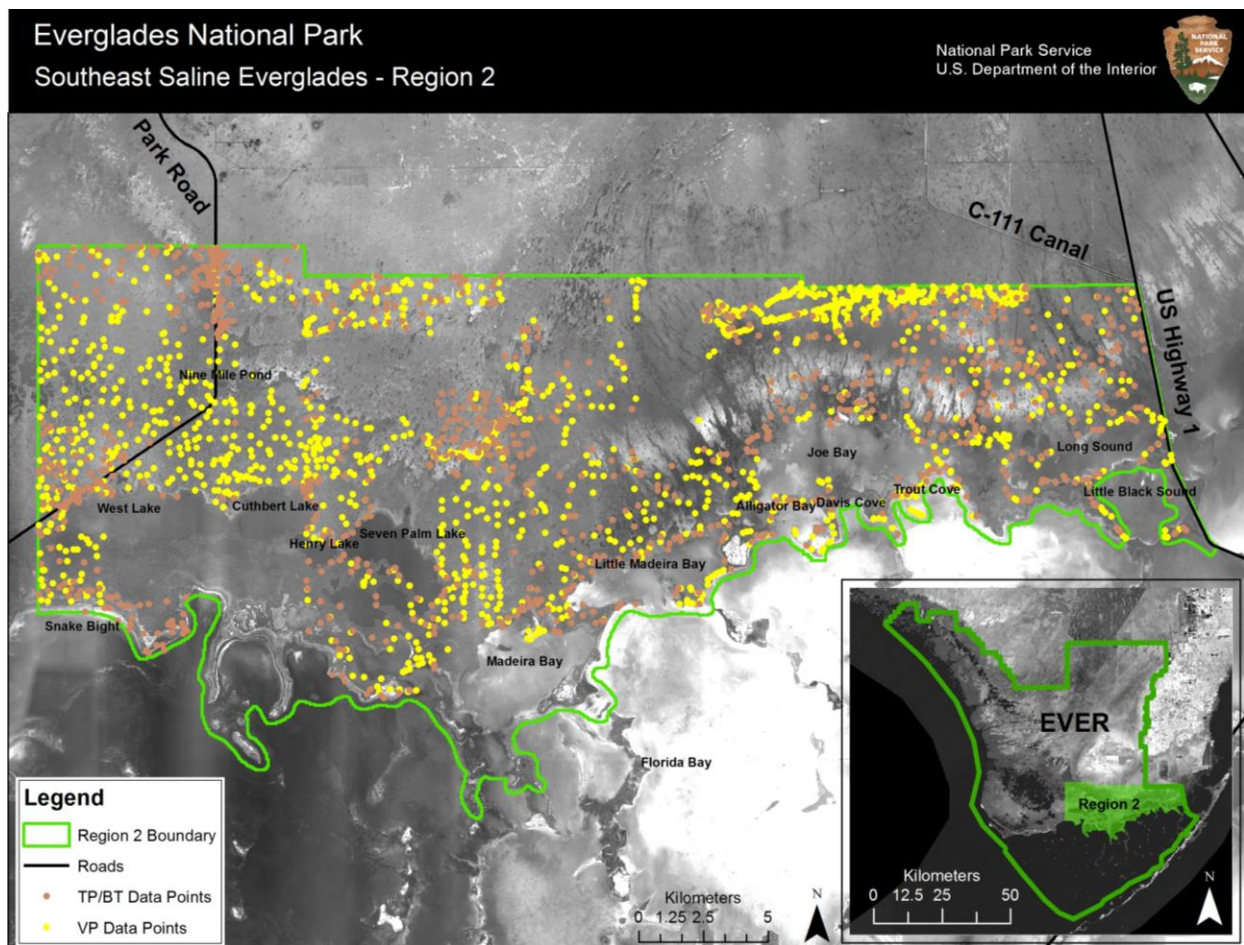


Figure 2. Location of Training Points (TP), Botanical Training Points (BT), and Verification Points (VP) collected within the Southeast Saline Everglades, Region 2, Everglades National Park.

The TP and BT data points provide species-specific compositional data and structural information. These two geospatial databases assist in the identification of the dominant community within each grid cell (TP points) or for botanical training (BT). In most cases, TP points characterize the dominant community within each grid cell. In some instances, however, they represent plant communities smaller than the .25-hectare (.61-ac) grid cell, e.g., patches of cattails, water lily, or other species-specific community type. Botanical training points are used to teach staff and photo-interpreters the flora and vegetation communities of south Florida. These data points are intended to characterize community types that extended beyond a single grid-cell, e.g., Bayhead Forests, Sawgrass Marshes, Black Mangrove Forests, or Cypress Swamps, even though they typically represent units smaller than the .25-hectare (.62-ac) mapping grid cell.

The data collection method for the TP, BT, and the AA (see Accuracy Assessment section below) data points is identical. Field staff record data on a pre-printed datasheet showing an aerial image of the area being sampled (Figure 3). Data recorded includes the overall canopy height and cover of the vegetation, the relative cover of each strata (Tree, Shrub, and Herb), the relative cover of the dominant species within each strata, and the maximum canopy height for each strata. In addition,

digital oblique photos taken at each TP, BT, or AA site document the structure and characteristics of the area sampled.

Sequence: Pt TP20867	Photo #: _____	GPS unit: 478com	Date/Time: 12/16/2014	Observers: BS / PR
Mark #: _____	Moved Point?: Y / N	Why: _____	Transport: helicopter	Heading: _____
			Direction: counter clockwise	
			General Description of Cell, Veg Type, Comments: (structures, roads, fire, storm damage, water cover, soil cover, etc.)	
			PI question: is this SMXcr	
			Dominant Vegetation Community in Polygon Vegetation Class: _____ Vegetation Cover: _____ % Average Height of Vegetation Class: _____ m	
			Cattail Code: _____ Exotic Codes: _____	
Tallest per Layer (m): Tree: _____ Shrub: _____ Herb: _____			Relative Cover of Plant Species (should add up to 100%) Note: 0.01% or "P" used to indicate species that are present but not a significant cover	
Trees: _____ % cover (list species and cover for each) 1) _____ 6) _____ 2) _____ 7) _____ 3) _____ 8) _____ 4) _____ 9) _____ 5) _____ 10) _____			Shrubs: _____ % cover (list species and cover for each) 1) _____ 6) _____ 2) _____ 7) _____ 3) _____ 8) _____ 4) _____ 9) _____ 5) _____ 10) _____	
			Herbs: _____ % cover (list species and cover for each) 1) _____ 6) _____ 2) _____ 7) _____ 3) _____ 8) _____ 4) _____ 9) _____ 5) _____ 10) _____	
N 0 5 10 20 Meters Background Imagery: CERP 2009 IR				

Figure 3. Example of datasheet used to collect vegetation data on this project.

The last type of vegetation data collected are the VP's. These data points complement the TP/BT data collection process and serve two purposes: (1) to confirm a common, typically homogeneous, spectral signature within the landscape, e.g., White Mangrove Shrubland or common reed (*Phragmites australis*) Marsh, and (2) document field observed vegetation information, e.g., clumps of cordgrass (*Spartina bakeri*) or black-topped sedge (*Schoenus nigricans*) within a contrasting vegetation type. Typically, structural and composition data is not collected. However, notes about key species and canopy height information is often recorded to assist photo-interpreters in recognizing species within the area of interest. The VP points are also used to document past disturbance history, exotic species presence, or any other natural phenomena encountered while conducting data collection missions. These data points take significantly less time to collect than TP or BT points and significantly reduce the cost associated with data collection on this project.

These data, including the AA data points, are stored in an ESRI ArcGIS v10.4 geodatabase and are referenced to the Universal Transverse Mercator (UTM) Zone 17N, North American Datum of 1983 (NAD83).

Vegetation Classification System

The Vegetation Classification System for South Florida Natural Areas (VCSF) is a multi-tiered hierarchical classification system developed specifically to map the natural areas occurring within the Greater Everglades (GE) restoration footprint, including the Florida Keys (Rutchev et al. 2006). Creation of the VCSF was a multi-year collaborative effort that included many of the top scientists, botanists, and experts on south Florida community ecology and botany. This classification system fills the gap in the level of detail and lack of specificity found within the U.S. National Vegetation Classification System when it came to the classification of south Florida plant communities (Rutchev et al. 2006). The current version of the VSCF is v6.10.09.

The VCSF is a living dynamic document; open to modification as new classes or communities not listed in the classification system are observed in the field. For example, in version v2.1.07 several modifications to the classification system were made in response to field observations and data collected by Ross et al. (2006). Similarly, Ruiz et al. (2008) suggested the inclusion of twenty-one new classes to the classification system based on their observations and work mapping Biscayne National Park. Since plant associations can be fluid combinations of many species, keeping the VCSF open to modification ensures that the classification system remains a useful and comparable way to record plant assemblages over successive generations of vegetation mapping.

The classification system used in this project (Appendix A) is a derivative of the VCSF. It differs from its parent system in several ways:

1. The hierarchical pathways between levels were modified to help photo-interpreters consistently reach the same vegetation class and reduce photo-interpreter variability.
2. Several vegetation class definitions were modified to clarify meaning and to reflect regional differences in species composition.
3. Vegetation classes not occurring within the Region 2 mapping area were removed, while region-specific observed and documented vegetation classes were added.
4. The vegetation classification key for exotic plant species is not included in this document because it includes all possible known exotic plant species present within south Florida.

The top of the classification system, **Level 1** (Class), provides the lowest level of detail, about plant communities and is based on dominant physiognomy and structure as followed:

- **Forest (F)** – Stands of trees (5 meters [16.4 ft] or taller) that are of high density (50–100% cover).

- **Woodland (W)** – Stands of trees (5 meters or taller) that are of low density (10-49% cover). Trees are evenly spaced out and often in a matrix of sparse shrubs, graminoids, and/or herbaceous vegetation.
- **Shrubland (S)** – Stands of shrubs (shorter than 5 meters) that are of high density (50-100% cover).
- **Scrub (C)** – Stands of shrubs (shorter than 5 meters) that are of low density (10-49% cover). Shrubs are evenly spaced out and often in a matrix of graminoids and/or herbaceous vegetation.
- **Marsh (M)** – Graminoid and/or herbaceous emergent or floating vegetation in shallow water that stands at or above the ground surface for much of the year. Prairie habitat is included in this class. A marsh can have low density (0-9%) tree and shrub cover.
- **Dune (D)** – Shrub, graminoid and/or herbaceous vegetation associated with beach dunes.
- **Submerged Aquatic Vegetation (A)** – Vegetation inhabiting a submerged freshwater or marine environment, e.g., *Vallisneria* spp. or *Thalassia* spp.
- **Exotic (E)** – Non-native plant species assemblages.
- **Other (O)** – Anthropogenic or non-vegetative features.

At the next level, **Level 2** (Subclass), the physiognomically defined **Level 1** is modified with a hydrologic designation, e.g., Wetland Forest vs Upland Forest; this is a new modification to the classification system not present in v6.10.09. The next lower level, **Level 3** (Group), replaces the hydrologically defined **Level 2** with a community designation based on additional physiognomic and environmental factors, e.g., Mangrove Forest, Swamp Forest, or Hardwood Hammock. At **Level 4** (Alliance), communities are defined based on the dominant diagnostic species in the upper most stratum, e.g., Black Mangrove Forest, Buttonwood Forest, or Live Oak Hammock. The remaining three levels of the classification system **Level 5** (Suballiance), **Level 6** (Association), and **Level 7** (Subassociation) continue to subdivide the previous community types by dominant canopy species composition and the understory species assemblages; for example, a **Level 7** mixed-mangrove scrub community in a matrix of sawgrass would have the following nomenclature Buttonwood-Red Mangrove Scrub-Sawgrass Marsh.

Taxonomic references in the classification system and this document utilize the Integrated Taxonomic Information System (<https://www.itis.gov/>).

Quality Assurance and Accuracy Assessment

Classification errors are a reality in all mapping projects. They are typically caused by confusion associated with one or more of the following factors: the spectral and spatial resolution of the imagery, the spectral separability of the feature(s) or attribute(s) being classified, the classification

system, or the skill set of the photo-interpreter team. In a large complex project with multiple photo-interpreters, managing for errors is critically important to ensure that the product meets expectations. Developing tools and techniques to help mitigate and reduce errors is an important aspect of this project.

Aerial Photo Interpretation Key

An aerial photograph interpretation key was developed and used in this project to assist photo-interpreters in the recognition of vegetation classes, based on spectral, structural, and locational clues in the imagery, and to reduce photo-interpreter variability (Appendix B). The key works much like a traditional dichotomous key; providing decision pathways that reduce the number of potential choices available to the photo-interpreter to a few or single best choice. Class descriptions utilize eight basic descriptive parameters: (1) size (e.g., length, width, and height); (2) shape (e.g., round, irregular, elliptical, conical, etc.); (3) color (e.g., red, green, white, etc.); (4) tone (e.g. bright, dark, light, etc.); (5) texture (e.g. smooth, rough, etc.); (6) pattern (e.g. regular, spotted, irregular, wavy, etc.); (7) shadow (e.g. long, narrow, short, circular etc.); and (8) spatial location within the mapping area or to an adjacent community type or physiographic feature.

Photo-interpreter Assessment

Photo-interpreter classification skills and their understanding of south Florida vegetation communities was assessed by having all photo-interpreters classify five randomly distributed mapping clusters, consisting of 100 grid cells each, within Region 2. This procedure allowed for an evaluation of how well each photo-interpreter understands the mapping methodology as well as the vegetation communities within Region 2. It also facilitated an open discussion between all photo-interpreters; creating a peer-to-peer learning environment.

QA/QC of Mapped Products

Quality assurance and quality control of photo-interpreter mapped products follows the protocol outlined in Rutchey et al. (2008). The lead photo-interpreter verified each grid cell in the stereo environment to ensure that no cell was misclassified due to clerical errors, majority rule determination including class exceptions, and that no artificial edges existed between photo-interpreter mapped products and previously checked areas. Mapping inconsistencies were addressed in an open discussion with all photo-interpreters participating to ensure that these types of errors would be minimized or eliminated in the future.

Accuracy Assessment

The thematic accuracy of the EVER/BICY vegetation map will be assessed using 2,114 randomly selected grid cells (AA points) collected between 2010 and 2015⁴. The AA data contains the same type of information collected in the TP and BT points discussed previously in this document (see Vegetation Data Collection section), thus its timely collection ensured that temporal vegetation change resulting from natural community succession or perturbation events, like fires and

⁴ AA data for EVER was collected between 2010 and 2013 while the BICY data was collected in 2015, one year after image acquisition.

windstorms, would not affect final map accuracy. All of the AA data collected in Region 2 was collected within one year of image acquisition.

To ascertain the level of confidence associated with this mapping project and the vegetation classes being mapped a preliminary assessment of thematic accuracy was conducted. The thematic accuracy of the Region 2 vegetation map was calculated as the total number of AA points considered acceptable divided by the total number of AA points collected in Region 2, 229 (Figure 4). In addition, a 1-tailed 90% confidence level was calculated using Zar (1999, p. 527) to determine whether the overall map accuracy was equal to or greater than 80% with 90% confidence as required by the NPS VMI.

Acceptable AA points included both (a) those that had a one-to-one match between the vegetation class on the map and the field collected AA point data, and (b) those for which the vegetation class was different, but considered acceptable because the point data observation was at the cutoff between categories. Grid cells were accepted or rejected based on a thorough review of the AA data and photos collected, and a strict set of criteria.

Reasons for accepting cells without a one-to-one match included:

- When the AA classification was at a more detailed level than the vegetation map classification but the vegetation map class was correct at the level mapped.
- When the vegetation map class was at a more detailed level than the AA classification, but the field notes supported the more detailed label as correct.
- When the AA data indicated that the vegetation label was at the boundary between two classes due to height or cover cutoff parameters, i.e. 5-meters (16.4-ft) height between Shrubland and Forest or 50% cover for Scrub and Shrubland. For example, if a Red Mangrove Shrubland was misclassified as a Red Mangrove Forest, the Red Mangrove Forest was accepted because the species composition was correct. This reasoning would apply to Forest vs Woodland that have a 50% cover cutoff or Marsh vs Scrub that have a 10% woody cover cutoff or for understory graminoid cover.
- When the class modifier for sawgrass, which includes short-dense, short-sparse, tall-dense, and tall-sparse, was misclassified due to cover or height cutoff parameters.

The project manager, lead photo-interpreter, or the photo-interpreters working on the project did not have access to the AA data collected.

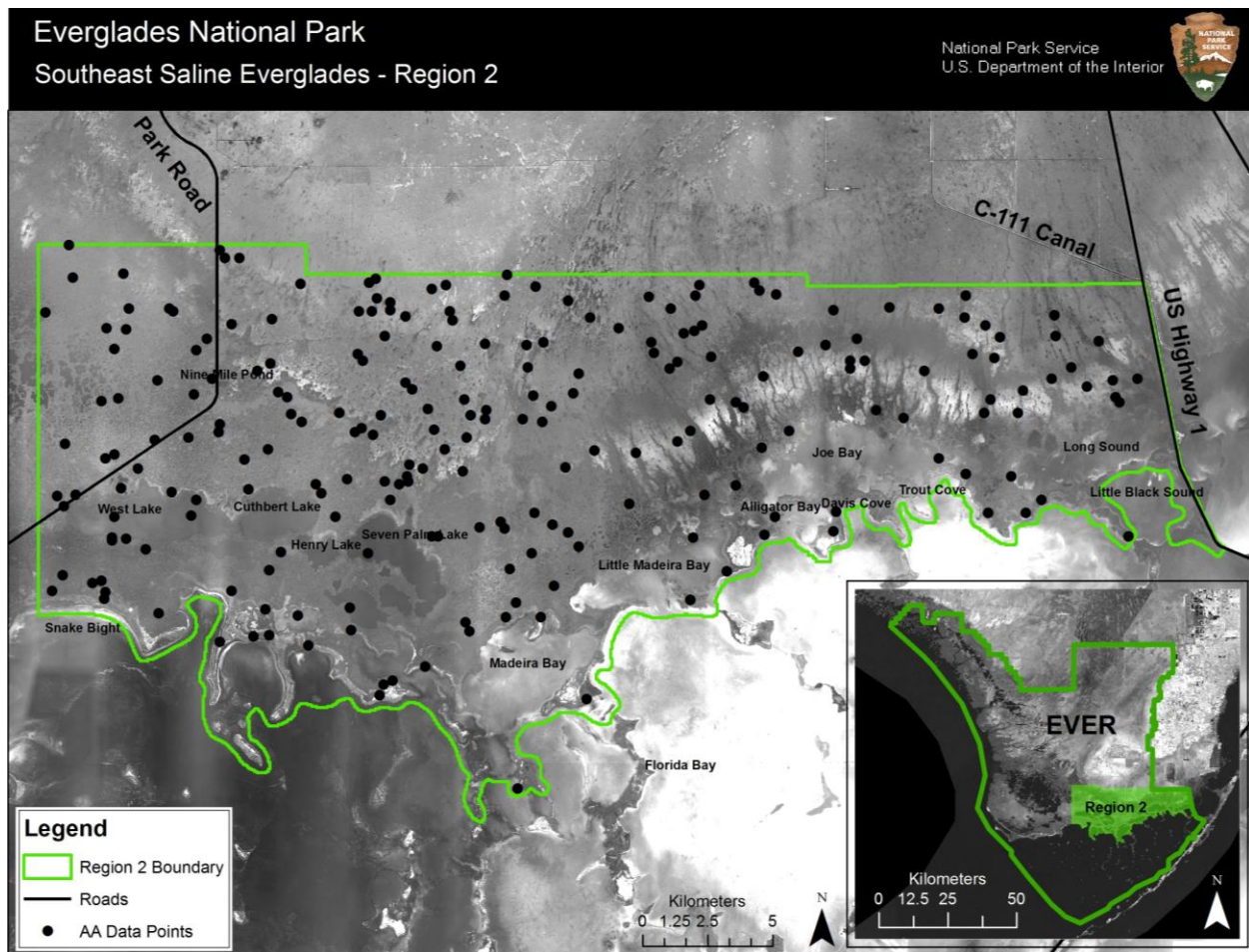


Figure 4. Location of accuracy assessments (AA) points collected within the Southeast Saline Everglades, Region 2, Everglades National Park.

Results

Vegetation

One hundred twenty-nine unique vegetation classes were used within Region 2 (Figure 5). Most classes, 84.5% (109 out of 129), accounted for less than 1% of the map (Appendix C). The most common vegetation class, Red Mangrove Scrub-Open Marsh, accounted for 17.3% (10,231 hectares [25,281 ac]) of the area mapped. Other notable classes included Short Sawgrass Marsh-Dense (8.6%), Transitional Bayhead Shrubland (7.2%), Red Mangrove Scrub-Sawgrass Marsh (5.4%), Red Mangrove Scrub-Spikerush Marsh (4.6%), Spikerush Marsh (3.5%), Transitional Bayhead Swamp Scrub-Sawgrass Marsh (2.5%), Buttonwood-Red Mangrove Scrub-Sawgrass Marsh (2.2%), Black Mangrove Forest (2.1%), Mixed Graminoid Freshwater Marsh (2.1%), and Buttonwood-Red Mangrove Shrubland (2%; Appendix C). These 11 vegetation classes and open water (23% of the area within Region 2) account for 80.7 % of the total area mapped within Region 2.

Forest and Woodland communities accounted for 9.5% of the total area mapped within Region 2 (Table 2). Mangrove Forests accounted for 7.7% of the total area and consisted primarily of Mixed Mangrove (4.3%) and Black Mangrove (2.1%) Forests. Other Forest types included Hardwood Hammock and Swamp Forest but these two types combined for less than 2.0% of the total area (Table 2). Woodlands account for approximately 0.23% of the total area. Woodlands fell into three types: Mangrove Woodland (0.23%), Swamp Woodland (<0.01%) and Upland Hardwood Woodland (<0.01%). The dominant woodland class was Black Mangrove Woodland (Table 2).

Shrublands accounted for approximately 13% of the total area mapped and consisted of Swamp Shrubland, Mangrove Shrubland, Coastal Hardwood Shrubland, and Tropical Hardwood Shrubland (Table 3). Most shrublands were Transitional Bayhead Shrubland—a shrubland community consisting of a mix of mangrove and bayhead species (7.2%), Mixed Mangrove Shrubland (3.1%), and Black Mangrove Shrublands (1.0%). Coastal Hardwood Shrubland and Tropical Hardwood Shrubland were a minor component at less than 1% combined (Table 3).

Scrub communities are the most common and diverse vegetation types found within Region 2. They account for 38.6% of the mapped area and consisted of Mangrove Scrub (34%), Swamp Scrub (4.6%), Coastal Hardwood Scrub (0.01%), and Upland Hardwood Scrub (<0.01%; Table 4). Red Mangrove Scrub was the most dominant community type within this group followed by Mixed Mangrove Scrub and Transitional Bayhead Swamp Scrub (Table 4). Most of these scrub communities occurred in a sawgrass or spikerush marsh matrix.

Marsh communities fell into seven types: Graminoid Freshwater Marsh, Open Freshwater Marsh, Broadleaf Emergent Marsh, Herbaceous Freshwater Marsh, Graminoid Freshwater Prairie, Graminoid Salt Marsh, and Succulent Salt Marsh (Table 5). The most common type of marsh found was Graminoid Freshwater Marsh (14.4%) with the two most dominant types being Sawgrass Marsh (8.7%) and Spikerush Marsh (3.5%; Table 5). Marl Prairies (Graminoid Freshwater Prairie), which is a habitat of concern, accounted for less than 1% and consisted of either Sawgrass Prairie or Muhly Grass Prairie (Table 5). Halophilic marshes, graminoid and succulent, were not as common only accounting for 0.38% of the area mapped (Table 5).

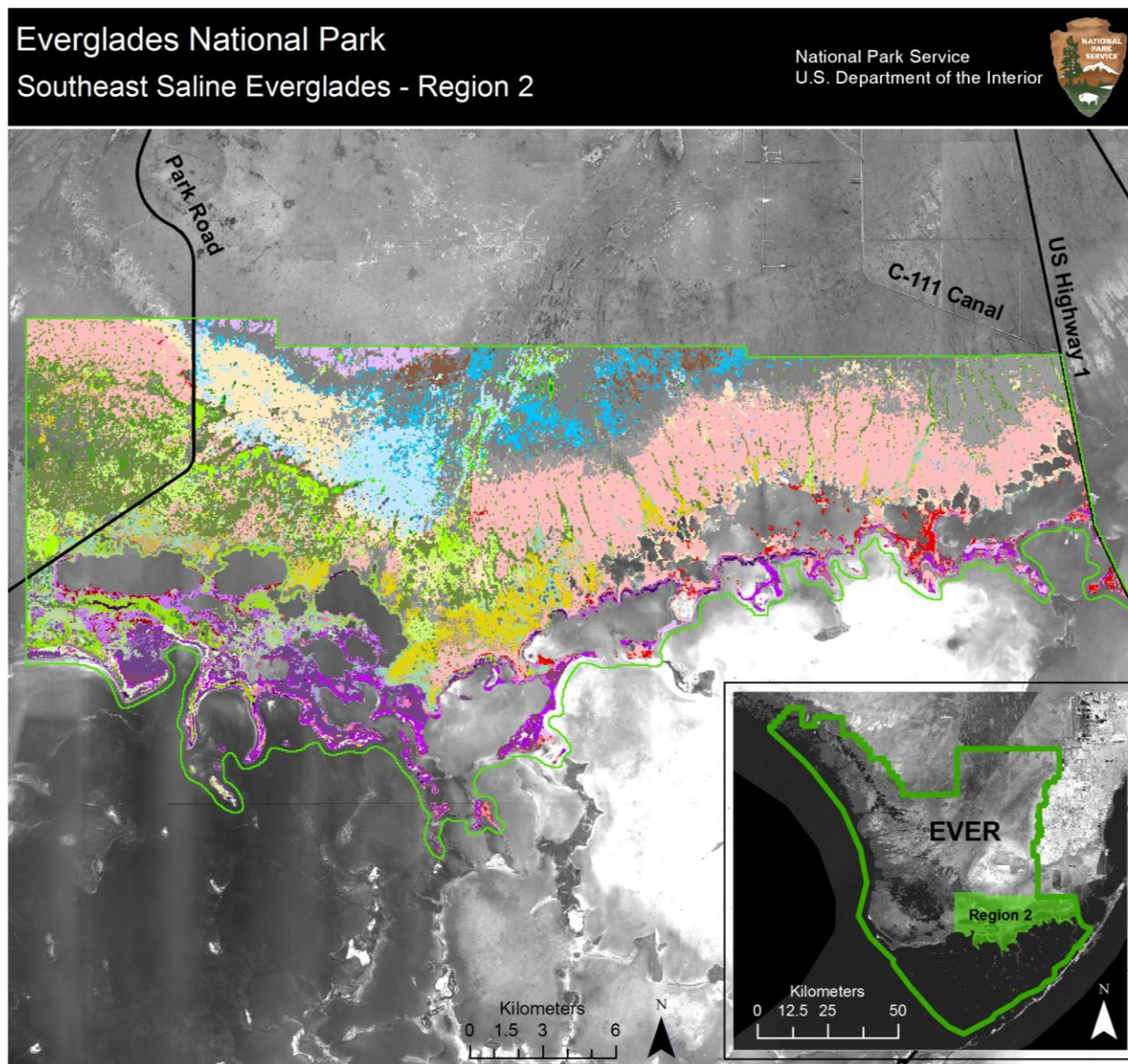


Figure 5. Vegetation map of Southeast Saline Everglades, Region 2, showing the top 48 vegetation classes comprising 99% of the total area mapped.

Table 2. Summary of total area (ha) and percent area mapped of forest and woodland communities within Region 2, Everglades National Park.

Community Type	Area (ha)	Percent of Total Area Mapped
Hardwood Hammock	184.0	0.31%
Coastal Hardwood Hammock	171.8	0.29%
Tropical Hardwood Hammock	12.3	0.02%
Mangrove Forest	4,554.5	7.70%
Black Mangrove Forest	1,267.8	2.14%
Buttonwood Forest	581.5	0.98%
Mixed Mangrove Forest	2,517.5	4.26%
Red Mangrove Forest	184.3	0.31%
White Mangrove Forest	3.5	0.01%
Swamp Forest	768.3	1.30%
Bayhead Forest	67.0	0.11%
Cypress Forest	24.5	0.04%
Paurotis Palm Forest	1.0	<0.01%
Transitional Bayhead Forest	675.8	1.14%
Mangrove Woodland	133.5	0.23%
Black Mangrove Woodland	109.5	0.19%
Buttonwood Woodland	17.3	0.03%
Mixed Mangrove Woodland	6.8	0.01%
Swamp Woodland	0.5	< 0.01%
Cypress Woodland	0.5	< 0.01%
Upland Hardwood Woodland	0.5	< 0.01%
Total	5,641.3	9.54%

Table 3. Summary of total area (ha) and percent area mapped of shrubland communities within Region 2, Everglades National Park.

Community Type	Area (ha)	Percent of Total Area Mapped
Coastal Hardwood Shrubland	43.8	0.07%
Mangrove Shrubland	2,959.8	5.00%
Black Mangrove Shrubland	608.8	1.03%
Buttonwood Shrubland	275.5	0.47%
Mixed Mangrove Shrubland	1,821.5	3.08%
Red Mangrove Shrubland	247.0	0.42%
White Mangrove Shrubland	7.0	0.01%
Swamp Shrubland	4,639.3	7.84%
Bayhead Shrubland	284.8	0.48%
Cocoplum Shrubland	102.3	0.17%
Transitional Bayhead Shrubland	4,252.3	7.19%
Tropical Hardwood Shrubland	2.3	< 0.01%
Total	7,649.9	12.93%

Table 4. Summary of total area (ha) and percent area mapped of scrub communities within Region 2, Everglades National Park.

Community Type	Area (ha)	Percent of Total Area Mapped
Coastal Hardwood Scrub	3.8	0.01%
Mangrove Scrub	20,087.3	33.96%
Black Mangrove Scrub	851.3	1.44%
Buttonwood Scrub	126.8	0.21%
Mixed Mangrove Scrub	2,556.5	4.32%
Red Mangrove Scrub	16,550.3	27.98%
Sea-Oxeye Scrub	0.5	< 0.01
White Mangrove Scrub	2.0	< 0.01
Swamp Scrub	2,727.5	4.61%
Bayhead Swamp Scrub	622.3	1.05%
Buttonbush Scrub	4.3	< 0.01
Cypress Scrub	519.5	0.88%
Transitional Bayhead Swamp Scrub	1,581.5	2.67%
Upland Hardwood Scrub	1.5	< 0.01
Total	22,820.0	38.58%

Table 5. Summary of total area (ha) and percent area mapped of marsh communities within Region 2, Everglades National Park.

Community Type	Area (ha)	Percent of Total Area Mapped
Broadleaf Emergent Marsh	4.8	0.01%
Arrowhead Marsh	4.8	0.01%
Graminoid Freshwater Marsh	8,486.0	14.35%
Beakrush Marsh	1.8	< 0.01
Cattail Marsh	3.5	0.01%
Mixed Graminoid Freshwater Marsh	1,251.8	2.12%
Sawgrass Marsh	5,161.3	8.73%
Short Sawgrass Marsh	5,145.3	8.70%
Tall Sawgrass Marsh	16.0	0.03%
Spikerush Marsh	2,067.8	3.50%
Graminoid Freshwater Prairie	428.8	0.72%
Muhly Grass Prairie	33.0	0.06%
Sawgrass Prairie	395.8	0.67%
Graminoid Salt Marsh	8.3	0.01%
Black Rush Marsh	1.0	< 0.01
Graminoid Salt Marsh	7.3	0.01%
Herbaceous Freshwater Marsh	0.3	< 0.01
Morning Glory Marsh	0.3	< 0.01
Open Freshwater Marsh	94.0	0.16%
Succulent Salt Marsh	224.8	0.38%
Total	9,246.8	15.63%

Anthropogenic and Non-vegetative classes accounted for approximately 23.3% of the total mapping area (Table 6). Anthropogenic features like roads and similar infrastructure accounted for less than 0.1% of the entire mapped area. Non-vegetative classes accounted for the majority of the area mapped under this grouping with water, in the form of lakes, bays, and creeks, accounting for 23% of the entire mapped area and was the dominant class within Region 2.

Several exotic species were encountered within Region 2; Brazilian pepper, Australian pine, seaside mahoe (*Thespesia populnea*), latherleaf (*Colubrina asiatica*), and Old-world climbing fern (*Lygodium* sp.). Only Brazilian pepper and Australian pine were found in high enough densities to quantify in the map. Brazilian pepper had the greatest areal coverage with approximately 518 hectares (1,280 ac). Brazilian pepper is distributed along the banks of Seven Palm Lake, Henry Lake, Cuthbert Lake,

and along the main park road west of West Lake (Figure 6). The observed density of Brazilian pepper at these locations were typically below 50% of the cell with only a few instances where it formed monotypic stands with densities greater than 89% (Figure 6). Australian pine, the only other mapped exotic plant species in this region, occupied approximately 59 hectares (145.7 ac) just west of the eastern park boundary (Figure 6). Australian pine densities were typically well below 50% cover within the mapping cells, but densities in excess of 50% were sometimes found.

Table 6. Summary of total area (ha) and percent area mapped for anthropogenic and non-vegetative classes within Region 2, Everglades National Park.

Thematic Class	Area (ha)	Total Area Mapped (%)
Anthropogenic	42.8	0.07%
Anthropogenic	1.5	< 0.01%
Roads	41.3	0.07%
Non-Vegetative	13,747.7	23.24%
Barren Salt Flat	80.8	0.14%
Tidal Flat	48.3	0.08%
Water	13,628.0	23.03%
Total	13,790.5	23.32%

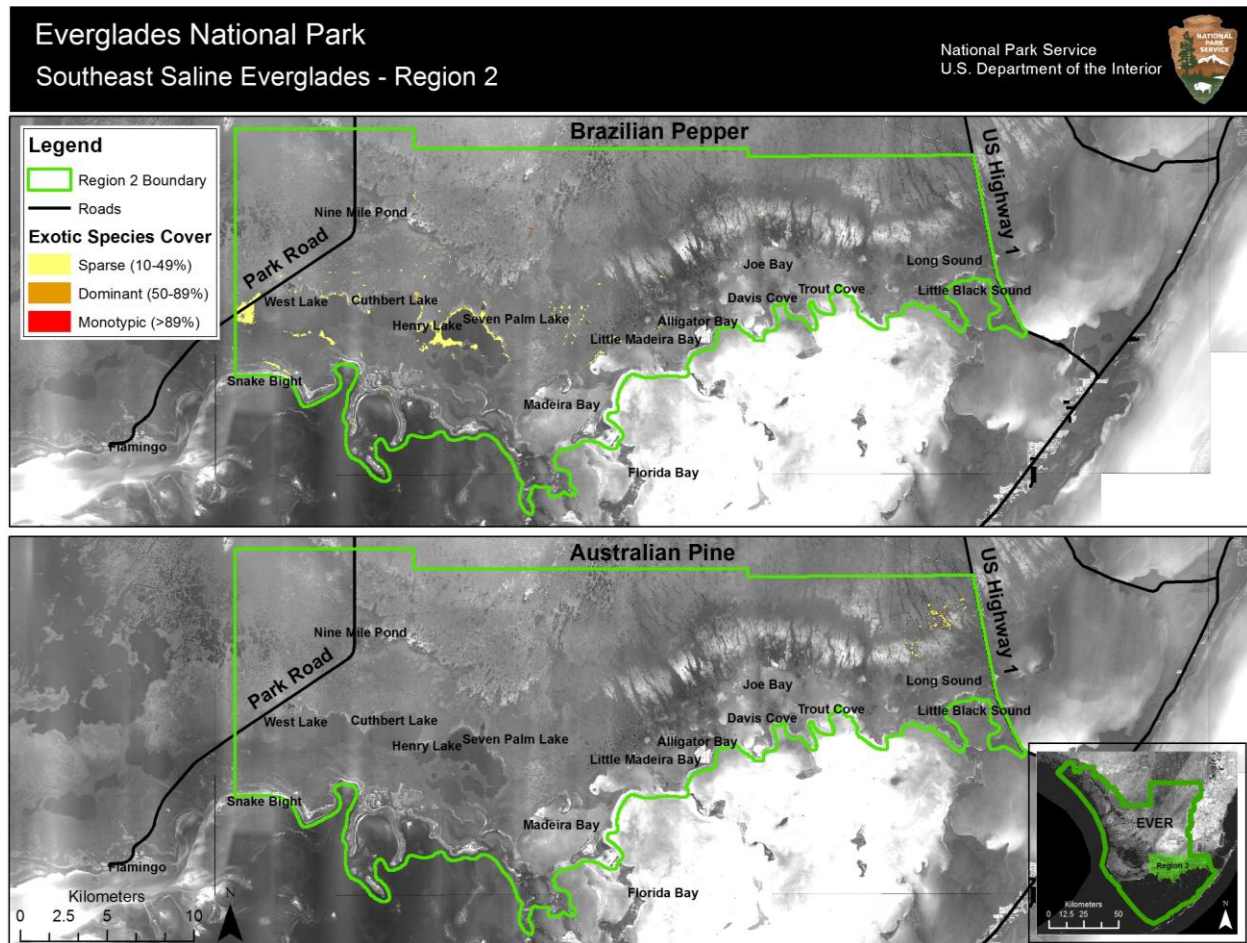


Figure 1. Distribution map and density of Brazilian Pepper (top) and Australian Pine (bottom) in the Southeast Saline Everglades, Region 2, Everglades National Park.

Cattail (*Typha domingensis*), while not exotic, is a species of concern because it is usually associated with the presence of high nutrient levels and prolonged hydroperiods (Newman et al. 1996). Within Region 2, 437.5 hectares (1,081 ac) were identified as containing Cattail in densities greater than 10% within a grid cell (Figure 7). With few exceptions, Cattail densities were generally below 50%. However, there were a few instances where it formed monotypic stands. Cattail was generally found in association with sawgrass within the Taylor Slough delta and in remnant sawgrass patches at the brackish-freshwater ecotone west of Taylor Slough (Figure 7).

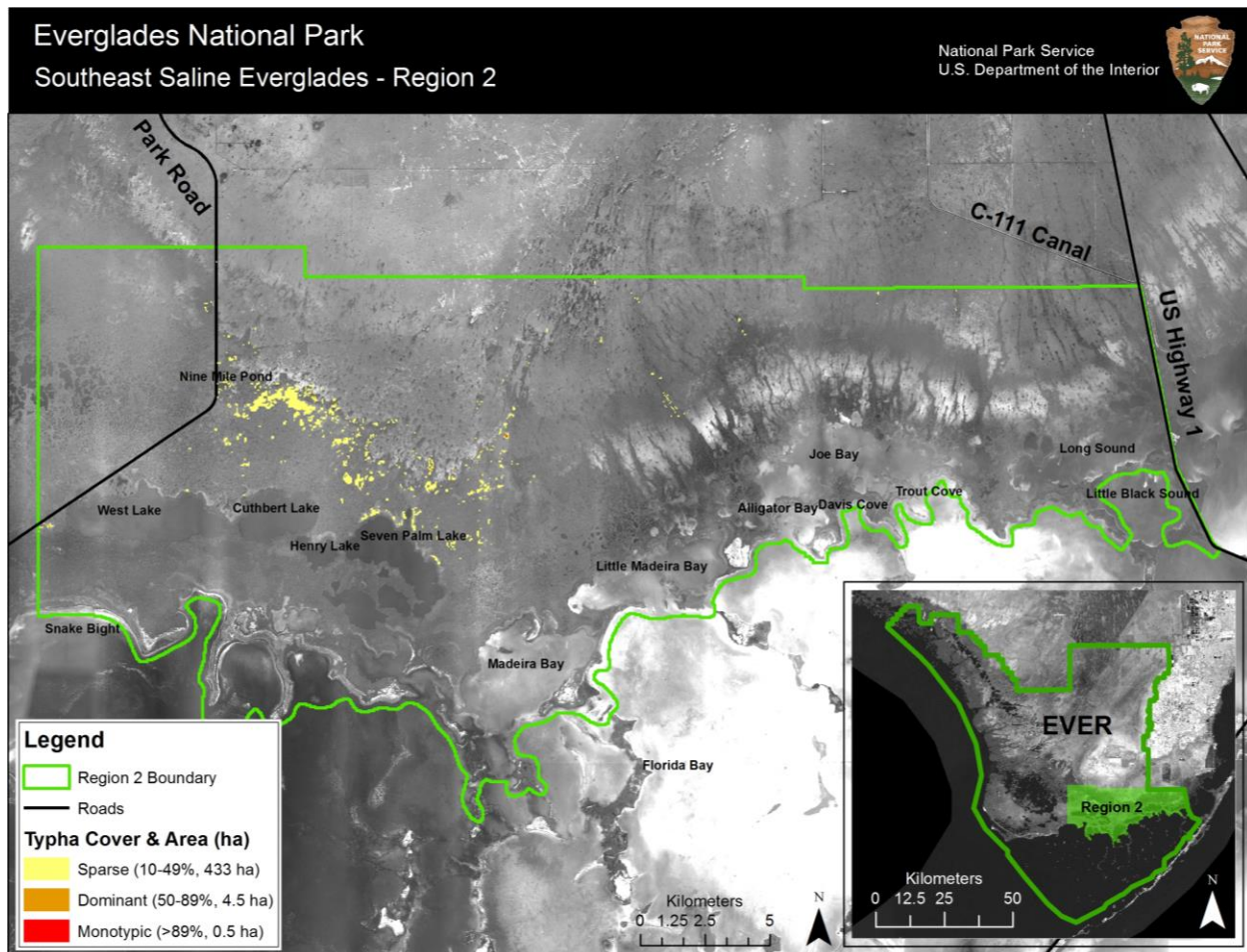


Figure 7. Distribution map and density of cattail in Southeast Saline Everglades, Region 2, Everglades National Park.

Fire and Windstorm

Fire and windstorm damage was common throughout Region 2 (Figure 8). Fires were mostly restricted to the marsh communities adjacent to the main park road near Nine Mile Pond and West Lake (Figure 8). A total of 162 hectares (400.3 ac) appear to have been affected by these fires, which according to EVER fire records were prescribed burns. No other fire scars were observed throughout Region 2. Approximately 3,900 hectares (9,637 ac) within Region 2 exhibited evidence of windstorm damage. Windstorm damage was restricted to most of the coastal forests between Snake Bight and Little Blackwater Sound. However, interior mangrove forest along the bank of West Lake, Seven Palm Lake, and Cuthbert Lake were also observed to have damage. This windstorm damage is believe to be the result of the 2005 Hurricane season when two hurricanes, Hurricane Katrina and Hurricane Wilma, made landfall over south Florida.

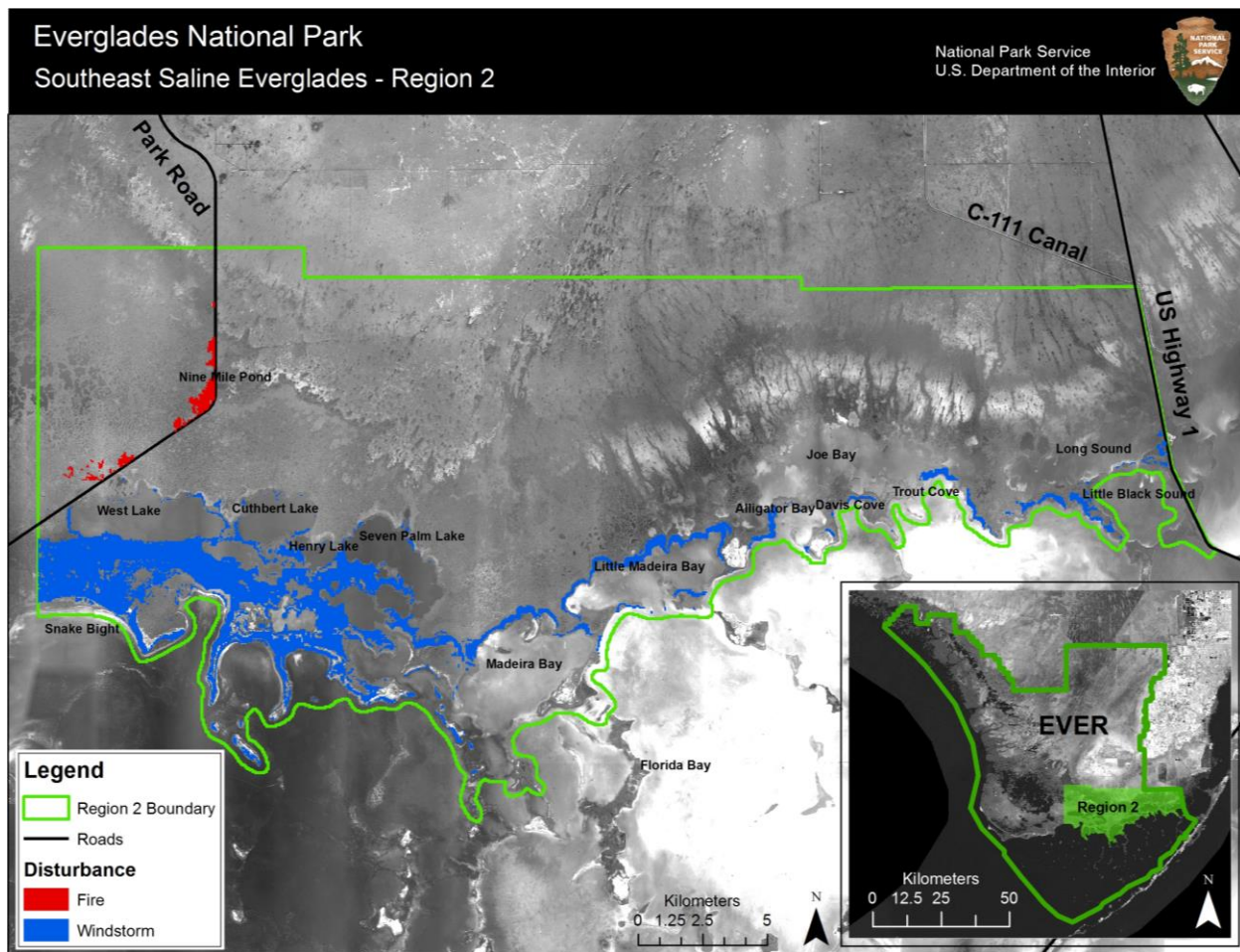


Figure 8. Grid cells within Southeast Saline Everglades, Region 2, Everglades National Park, showing evidence of fire or windstorm damage.

Accuracy Assessment

An exact one-to-one match between the AA points and the vegetation code on the map (complete agreement between the map point classification and the grid cell label) occurred for 124 of the 229 AA points (54%) selected (Appendix D). The 105 grid cells that did not have a one-to-one correlation were re-examined to determine whether they could be deemed acceptable based on the conditions described previously in the methods section. This analysis yielded an additional 79 matching points, increasing the total number of acceptable points to 203. Based on this number of acceptable AA points, the accuracy of the map regardless of categorical level is estimated to be 88.6% with a 90th Percentile Confidence Interval of 84.6% (Table 7). As expected, map accuracy decreased as a function of increasing level of detail (Table 7). Map accuracy exceeded 90% for all vegetation classes with a Level 1, 2, or 3 designation, and were above 80% for vegetation classes with a Level 4, 5, 6, or 7 designation (Table 7).

Table 7. Results of the Region 2 accuracy assessment for each level in the classification system.

Classification Level	Number of Points Acceptable	Number of AA Points	Percent Correct	90th Percentile Confidence Interval
Level 1	219	229	95.6%	92.7%
Level 2	217	229	94.8%	91.6%
Level 3	214	229	93.4%	90.1%
Level 4	191	216	88.4%	84.2%
Level 5	121	139	87.1%	81.4%
Level 6	66	80	82.5%	74.0%
Level 7	4	4	100.0%	47.3%
Overall	203	229	88.6%	84.6%

The individual assessment of Region 2 vegetation classes with sufficient accuracy assessment points is provided in Table 8. Out of the 129 vegetation classes used on the map, only 41 (32%) could be verified with at least one AA point (Appendix D). Of these, 10 classes, totaling 75% of the area mapped, had more than seven assessment locations (Table 8). Class accuracy was generally above 80% for all but two of these 10 classes, Transitional Bayhead Shrubland and Transitional Bayhead Swamp Scrub-Sawgrass Marsh (Table 8). This result was not surprising considering the compositional, structural, and spectral similarity between these two classes to each other and other classes like Red Mangrove Scrub-Sawgrass, Buttonwood-Red Mangrove Scrub-Sawgrass, and Buttonwood-Red Mangrove Shrubland, for example (Appendix D). The accuracy of vegetation classes with fewer than seven assessment locations (31 classes) ranged between 0–100%. Over three-quarters (24 out of 31, 77%) had an estimated accuracy of 100%. The few classes that did not have 100% accuracy, consisted of five mangrove dominated communities, Buttonwood Shrubland, and Tropical Hardwood Shrubland (Appendix D). As additional regions are mapped, more individual vegetation classes will have sufficient accuracy assessment points to allow reporting of accuracy.

Table 8. Accuracy assessment of classes with seven or more accuracy assessment points in Region 2.

Vegetation Class	Number of AA Points (162 of 229)	Class Accuracy (%)	Percent Area of Map (75.2%)
Red Mangrove Scrub-Open Marsh	42	98%	17.3%
Sawgrass Marsh-Short-Dense	28	86%	8.6%
Transitional Bayhead Shrubland	18	56%	7.2%
Red Mangrove Scrub-Sawgrass Marsh	15	100%	5.4%
Red Mangrove Scrub-Spikerush Marsh	13	100%	4.6%
Buttonwood Forest	13	100%	1.0%
Spikerush Marsh	12	100%	3.5%
Water	11	100%	23.0%
Transitional Bayhead Swamp Scrub- Sawgrass Marsh	10	60%	2.5%
Freshwater Marsh-Mixed	7	86%	2.1%

Discussion

Vegetation

Like Egler (1952) and Ross et al. (2000), we found the vegetation of the SESE (Region 2) arranged into physiognomic landscape units. However, these units do not appear as contiguous as previously described, with differences in community type evident on either side of Taylor Slough (Figure 9). A generalization of the Region 2 vegetation maps shows the region consisting of nine landscape units: (1) Marl Prairie, (2) Freshwater Marsh-Cypress Scrub, (3) Red Mangrove-Sawgrass Marsh, (4) Red Mangrove-Gulf Coast spikerush Marsh, (5) Red Mangrove-Open Marsh, (6) Gulf Coast spikerush Marsh, (7) Red Transitional Shrubland, (8) Buttonwood-Red Mangrove Shrubland, and (9) Mangrove Forests, Coastal Hammocks, and Salt Marshes (Figure 9).

Marl Prairie

The Marl Prairie unit is the smallest unit within Region 2 and represents the transitional zone between the short hydroperiod marl prairies, and the longer hydroperiod marshes to the south and east. Micro-topography is the main driver of vegetation pattern and species composition within this unit, creating a patch mosaic of Sawgrass and Muhly Grass prairies intermixed with pockets of Sawgrass Marsh or Mixed-Freshwater Marsh communities. Small patches of Cordgrass are present within this unit as well. The woody vegetation is mostly limited to isolated clumps of red mangroves or pond cypress. The few tree islands that are present are small and contain a mix of bayhead species and pond cypress.

Freshwater Marsh and Cypress Scrub

The Freshwater Marsh and Cypress Scrub unit is equivalent to Egler's Belt 3, which he described as a vast sawgrass flat with numerous tree islands and cypress. Today, however, this unit is a mixed-marsh mosaic of freshwater marshes and sloughs with pond cypress and tree islands dominated by a mix of bayhead species. The marsh communities within this unit are mostly Sawgrass Marsh but large areas of Gulf Coast spikerush and Mixed-Freshwater Marsh communities consisting of a mix of sawgrass, Gulf Coast spikerush, and/or Tracy's beakrush (*Rhynchospora tracyi*) are common. Large areas of Gulf Coast spikerush and duck potato (*Sagittaria lancifolia*), and Gulf Coast spikerush with either string lily (*Crinum americanum*) or alligator lily (*Hymenocallis palmeri*) are also common east of Taylor Slough (Photo 3). Cordgrass occurs in low abundance west of Taylor Slough near the Marl Prairie unit.

Everglades National Park
Southeast Saline Everglades - Region 2

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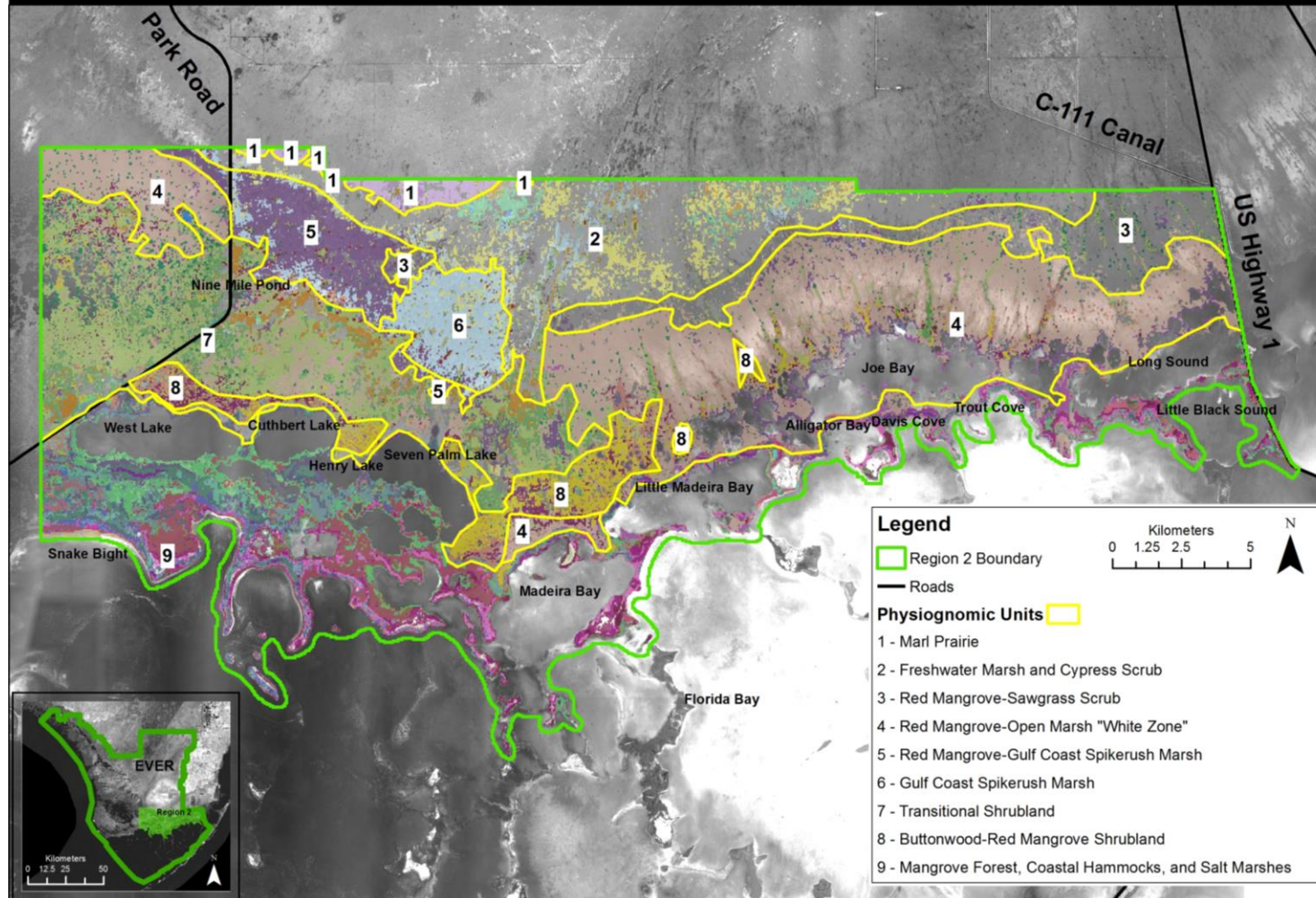


Figure 9. Map of Southeast Saline Everglades, Region 2, Everglades National Park showing the locations and boundaries of the physiognomic units described in the text.



Photo 3. Freshwater marsh dominated by Gulf Coast spikerush and string lily within the Freshwater Marsh and Cypress Scrub unit within the Southeast Saline Everglades, Region 2, Everglades National Park.

The marsh woody vegetation within this unit is mostly restricted to short statured pond cypress trees, typically less than 5 meters (16.4 ft) tall (Photo 4). This Cypress Scrub community is associated with long-hydroperiod graminoid species like sawgrass, Gulf Coast spikerush or Tracy's beakrush. However, small pockets of pond cypress with short-hydroperiod graminoid species like Muhly grass and Florida little bluestem (*Schizachyrium rhizomatum*) were found west of Taylor Slough at the ecotonal boundary with the Marl Prairie unit. Red mangrove, while rare, is present throughout this unit, typically as solitary individuals within the marsh or as a group of individuals located at the downstream end of tree islands or along their perimeter. The current density of red mangrove in this unit is low and does not appear to be ecologically important. However, with increasing sea level and the absence of fire or freeze events, red mangrove is likely to increase in importance.

Most of the tree islands found within this unit are located along the main Taylor Slough flowway that bisects Region 2. The species composition within these tree islands is typical of other bayhead dominated tree islands throughout the Everglades. Large individual pond cypress trees are common within the main flowway of Taylor Slough, but do not form domes. Cypress dominated tree islands and domes are common, however, east and west of Taylor Slough. Tree islands outside the main Taylor Slough flowway vary in size and shape, may have an elongated tail, and are compositionally similar to those found within Taylor Slough.



Photo 4. Cypress and sawgrass marsh within the Freshwater Marsh and Cypress Scrub unit within the Southeast Saline Everglades, Region 2, Everglades National Park.

Red Mangrove-Sawgrass Marsh

The Red Mangrove-Sawgrass Marsh unit is a thin, 0.5–1.0 kilometer (.31–.62 mi) band of short-statured red mangrove (typically less than 2 meters [6.5 ft] tall) and short sawgrass (Photo 5). This unit extends east from Taylor Slough toward U.S. Highway 1 where it expands to a maximum width of approximately 3 kilometers (1.8 mi). Red mangrove cover is highly variable throughout this unit, ranging from 10–85% total cover. Sawgrass cover, however, tends to be more spatially variable than red mangrove. Sawgrass cover is higher along the narrow western portion of this unit than at the eastern expanse where sawgrass cover is generally low and does not exceed 50%. This unit represents the ecotonal line between graminoid dominated freshwater marshes to the north and marine influenced marsh communities dominated by red mangrove to the south. The expanse of sawgrass so close to Long Sound and adjacent to U.S. Highway 1 suggests that upstream freshwater input is countering the effects of saltwater intrusion into this section of the SESE.

Circular tree islands and elongated woody dominated drainages with sawgrass are common throughout this unit. Woody species composition consists of a mixed-species assemblage of poisonwood, cocoplum (*Chrysobalanus icaco*), wax myrtle (*Morella cerifera*), dahoon holly, (*Ilex cassine*), red bay, buttonwood, and red mangrove.



Photo 5. Red Mangrove-Sawgrass Marsh unit within the Southeast Saline Everglades, Region 2, Everglades National Park.

Red Mangrove-Open Marsh, the “White Zone”

The Red Mangrove-Open Marsh unit extends east from Taylor Slough and south from the Red Mangrove-Sawgrass Marsh unit towards the shoreline of Little Madeira Bay, Joe Bay, and Long Sound. It occurs west of the main park road as well. This unit is equivalent to Egler’s Belt 4, the “White Zone,” which he described as a thin belt of sparse vegetation consisting of sawgrass, Gulf Coast spikerush, and red mangrove.

At the time of Egler, the “White Zone,” west of U.S. Highway 1, was a thin coastal feature with an average width of approximately 0.5 kilometers (.31 mi; Ross et al. 2000). By 1994, the interior boundary of the “White Zone” was on average 1.2 kilometers (.74 mi) from the shoreline (Ross et al. 2000). Today this unit is approximately 3 kilometers (1.8 mi) wide and consists of short stature, less than 2-meter (6.5-ft) tall, red mangroves in an open water environment, with little to no understory graminoid cover (Photo 6). Graminoid cover, when present, is generally below 10% and consists of either sawgrass or Gulf Coast spikerush.



Photo 6. Red Mangrove-Open Marsh unit, the “White Zone”, within the Southeast Saline Everglades, Region 2, Everglades National Park. Note the absence of any graminoids in the understory.

The tree islands within this unit are typically circular and more often than not, are associated with a drainage basin, or have a downstream red mangrove dominated tail. Most tree islands tend to be compositionally complex and include a mixed-species assemblage of West Indian mahogany (*Swietenia mahagoni*), poisonwood, pigeon plum, spicewood, Florida bully (*Sideroxylon reclinatum*), wax myrtle, seagrape (*Coccoloba uvifera*), several species of vines and ferns, buttonwood, and red mangrove. The exotic invasive species Brazilian pepper is often found in the understory, but typically in low abundance. In addition, tree islands co-dominated by buttonwood and red mangrove, are common throughout this unit.

Many drainage basins or sloughs bisect this unit. Compositionally they are very similar to the tree islands and contain a significant amount of sawgrass. However, as the drainage basin nears the coast, the abundance of buttonwood and red mangrove increases to the point that they replace all other species.

Red Mangrove-Gulf Coast Spikerush Marsh

The Red Mangrove-Gulf Coast spikerush Marsh unit is located to the northwest of Taylor Slough and is bisected by the main park road. Structurally, this unit is very similar to the Red Mangrove-Open Marsh unit located east of Taylor Slough. However, the understory of this unit is dominated by Gulf Coast spikerush instead of the open-marsh environment of the unit east of Taylor slough (Photo 7).

Sawgrass and Tracy's beakrush is often intermixed with the Gulf Coast spikerush. In addition, small isolated patches of red mangrove with sparse sawgrass occur throughout the unit as well.

Red mangrove cover varies throughout the unit, with lower cover values adjacent to the main park road and along the Transitional Shrubland unit to the south where water impounds most of the year. Within this ecotonal margin, graminoid dominated communities consisting of Gulf Coast spikerush with sawgrass and Tracy's beakrush prevail.

Tree islands in this unit contain a significant amount of cocoplum. In some cases, cocoplum is the dominant species and forms monotypic stands. Paurotis palm (*Acoelorrhapha wrightii*) is also common and generally found in most tree islands. Other common species include poisonwood, pigeon plum, spicewood, wax myrtle, and red bay.



Photo 7. Red Mangrove-Gulf Coast Spikerush Marsh unit within the Southeast Saline Everglades, Region 2, Everglades National Park.

Gulf Coast Spikerush Marsh

The Gulf Coast spikerush Marsh unit is located due west of Taylor Slough and downstream of the Freshwater Marsh and Cypress Scrub unit. This unit is a sparsely vegetated landscape where Gulf Coast spikerush is the dominant graminoid species (Photo 8). Small patches of sparse sawgrass and Gulf Coast spikerush with sawgrass are common along the ecotonal line with the Freshwater Marsh and Cypress Scrub unit to the north. Red mangrove abundance is very low and not a significant source of biomass within this unit. Most individuals are less than 1 meter (3.2 ft) tall and have small crowns, typically less than 1 meter (3.2 ft) in diameter. Red mangrove is often encountered inside or

along the perimeter of the tree islands within this unit. Tree island species composition varies from a mixed-bayhead species composition, to nearly monotypic stands of cocoplum. Paurotis palm is sometimes encountered within these tree islands as well.



Photo 8. Gulf Coast Spikerush Marsh unit within the Southeast Saline Everglades, Region 2, Everglades National Park.

Inundation period, or hydroperiod, appears to be the main driver of species composition within this unit. A ten-year estimate of hydroperiod from 2007 to 2016, using water level data from the Everglades Depth Estimation Network, indicates that the average hydroperiod for this unit was approximately 354 days. In contrast, the hydroperiod for the Freshwater Marsh and Cypress Scrub unit to the north was about 292 days. During this period of record, the surface water elevation of the Gulf Coast spikerush marsh unit fell below the ground surface on three separate years, 2008, 2009, and 2011, for a combined total number of 111 days. In the Freshwater Marsh and Cypress Scrub unit to the north, surface water levels fell below the ground surface for a total of 733 days, with multi-week dry-downs occurring in all years.

Transitional Shrubland

The Transitional Shrubland unit corresponds to Egler's Belt 5, which he described as a complicated mosaic of sawgrass swamp, mangroves, and areas of open water. Today, this unit is a highly diverse and complex mosaic of sawgrass marshes, freshwater and mangrove shrublands, and ponds. Vegetation patterning through this large expanse reflects the underlying topography, lack of fires, and the effects of reduced freshwater inflows and increased salt water intrusion. Small isolated

patches of sawgrass with freshwater woody species remain within this landscape. However, they are slowly being invaded by buttonwood and red mangrove. In addition, the few large patches of sawgrass marsh that remain are being encroached by cattail (Photo 9).



Photo 9. Sawgrass marsh with cattails found within the Transitional Shrubland unit within the Southeast Saline Everglades, Region 2, Everglades National Park.

Along the northern border of this unit, extending east from the park road toward Taylor Slough is a strip of sawgrass marsh and cocoplum dominated tree islands. This vegetation band acts as a hydrologic barrier to upstream freshwater inflow. It impounds water upstream at the border between the Red Mangrove-Gulf Coast spikerush and Gulf Coast spikerush units and restricts the flow of freshwater south to the multiple lakes along its southern boundary and ultimately into Florida Bay. The interior of this band is a labyrinth of short-statured, woody shrublands containing buttonwood, red mangrove, poisonwood, cocoplum, and wax myrtle (Photo 10). Large areas of short-statured monotypic red mangrove are also common.

Tree islands within this unit consist of a mixed species assemblage of upland freshwater species: poisonwood, cocoplum, red bay, and wax myrtle with buttonwood and red mangrove. Typically, the latter two are the dominant species found within these islands. Bayhead dominated tree islands including monotypic stands of cocoplum are common east of the park road. Large West Indian mahogany trees are often found in the larger tree islands located west of the main park road where

they typically co-dominant with buttonwood (Photo 11). Paurotis palm often occurs within these tree islands as well as in the marsh.

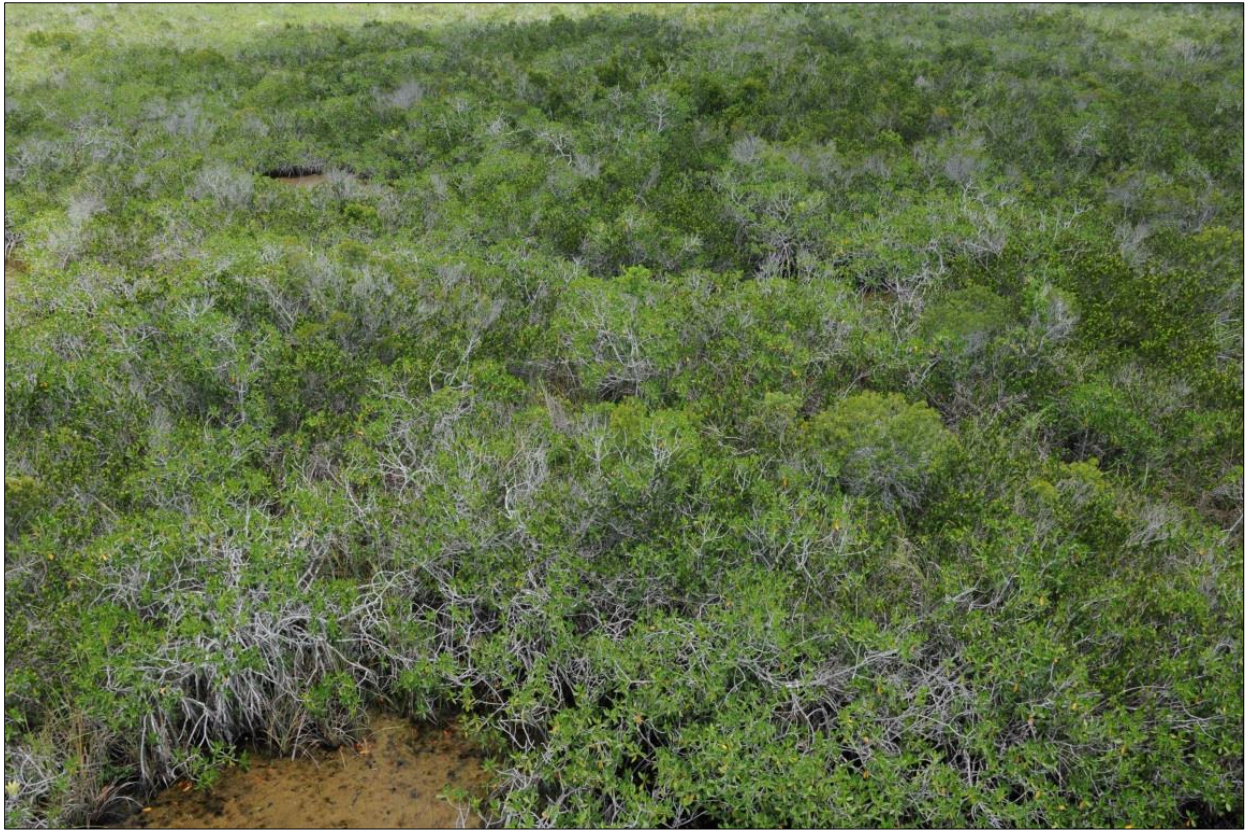


Photo 10. Mixed-species assemblage of short statured woody vegetation consisting of buttonwood, red mangrove, poisonwood, cocoplum, and wax myrtle within the Transitional Shrubland unit within the Southeast Saline Everglades, Region 2, Everglades National Park.

Buttonwood-Red Mangrove Shrubland

The Buttonwood-Red Mangrove Shrubland unit is found downstream of most drainage basins within Region 2 including Taylor Slough. It is a compositionally simple unit consisting of buttonwood, red mangrove, sawgrass, and open water (Photo 12). Poisonwood, wax myrtle, red bay, and Florida bully occur occasionally at higher elevation sites or within the few tree islands that are present within this unit. The presence and abundance of sawgrass indicates that this unit is oligohaline, and transitioning from a period when freshwater dominated communities occurred closer to the coast than today.



Photo 11. West Indian mahogany trees found in the tree islands within the Transitional Shrubland unit within the Southeast Saline Everglades, Region 2, Everglades National Park.



Photo 12. Buttonwood-Red Mangrove Shrubland unit within the Southeast Saline Everglades, Region 2, Everglades National Park.

Mangrove Forest, Coastal Hammock, and Salt Marsh

The Mangrove Forest, Coastal Hammock, and Salt Marsh unit is an ecologically complex and diverse unit with a wide variety of habitat types. Vegetation communities within this unit include mangrove forest, woodlands, and scrub communities, tropical hardwood and palm hammocks, succulent marshes, and salt flats. Vegetation patterning within this unit is a function of substrate type, topography, salinity, and disturbance history, particularly hurricanes that can have a long-lasting effect on the structure and floristic composition of forest ecosystems within this unit (Tanner et al. 1991).

Mangrove Forest

Mangrove forests are well distributed throughout this unit and included monotypic stands of black mangrove or buttonwood, and mixed-mangrove forest containing black mangrove, buttonwood, red mangrove and sometimes white mangrove. The abundance of mature white mangroves in these forests is typically very low. However, post-hurricane recruitment of white mangrove was evident in some of the more disturbed buttonwood forests (Photo 13). The recruitment of white mangrove and its increase in abundance appears to be a common phenomenon within these coastal communities following severe windstorm events. Olmsted et al. (1981) attributes the presence of young white mangroves trees between Shake Bight and Garfield Bight in EVER to Hurricane Donna.

Mangrove scrub communities in a matrix of halophilic graminoids, succulents, or open marsh environment are common throughout this unit as well. Black mangrove scrub is the dominant scrub community within this region followed by red mangrove scrub. Pockets of red mangrove with Gulf Coast spikerush along the shore of Long Sound are common as well.

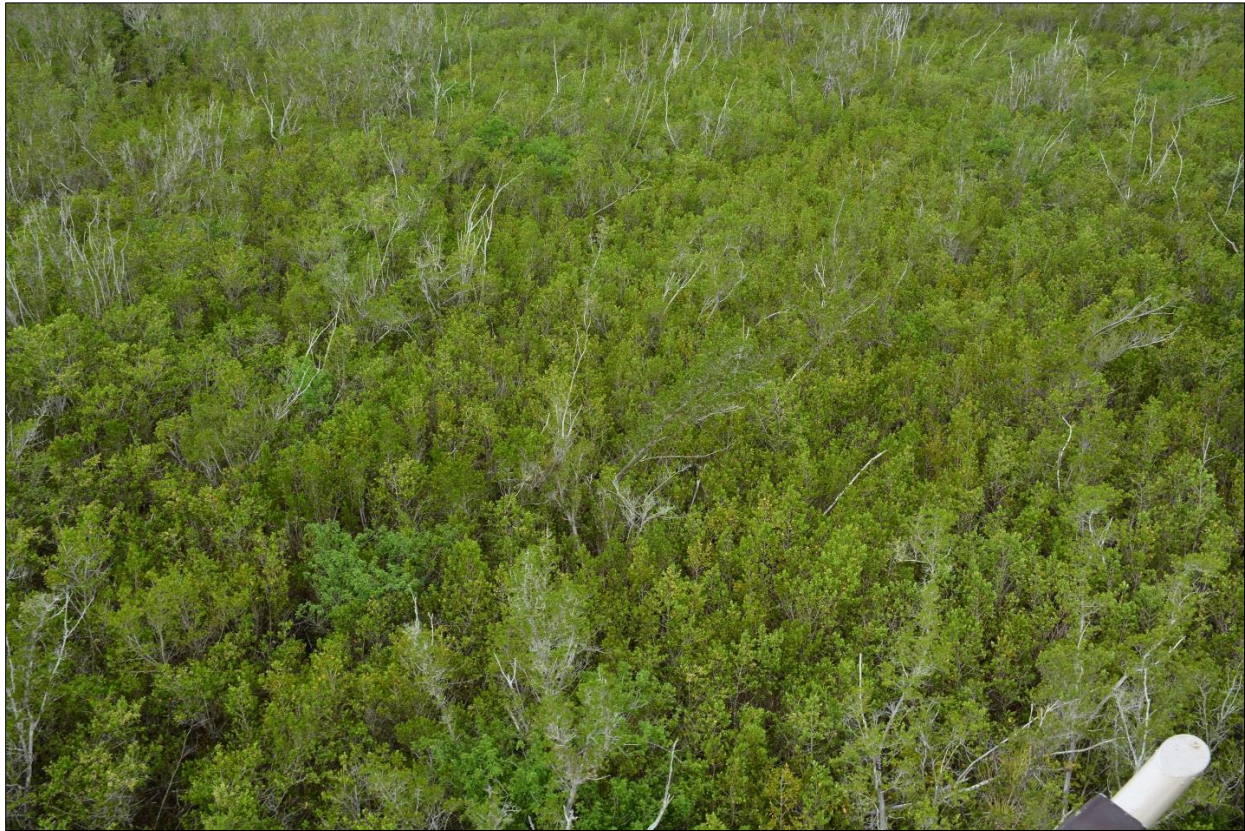


Photo 13. Post-hurricane recruitment and establishment of white mangroves within the Southeast Saline Everglades, Region 2, Everglades National Park.

The Coastal Hammocks within this unit consist of Fan Palm Hammocks, West Indian Mahogany Hammocks, Coastal Dune Hammocks, and Buttonwood Hammocks, which differ from Buttonwood Forest in species composition and soil type. These communities are located on higher elevation sites along the bays and bights of Florida Bay. Soils tend to be calcareous and/or sandy, typical of storm deposition (Olmsted et al. 1981). Hurricane damage was severe in all of these communities but most destructive in the Buttonwood Hammocks, with many dead trees and canopy recovery still ongoing (Photo 14). The viny shrub, Browne's Indian Rosewood (*Dalbergia brownei*), is often found blanketing the canopy of these forests.



Photo 14. Hurricane damaged Coastal Buttonwood Hammocks with dead buttonwood trees in Region 2, Everglades National Park.

Buttonwood Hammocks are currently the most common type of Coastal Hammock found within Region 2. Besides buttonwood, common species include Jamaica dogwood (*Piscidia piscipula*), strangler fig (*Ficus aurea*), and several species of palms (*Sabal palmetto* and *Thrinax radiata*), Florida bully, West Indian mahogany, pigeon plum, and poisonwood, among others. Black mangrove is often present in these forests as well (Photo 14); however, Olmsted et al. (1981) did not list black mangrove in their species list for this community type when they mapped the area in 1979. The current abundance of black mangrove, while low compared to other species like Jamaica dogwood, suggests that compositionally these coastal hammocks are slowly shifting from a freshwater dominated taxa toward a halophilic taxa. Exotics species like Brazilian pepper, seaside mahoe, and latherleaf are common in the understory but typically in low abundance.

Fan Palm Hammocks are located along the shore of Little Madeira Bay and Alligator Bay. They are commonly found adjacent to Buttonwood Hammocks and have a similar species composition. Thatch Palm (*T. radiata*) is typically the dominant canopy species within this community (Photo 15). However, Jamaica dogwood, buttonwood, West Indian mahogany, and black mangrove occur in the canopy layer as well. Because of its proximity to the shoreline and its fragmented distribution, encompassing less than 11 hectares (27.1 ac), this community is at risk of extirpation as halophilic species like black mangrove begin to replace the freshwater taxa within this community in response to disturbance and sea level rise.

West Indian Mahogany Hammocks (Madeira Hammocks) and Coastal Dune Hammocks are currently limited to six very small, isolated locations between Little Madeira Bay and Davis Cove. Olmsted et al. (1981) reported that Madeira Hammocks were likely the most extensive hammock type found along the shore of Florida Bay and the most species rich. Today, however, less than three hectares remain of this hammock type and the floristic composition is not much different from that of the Buttonwood Hammocks. The few remnant mahogany trees are small and isolated in fragments less than a ¼ ha.



Photo 15. Fan Palm Hammock within the Mangrove Forest, Coastal Hammock, and Salt Marsh unit in Region 2, Everglades National Park.

Coastal Dune Hammocks are rare and limited to approximately 2 hectares (4.9 ac). They consist of a mixed species assemblage of Gumbo Limbo (*Bursera simaruba*), White Stopper (*Eugenia axillaris*), Spanish Stopper (*E. foetida*), Jamaican Dogwood (*Piscidia piscipula*), and Wild Lime (*Zanthoxylum fagara*), among others. These communities are associated with topographic highs resulting from storm deposits. Topography is typically higher than the other Coastal Hammock types found within the region.

Salt Marshes

Salt marshes are prevalent throughout this unit and consist of halophilic succulent and graminoid species. The most common species include saltwort (*Batis maritima*), perennial glasswort, shoreline seapurslane (*Sesuvium portulacastrum*), Saltgrass (*Distichlis spicata*), and keygrass (*Monanthochloe*

littoralis). Monotypic single-species dominated salt marshes are common, however most marshes consist of a mixed-species assemblage of succulents, graminoids, and woody vegetation (Photo 16). Buttonwood and black mangrove are often associated with these community types and may form scrub or woodland communities. Large areas of succulent marsh with dead buttonwood are common as well (Photo 17). Bromeliads and orchids typically grow on these dead snags.



Photo 16. Mixed-species assemblage of halophilic succulents and graminoids within the Mangrove Forest, Coastal Hammock, and Salt Marsh unit in Region 2, Everglades National Park.



Photo 17. Succulent marsh with dead buttonwood trees within the Mangrove Forest, Coastal Hammock, and Salt Marsh unit in Region 2, Everglades National Park.

Accuracy Assessment

The accuracy of the Region 2 vegetation map met and exceeded NPS VMI vegetation mapping standards with 88.6% of visited points classified as acceptable with a lower 90th percentile confidence level of 84.6%. The design of the accuracy assessment as a random draw across the region does not allow an accuracy assessment of each individual vegetation class because of the low number of accuracy assessment points (229) falling within the region. Of the ten classes with sufficient points for assessment, only Transitional Bayhead Shrubland and Transitional Bayhead Swamp Scrub-Sawgrass Marsh had class accuracies below 80%. These two communities are transitional, ecotonal boundary categories with mixed signatures that are difficult to differentiate from other structurally and compositionally similar classes like Bayhead Shrubland, Buttonwood-Red Mangrove Shrubland, or Buttonwood-Red Mangrove Scrub-Sawgrass. Of the other thirty-one classes with at least one accuracy assessment point, only seven had a calculated accuracy of less than 80%. However, we caution that there were insufficient points to provide a proper accuracy assessment for these seven classes. Of these, the Buttonwood-Red Mangrove Scrub-Sawgrass is the most important class, accounting for about 2.2% of the area mapped, and warrants additional assessment. A more rigorous analysis based on all of the accuracy assessment points within EVER will be conducted once the remaining three mapping regions within the park are completed. This analysis will provide a better estimate of overall map accuracy and individual class accuracy.

Conclusion

The accuracy of the SESE, Region 2 vegetation map is 88.6% with a lower 90th percentile confidence level of 84.6%. This level of accuracy meets the NPS VMI map accuracy requirement standard set for all NPS vegetation mapping products. This vegetation map is a baseline of plant community distribution within the SESE at the turn of the 21st century. It provides land-cover information to NPS park managers and scientists for use in park management, resource management, research, and monitoring. It also provides a cost effective mechanism by which managers can track and document the rate and direction of vegetation change resulting from natural successional processes, disturbance events, sea level rise, and/or management, by monitoring individual grid-cells instead of depending on a new mapping product. Furthermore, this map allows hydrologist and ecologists to run fine-scale predictive models of potential vegetation change within the SESE in response to hydrologic manipulation and sea level rise by applying known community hydrologic and salinity tolerances to different hydrologic, salinity, and disturbance scenarios at a .25-hectare (.61-ac) scale.

The SESE, Region 2 vegetation map shows that significant changes to the vegetation of the SESE have occurred since Egler (1952) described it. Due to community resilience and species-specific hydrologic and salinity tolerances, the rate and direction of vegetation change within the SESE has been spatially variable in response to regional differences in the historical management-driven hydrologic regime, disturbance history, and sea level rise. Red mangrove, for example, has colonized extensive areas of freshwater marsh east of Taylor Slough, once dominated by sawgrass, and the location of the “White Zone” has shifted landwards by as much as 3 kilometers (1.8 mi) since the 1940’s. Tree islands within the SESE appear to be relatively stable. However, the effects of sea level rise are becoming apparent by the presence of red mangrove and buttonwood in tree islands several kilometers inland. Likewise, coastal communities considered long-lived and stable formations on the landscape, like Buttonwood Hammocks, Mahogany Hammocks, and Fan Palm Hammocks, are in a dynamic state of flux; at risk of shifting to an alternative stable state as halophilic species begin to replace the freshwater taxa present within these communities.

This vegetation map is the first of four regional maps of EVER to be completed. Work on the remaining three Regions (Region 1, 3, and 4) is ongoing, with final map completion expected in 2019. The mapping of Regions 5 and 6 in BICY is in progress, with completion expected in 2020. The map report for Region 7 in BICY is under final peer review and will be available for distribution once finalized. As the remaining mapping Regions are finalized, a report similar to this will be distributed to all partners.

Summary of Final Product and Deliverables (DVD)

The SESE, Region 2, vegetation map of EVER covers an area of approximately 591 square kilometers (228.1 mi² or 146,138 acres). It is the first of four mapping regions completed within EVER to date and consists of 129 thematic classes. The most common class, Red Mangrove Scrub-Open Marsh, accounted for 17.3% (10,231 hectares [25,281 ac]) of the area. However, most classes, 84.5% (109 out of 129), accounted for less than 1% of the map. Map accuracy, at 88.6% with a lower 90th percentile confidence level of 84.6%, meets the NPS VMI map accuracy requirement standard set for all NPS vegetation mapping products. All of the geospatial data collected and created in this project are stored in an ESRI ArcGIS V10.4 personal geodatabase and are referenced to the Universal Transverse Mercator (UTM) Zone 17N, North American Datum of 1983 (NAD83).

This report and the geospatial products developed in the preparation of the SESE, Region 2, vegetation map of EVER are stored on *The Vegetation Map of the Southeast Saline Everglades* (Region 2), Everglades National Park DVD. Stored items include:

- This vegetation inventory report that includes the methods, results, accuracy assessment, and the vegetation classification and photo-interpretation keys.
- An ESRI ArcGIS v10.4 geodatabase containing the SESE, Region 2, vegetation map;
- An ESRI ArcGIS v10.4 geodatabase containing all of the vegetation data collected and a library of oblique aerial photos captured at each vegetation point;
- The metadata for all spatial data.
- An ESRI ArcGIS symbology legend file

Please do not redistributed this report without a copy of the accompanying DVD (*The Vegetation Map of the Southeast Saline Everglades* (Region 2), Everglades National Park). Additional copies of the DVD are available from the NPS South Florida Caribbean Network or by contacting the author.

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Appendix A. Vegetation Classification Key for the Everglades National Park and Big Cypress National Preserve: Southeast Saline Everglades – Region 2



Version R2_20170426

ON THE COVER

Photo of cypress trees and herbaceous vegetation in a flooded cypress strand in Everglades National Park, taken by Michelle Prats on 22 December 2015.

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Introduction

This vegetation classification key was designed to be used in Region 2 of the Everglades National Park and Big Cypress National Preserve vegetation mapping project. This key is modeled after the Vegetation Classification System for South Florida Natural Areas v6.15.09 (Rutchev et al. 2006) which was developed and used to map wetland and upland plant communities in other regions of the Everglades (Rutchev et al. 2008). The classification key presented in this report differs from its parent system in several ways:

1. The hierarchical pathways between levels in the classification system were streamlined to help photo-interpreters consistently reach the same vegetation class and reduce photo-interpreter variability.
2. Many vegetation class definitions were modified to clarify meaning and to reflect regional differences in species composition.
3. Vegetation classes not occurring within the Region 2 mapping area were removed, while region-specific observed and documented vegetation classes were added.
4. The vegetation classification key for exotic plant species is not included in this document because of its length and inclusion of all possible known exotic plant species present within south Florida. Please see the Vegetation Classification System for South Florida Natural Areas for a breakdown of the Exotic key.

Users of this key should be familiar with most, if not all, of the plant species listed and have a general knowledge of the vegetation communities found within Region 2 and their general distribution. This key is not complete and is a work in progress. As new classes are encountered, they will be added to the classification system to ensure a comprehensive final vegetation classification system for Everglades National Park and Big Cypress National Preserve is produced at the end of the project.

Glossary

Cover (absolute): The relative area covered by a plant or a community expressed as a percentage of the total area it occupies within a region of finite size. The absolute cover for all species present shall always add up to 100%.

Cover (density): The percentage of the area being classified that is occupied by an individual plant species or plant community

Co-dominant (mixed): Two or more species that are equally distributed, $\pm 20\%$, throughout a region of finite size with no significant difference in their absolute cover.

Dominant (dominated by): The individual species having the highest cover of any species within the area being classified.

Dominant: Species cover between 50–89%. This term is typically used to classify cattail and exotic species cover.

Graminoids: Grasses and grass-like plant species such as sedges and rushes.

Herbaceous: Non-woody vascular plants species (graminoids excluded) typically persisting for only one growing season.

Monotypic: Species cover 90–100%. This term is typically used to classify cattail and exotic species cover.

Tree: A perennial plant that has a permanent woody main stem or trunk that is at least 5 meters (16.4 ft) tall.

Shrub: A perennial plant that has a permanent singular or multi stemmed woody trunk that is at least 5 meters (16.4 ft) tall.

Sparse: Species cover 10–49%. This term is typically used to classify cattail and exotic species cover. In the marsh context it usually means less than 15%.

Uplands: Rarely flooded communities consisting of semi-flood-tolerant or flood-intolerant plant species.

Wetlands: Regularly flooded communities consisting of flood-tolerant plant species.

Vegetation Classification Key

L1 – Forest (F) – Stands of trees (5 meters [16.4 ft] or taller) that are of high density (50–100% cover).

L1 – Woodland (W) – Stands of trees (5 meters [16.4 ft] or taller) that are of low density (10–49% cover). Trees are evenly spaced out and often in a matrix of sparse shrubs (<50%), graminoids, and/or herbaceous vegetation. If understory shrub cover $\geq 50\%$, then the community is treated as a L1 – Shrubland.

L1 – Shrubland (S) – Stands of shrubs (shorter than 5 meters [16.4 ft]) that are of high density (50–100% cover). However, Mangrove communities with mean canopy heights of 2 meters (6.5 ft) or less with canopy cover greater than 10% are an exception to the Shrubland Class and fall under L1 – Scrub class.

L1 – Scrub (C) – Stands of shrubs (shorter than 5 meters [16.4 ft]) that are of low density (10–49% cover) and evenly spaced out in a matrix of graminoids and/or herbaceous vegetation. Mangrove communities with mean canopy heights of 2 meters (6.5 ft) or less with canopy cover greater than 10% are an exception to the Shrubland Class and fall under L1 – Scrub class.

L1 – Marsh (M) – Graminoid and/or herbaceous emergent or floating vegetation in shallow water that stands at or above the ground surface for much of the year. Prairie habitat is included in this class. A marsh can have low density (<10%) tree and shrub cover.

L1 – Dune (D) – Shrub, graminoid and/or herbaceous vegetation associated with beach dunes.

L1 – Submerged Aquatic Vegetation (A) – Vegetation inhabiting a submerged freshwater or marine environment, e.g., *Vallisneria* spp. or *Thalassia* spp.

L1 – Exotic (E) – Non-native plant species assemblages.

L1 – Other (O) – Anthropogenic or non-vegetative features.

L1 – Forest (F)

Stands of trees (5 meters [16.4 ft] or taller) that are of high density (50–100% cover).

I. Regularly flooded forest consisting of flood tolerant tree species. Most common forest type found in the Everglades.

L2 – Wetland Forest (FW)

1. Regularly flooded forests consisting of salt tolerant tree species. These communities are typically found along saltwater shorelines, interior tidal rivers and creeks, or estuarine zones.

L3 – Mangrove Forest (FM)

2. Seasonally to semi-permanently flooded freshwater forests primarily found in interior wetlands but may extend well into coastal areas.

L3 – Swamp Forest (FS)

II. Rarely flooded forests consisting of flood intolerant hardwood tree species of both temperate and tropical origins. These communities are found throughout the Everglades along coastal areas and offshore islands, pine woodlands, and interior marshes.

L2 – Upland Forest (FU)

1. Rarely flooded forest associated with flood intolerant trees of both temperate and tropical origins. Species composition is highly diverse but varies throughout the region.

L3 – Hardwood Hammock (FH)

L2 – Wetland Forest (FW)

L3 – Mangrove Forest (FM)

1a. Black Mangrove (*Avicennia germinans*) dominant forest. This community is usually characterized by a minimum of 50% Black Mangrove (*A. germinans*) trees and shrubs found in a matrix of other species.

L4 – Black Mangrove Forest (FMa)

1b. Buttonwood (*Conocarpus erectus*) dominant forest. This community is usually characterized by a minimum of 50% Buttonwood (*C. erectus*) trees and shrubs found in a matrix of other species.

L4 – Buttonwood Forest (FMc)

1c. White Mangrove (*Laguncularia racemosa*) dominant forest. This community is usually characterized by a minimum of 50% White Mangrove (*L. racemosa*) trees and shrubs found in a matrix of other species.

L4 – White Mangrove Forest (FMl)

1d. Red Mangrove (*Rhizophora mangle*) dominant forest. This community is usually characterized by a minimum of 50% Red Mangrove (*R. mangle*) trees and shrubs found in a matrix of other species.

L4 – Red Mangrove Forest (FMr)

1e. Mix of mangrove tree species with no particular species having dominance.

L4 – Mixed Mangrove Forest (FMX)

1e.1. Co-dominant mix (20% or less difference in percent cover) of Black Mangrove (*Avicennia germinans*) and Buttonwood (*Conocarpus erectus*) trees.

L5 – Black Mangrove-Buttonwood Forest (FMXac)

1e.2. Co-dominant mix (20% or less difference in percent cover) of Black Mangrove (*Avicennia germinans*) and White Mangrove (*Laguncularia racemosa*) trees.

L5 – Black Mangrove-White Mangrove Forest (FMXal)

1e.3. Co-dominant mix (20% or less difference in percent cover) of Black Mangrove (*Avicennia germinans*) and Red Mangrove (*Rhizophora mangle*) trees.

L5 – Black Mangrove-Red Mangrove Forest (FMXar)

1e.4. Co-dominant mix (20% or less difference in percent cover) of Buttonwood (*Conocarpus erectus*) and White Mangrove (*Laguncularia racemosa*) trees.

L5 – Buttonwood-White Mangrove Forest (FMXcl)

1e.5. Co-dominant mix (20% or less difference in percent cover) of Buttonwood (*Conocarpus erectus*) and Red Mangrove (*Rhizophora mangle*) trees.

L5 – Buttonwood-Red Mangrove Forest (FMXcr)

1e.6. Co-dominant mix (20% or less difference in percent cover) of White Mangrove (*Laguncularia racemosa*) and Red Mangrove (*Rhizophora mangle*) trees.

L5 – White Mangrove-Red Mangrove Forest (FMXlr)

1e.7. Co-dominant mix of trees of three or more mangrove species including Black Mangrove (*Avicennia germinans*), Buttonwood (*Conocarpus erectus*), Red Mangrove (*Rhizophora mangle*), and White Mangrove (*Laguncularia racemosa*). This community is characterized by having no particular species in dominance, meaning there is 20% or less difference in percent cover between the most and least abundant mangrove tree species.

L5 – Mixed Mangrove Forest-Mixed (FMXX)

L3 – Swamp Forest (FS)

2a. Seasonally flooded, dominant to monotypic ($\geq 50\%$ cover) stands of Cocoplum (*Chrysobalanus icaco*) trees (≥ 5 meters [16.4 ft]) and shrubs in association with other wetland species, e.g., Swamp Bay (*Persea palustris*), Red Bay (*P. borbonia*), Dahoon Holly (*Ilex cassine*), Willow (*Salix caroliniana*), Wax Myrtle (*Morella cerifera*), Sweetbay (*Magnolia virginiana*), Cypress (*Taxodium* spp.), and/or Pond Apple (*Annona glabra*), or upland tree species like Poisonwood (*Metopium toxiferum*) and/or Pigeon

Plum (*Coccoloba diversifolia*). This community is an exception to the L1 – Forest Class and falls under **L1 – Shrubland (S)**.

L4 – Cocoplum Shrubland (SSy)

2b. Paurotis Palm (*Acoelorrhaphe wrightii*) dominant forest. This community is usually characterized by a minimum of 50% Paurotis Palm (*A. wrightii*) trees and shrubs found in a matrix of other species.

L4 – Paurotis Palm Forest (FSw)

2c. Mix of Swamp Bay (*Persea palustris*), Red Bay (*P. borbonia*), Cocoplum (*Chrysobalanus icaco*), Dahoon Holly (*Ilex cassine*), Willow (*Salix caroliniana*), Wax Myrtle (*Morella cerifera*), Sweetbay (*Magnolia virginiana*), Pond Apple (*Annona glabra*), and occasionally Buttonwood (*Conocarpus erectus*) or Cypress (*Taxodium* spp.).

L4 – Bayhead Forest (FSB)

2d. Mix of trees characterized by Buttonwood (*Conocarpus erectus*), Red Mangrove (*Rhizophora mangle*), Cocoplum (*Chrysobalanus icaco*), Wax Myrtle (*Morella cerifera*), Poisonwood (*Metopium toxiferum*), and occasionally West Indian Mahogany (*Swietenia mahagoni*), Swamp Bay (*Persea palustris*), Red Bay (*P. borbonia*), Sweetbay (*Magnolia virginiana*), and Dahoon Holly (*Ilex cassine*). The signatures for Buttonwood (*C. erectus*) and Dahoon Holly (*I. cassine*) are often confused in regions where the two species co-exist, leaving Red Mangrove (*R. mangle*) as the distinguishing component between the Transitional Bayhead and Bayhead classes in regions where both classes are likely to be found. The significant presence (at least 30% cover) of Buttonwood (*C. erectus*) or Red Mangrove (*R. mangle*) evenly distributed throughout the vegetation matrix sets this class apart from the Bayhead Forest class. Note that when these species are confined to the outside fringe they are not considered indicative of a Transitional Bayhead.

L4 – Transitional Bayhead Forest (FSBT)

2e. Cypress (*Taxodium* spp.) dominant forest with common understory vegetation consisting of Pond Apple (*Annona glabra*), Wax Myrtle (*Morella cerifera*), Pop Ash (*Fraxinus caroliniana*), Cocoplum (*Chrysobalanus icaco*), and Leather Fern (*Acrostichum danaeifolium*).

L4 – Cypress Forest (FSt)

2e.1. Cypress (*Taxodium* spp.) dominant forest typically found in a pond-like depression.

L5 – Cypress Forest-Dome (FStD)

2e.2. Cypress (*Taxodium* spp.) dominant forest typically found in an elongated slough-like or open-ended depression.

L5 – Cypress Forest-Strand (FStS)

L2 – Upland Forest (FU)

L3 – Hardwood Hammock (FH)

1a. Coastal hardwood forest containing a rich mixed species assemblage of tropical and temperate broad-leaved trees typified by the presence of Buttonwood (*Conocarpus erectus*), Pigeon Plum (*Coccoloba diversifolia*), False Mastic (*Sideroxylon foetidissimum*), Gumbo Limbo (*Bursera simaruba*), Strangler Fig (*Ficus aurea*), White Stopper (*Eugenia axillaris*), Jamaican Dogwood (*Piscidia piscipula*), Spanish Stopper (*E. foetida*), West Indian Mahogany (*Swietenia mahagoni*), Cabbage Palm (*Sabal Palmetto*), Wild Lime (*Zanthoxylum fagara*), Blackbead (*Pithecellobium keyense*), Spanish Bayonet (*Yucca aloifolia*), Catclaw Blackbead (*P. unguis-cati*), Triangle Cactus (*Acanthocereus tetragonus*), Prickly Pear (*Opuntia stricta*), Wild Cinnamon (*Canella winterana*), Sea Grape (*C. uvifera*), Geigertree (*Cordia sebestena*), Milk Bark (*Drypetes lateriflora*), Seven Year Apple (*Genipa clusiifolia*), Crabwood (*Gymnanthes lucida*), Manchineel (*Hippomane mancinella*), Joewood (*Jacquinia keyensis*), Thach Palm species (*Leucothrinax morrisii* or *Thrinax radiata*), Poisonwood (*Metopium toxiferum*), Florida bully (*Sideroxylon reclinatum*) among other species.

L4 – Coastal Hammock (FHC)

1a.1. Coastal hardwood hammock forest dominated by Buttonwood (*Conocarpus erectus*) in a matrix of tropical hardwood species like Jamaican Dogwood (*Piscidia piscipula*), Sea Grape (*Coccoloba uvifera*), Blackbead (*Pithecellobium keyense*), Spanish Bayonet (*Yucca aloifolia*), Catclaw Blackbead (*P. unguis-cati*), Triangle Cactus (*Acanthocereus tetragonus*), Prickly Pear (*Opuntia stricta*), and Spanish Stopper (*Eugenia foetida*), among others.

L5 – Buttonwood Hammock (FHCc)

1a.2. Coastal hardwood hammock forest dominated by West Indian Mahogany (*Swietenia mahagoni*) in a matrix of Jamaican Dogwood (*Piscidia piscipula*), Buttonwood (*Conocarpus erectus*), Wild Cinnamon (*Canella winterana*), Spanish Stopper (*Eugenia foetida*), Gumbo Limbo (*Bursera simaruba*), Strangler Fig (*Ficus aurea*), Pigeon Plum (*Coccoloba diversifolia*), and False Mastic (*Sideroxylon foetidissimum*), among others.

L5 – West Indian Mahogany Hammock (FHCg)

1a.3. Coastal hardwood hammock forest dominated by Florida thatch palm (*Thrinax radiata*) in a matrix of Jamaican Dogwood (*Piscidia piscipula*), Wild Cinnamon (*Canella winterana*), Spanish Stopper (*Eugenia foetida*), White Stopper (*E. axillaris*), Buttonwood (*Conocarpus erectus*), Pigeon Plum (*Coccoloba diversifolia*), Wild Lime (*Zanthoxylum fagara*), and Blackbead (*Pithecellobium keyense*), among others.

L5 – Fan Palm Hammock (FHCt)

1a.4. Hammock forests containing a mixture of tropical broad-leaved trees such as False Mastic (*Sideroxylon foetidissimum*), Gumbo Limbo (*Bursera simaruba*), Strangler Fig (*Ficus aurea*), White Stopper (*Eugenia axillaris*), Jamaican Dogwood

(*Piscidia piscipula*), Spanish Stopper (*E. foetida*), Wild Lime (*Zanthoxylum fagara*), Blackbead (*Pithecellobium keyense*), Spanish Bayonet (*Yucca aloifolia*), Catclaw Blackbead (*P. unguis-cati*), Triangle Cactus (*Acanthocereus tetragonus*), and Prickly Pear (*Opuntia stricta*), among others found along coastal areas on sandy dunes (shell mounds excluded).

L5 – Coastal Dune Hammock (FHCD)

1b. Mix species assemblage of False Tamarind (*Lysiloma latisiliquum*), Gumbo Limbo (*Bursera simaruba*), Poisonwood (*Metopium toxiferum*), Pigeon Plum (*Coccoloba diversifolia*), False Mastic (*Sideroxylon foetidissimum*), Live Oak (*Quercus virginiana*), Sugarberry (*Celtis laevigata*), White Stopper (*Eugenia axillaris*) and Lancewood (*Nectandra coriacea*). May also contain Strangler Fig (*Ficus aurea*), Swamp Bay (*Persea borbonia*), Dahoon Holly (*Ilex Cassine*), Wax Myrtle (*Morella cerifera*), Myrsine (*Myrsine floridana*), and Willow Bustin (*Sideroxylon salicifolium*). Water Oak (*Q. nigra*), Red Maple (*Acer rubrum*), and Laurel Oak (*Q. laurifolia*) may be present as single individuals.

L4 – Tropical Hardwood Hammock (FHS)

L1 – Woodland (W)

Stands of trees (5 meters [16.4 ft] or taller) that are of low density (10–49% cover). Trees are evenly spaced out and often in a matrix of sparse shrubs (<50%), graminoids, and/or herbaceous vegetation. If understory shrub cover $\geq 50\%$, then the community is treated as a L1 – Shrubland.

I. Regularly flooded low density stands of trees consisting of flood tolerant tree species.

L2 – Wetland Woodland (WW)

1. Regularly flooded low density stands of trees consisting of salt tolerant tree species.

L3 – Mangrove Woodland (WM)

2. Seasonally to semi-permanently flooded low density stands of freshwater tree species.

L3 – Swamp Woodland (WS)

II. Briefly flooded low density stands of trees consisting of semi-flood tolerant or flood intolerant woody species.

L2 – Upland Woodland (WU)

1. Rarely inundated and well drained open canopy woodland containing a mixed species assemblage of tropical and temperate broad-leaved trees.

L3 – Upland Hardwood Woodland (WUH)

L2 – Wetland Woodland (WW)

L3 – Mangrove Woodland (WM)

1a. Black Mangrove (*Avicennia germinans*) in a matrix composed of salt marsh graminoids, herbs, and/or succulents.

L4 – Black Mangrove Woodland (WMA)

1a.1. Black Mangrove (*Avicennia germinans*) in a matrix composed predominately of graminoids.

L5 – Black Mangrove Woodland-Graminoid Marsh (WMAg)

1a.2. Black Mangrove (*Avicennia germinans*) in a matrix composed predominately of Open Freshwater Marsh or Open Saltwater Marsh, both of which have less than 15% marsh vegetation. Mangroves can occur in both salt and freshwater dominated marshes.

L5 – Black Mangrove Woodland-Open (WMAO)

1a.3. Black Mangrove (*Avicennia germinans*) in a matrix composed predominately of succulents.

L5 – Black Mangrove Woodland-Succulent Marsh (WMA_S)

1b. Buttonwood (*Conocarpus erectus*) in a matrix composed of salt marsh graminoids, herbs, and/or succulents.

L4 – Buttonwood Woodland (WMC)

1b.1. Buttonwood (*Conocarpus erectus*) in a matrix composed predominately of graminoids.

L5 – Buttonwood Woodland-Graminoid Marsh (WMcG)

1b.2. Buttonwood (*Conocarpus erectus*) in a matrix composed predominately of succulents.

L5 – Buttonwood Woodland-Succulent Marsh (WMcS)

1c. Mixed assemblage of mangrove tree species in a matrix composed of salt marsh graminoids, herbs, and/or succulents.

L4 – Mixed Mangrove Woodland (WMX)

1c.1. Co-dominant mix (20% or less difference in percent cover) of Black Mangrove (*Avicennia germinans*) and Buttonwood (*Conocarpus erectus*) trees.

L5 – Black Mangrove-Buttonwood Woodland (WMXac)

1c.1i. Co-dominant mix (20% or less difference in percent cover) of Black Mangrove (*Avicennia germinans*) and Buttonwood (*Conocarpus erectus*) trees in a matrix of graminoids.

L6 – Black Mangrove-Buttonwood Woodland-Graminoid Marsh (WMXacG)

1c.1ii. Co-dominant mix (20% or less difference in percent cover) of Black Mangrove (*Avicennia germinans*) and Buttonwood (*Conocarpus erectus*) trees with an open understory.

L6 – Black Mangrove-Buttonwood Woodland-Open (WMXarO)

1c.1iii. Co-dominant mix (20% or less difference in percent cover) of Black Mangrove (*Avicennia germinans*) and Buttonwood (*Conocarpus erectus*) trees in a matrix of succulents.

L6 – Black Mangrove-Buttonwood Woodland-Succulent Marsh(WMXacS)

1c.2. Co-dominant mix (20% or less difference in percent cover) of Black Mangrove (*Avicennia germinans*) and White Mangrove (*Laguncularia racemosa*) trees.

L5 – Black Mangrove-White Mangrove Woodland (WMXal)

1c.2i. Co-dominant mix (20% or less difference in percent cover) of Black Mangrove (*Avicennia germinans*) and White Mangrove (*Laguncularia racemosa*) trees in a matrix of succulents.

L6 – Black Mangrove-White Mangrove Woodland-Succulent Marsh (WMXalS)

1c.3. Co-dominant mix (20% or less difference in percent cover) of Black Mangrove (*Avicennia germinans*) and Red Mangrove (*Rhizophora mangle*) trees.

L5 – Black Mangrove-Red Mangrove Woodland (WMXar)

1c.3i. Co-dominant mix (20% or less difference in percent cover) of Black Mangrove (*Avicennia germinans*) and Red Mangrove (*Rhizophora mangle*) trees in a matrix of graminoids.

L6 – Black Mangrove-Red Mangrove Woodland-Graminoid Marsh (WMXarG)

1c.3ii. Co-dominant mix (20% or less difference in percent cover) of Black Mangrove (*Avicennia germinans*) and Red Mangrove (*Rhizophora mangle*) trees with an open understory.

L6 – Black Mangrove-Red Mangrove Woodland-Open (WMXarO)

1c.3iii. Co-dominant mix (20% or less difference in percent cover) of Black Mangrove (*Avicennia germinans*) and Red Mangrove (*Rhizophora mangle*) trees in a matrix of succulents.

L6 – Black Mangrove-Red Mangrove Woodland-Succulent Marsh (WMXarS)

L3 – Swamp Woodland (WS)

2a. Cypress (*Taxodium* spp.) in a matrix composed of Open Freshwater Marsh, graminoids, herbs, and/or shrubs.

L4 – Cypress Woodland (WSt)

2a.1. Cypress (*Taxodium* spp.) in a matrix composed predominately of graminoids, such as Sawgrass (*Cladium jamaicense*), Switchgrass (*Panicum virgatum*), Maidencane (*P. hemitomon*), among others.

L5 – Cypress Woodland-Graminoid Marsh (WStG)

2a.1i. Cypress (*Taxodium* spp.) in a matrix composed predominately of Sawgrass (*Cladium jamaicense*).

L6 – Cypress Woodland-Sawgrass Marsh (WStGc)

L2 – Upland Woodland (WU)

1. Rarely inundated and well drained open canopy woodland containing a mixed species assemblage of tropical and temperate broad-leaved trees.

L3 – Upland Hardwood Woodland (WUH)

L1 – Shrubland (S)

Stands of shrubs (shorter than 5 [16.4 ft] meters) that are of high density (50–100% cover). Mangrove communities with mean canopy heights of 2 meters (6.5 ft) or less with canopy cover greater than 10% are an exception to the Shrubland Class and fall under L1 – Scrub class.

I. Shrubs adapted to regularly flooded conditions.

L2 – Wetland Shrubland (SW)

1. Regularly flooded salt tolerant shrubs. These communities are typically found along saltwater shorelines, interior tidal rivers and creeks, or estuarine zones. Mangrove shrubs (taller than 2 meters [6.5 ft] but shorter than 5 meters [16.4]) that are of high density (50–100% cover) are considered **L1 – Shrubland (S)**, and if they are of low density (10–49% cover) they are considered **L1 – Scrub (C)**. Dwarf mangrove shrubs (2 meters [6.5 ft] or shorter) are an exception to the Shrubland class because regardless of density (10–100% cover) they are **L1 – Scrub (C)**.

L3 – Mangrove Shrubland (SM)

2. Seasonally to semi-permanently flooded freshwater shrubs primarily found in interior wetlands but may extend well into coastal zone.

L3 – Swamp Shrubland (SS)

II. Rarely flooded shrub communities consisting of semi-flood tolerant or flood intolerant woody species.

L2 – Upland Shrubland (SU)

1. Coastal Shrubland characterized by a mixed species assemblage of Sea Grape (*Coccoloba uvifera*), Gumbo Limbo (*Bursera simaruba*), Mahogany (*Swietenia mahagoni*), Spanish Stopper (*Eugenia foetida*), Poisonwood (*Metopium toxiferum*), Willow Busic (*Dipholis salicifolia*), Jamaican Dogwood (*Piscidia piscipula*), Florida Thatch Palm (*Thrinax radiata*), Bahama Maidenbush (*Savia bahamensis*), Florida Swampprivet (*Forestiera segregata*), Pride-of-Big-Pine (*Strumpfia maritima*), and Yellow Necklacepod (*Sophora tomentosa*). Common understory components include Pricklypear (*Opuntia stricta*), Triangle Cactus (*Acanthocereus tetragonus*), among others.

L3 – Coastal Hardwood Shrubland (SUC)

2. Mix of Gumbo Limbo (*Bursera simaruba*), Poisonwood (*Metopium toxiferum*), Pigeon Plum (*Coccoloba diversifolia*), White Stopper (*Eugenia axillaris*), Strangler Fig (*Ficus aurea*), Red Bay (*Persea borbonia*), Dahoon Holly (*Ilex Cassine*), Saffron Plum (*Sideroxylon celastrinum*), Sugarberry (*Celtis laevigata*), False Mastic (*S. foetidissimum*), Wax Myrtle (*Morella cerifera*), and Myrsine (*Myrsine floridana*). Similar to **L4 – Tropical Hardwood Hammock (FHS)** except average vegetation height is less than 5 meters (16.4 ft).

L3 – Tropical Hardwood Shrubland (SUH)

L2 – Wetland Shrubland (SW)

L3 – Mangrove Shrubland (SM)

1a. Black Mangrove (*Avicennia germinans*) dominant Shrubland.

L4 – Black Mangrove Shrubland (SMa)

1b. Seaside Oxeye (*Borrchia* spp.) shrubs with 10–100% cover. This is an exception to the Shrubland class because even in the case of Shrubland density (50–100% cover) this community is still considered **L1 – Scrub (C)**.

L4 – Sea-Oxeye Shrubland (CMb)

1c. Buttonwood (*Conocarpus erectus*) dominant Shrubland.

L4 – Buttonwood Shrubland (SMc)

1d. White Mangrove (*Laguncularia racemosa*) dominant Shrubland.

L4 – White Mangrove Shrubland (SMI)

1e. Red Mangrove (*Rhizophora mangle*) dominant Shrubland.

L4 – Red Mangrove Shrubland (SMr)

1f. Mix of mangrove tree species with no particular species having dominance.

L4 – Mixed Mangrove Shrubland (SMX)

1f.1. Co-dominant mix (20% or less difference in percent cover) of Black Mangrove (*Avicennia germinans*) and Buttonwood (*Conocarpus erectus*) shrubs.

L5 – Black Mangrove-Buttonwood Shrubland (SMXac)

1f.2. Co-dominant mix (20% or less difference in percent cover) of Black Mangrove (*Avicennia germinans*) and White Mangrove (*Laguncularia racemosa*) shrubs.

L5 – Black Mangrove-White Mangrove Shrubland (SMXal)

1f.3. Co-dominant mix (20% or less difference in percent cover) of Black Mangrove (*Avicennia germinans*) and Red Mangrove (*Rhizophora mangle*) shrubs.

L5 – Black Mangrove-Red Mangrove Shrubland (SMXar)

1f.4. Co-dominant mix (20% or less difference in percent cover) of Buttonwood (*Conocarpus erectus*) and White Mangrove (*Laguncularia racemosa*) shrubs.

L5 – Buttonwood-White Mangrove Shrubland (SMXcl)

1f.5. Co-dominant mix (20% or less difference in percent cover) of Buttonwood (*Conocarpus erectus*) and Red Mangrove (*Rhizophora mangle*) shrubs.

L5 – Buttonwood-Red Mangrove Shrubland (SMXcr)

1f.6. Co-dominant mix (20% or less difference in percent cover) of White Mangrove (*Laguncularia racemosa*) and Red Mangrove (*Rhizophora mangle*) shrubs.

L5 – White Mangrove-Red Mangrove Shrubland (SMXlr)

1f.7. Co-dominant mix (20% or less difference in percent cover) of Red Mangrove (*Rhizophora mangle*) and Cocoplum (*Chrysobalanus icaco*) shrubs.

L5 – Red Mangrove-Cocoplum Shrubland (SMXry)

1f.8. Co-dominant mix of shrubs of three or more mangrove species including Black Mangrove (*Avicennia germinans*), Buttonwood (*Conocarpus erectus*), Red Mangrove (*Rhizophora mangle*), and White Mangrove (*Laguncularia racemosa*). This community is characterized by having no particular species in dominance, meaning there is 20% or less difference in percent cover between the most and least abundant mangrove shrub species.

L5 – Mixed Mangrove Shrubland-Mixed (SMXX)

L3 – Swamp Shrubland (SS)

2a. Cypress (*Taxodium* spp.) shrubs, < 5 meter (16.4 ft) tall, with 10–100% cover are considered **L1 – Scrub (C)**.

L4 – Cypress Scrub (CSt)

2b. Mix of flood tolerant fresh water tree and shrub species like Swamp Bay (*Persea palustris*), Red Bay (*P. borbonia*), Cocoplum (*Chrysobalanus icaco*), Dahoon Holly (*Ilex cassine*), Willow (*Salix caroliniana*), Wax Myrtle (*Morella cerifera*), Sweetbay (*Magnolia virginiana*), Pond Apple (*Annona glabra*), and occasionally Buttonwood (*Conocarpus erectus*) or Cypress (*Taxodium* spp.).

L4 – Bayhead Shrubland (SSB)

2c. Mixed assemblage of shrubs characterized by Buttonwood (*Conocarpus erectus*), Red Mangrove (*Rhizophora mangle*), Cocoplum (*Chrysobalanus icaco*), Wax Myrtle (*Morella cerifera*), Poisonwood (*Metopium toxiferum*), Swamp Bay (*Persea palustris*), Red Bay (*P. borbonia*), Sweetbay (*Magnolia virginiana*), Dahoon Holly (*Ilex cassine*), and occasionally West Indian Mahogany (*Swietenia mahagoni*). The signatures for Buttonwood and Dahoon Holly (*I. cassine*) are often confused in regions where the two species co-exist, leaving Red Mangrove (*R. mangle*) as the distinguishing component between the Transitional Bayhead and Bayhead classes in regions where both classes are likely to be found. The significant presence (at least 30% cover) of Buttonwood (*C. erectus*) or Red Mangrove (*R. mangle*) evenly distributed throughout the vegetation matrix sets this class apart from the Bayhead Shrubland class. Note that when these species are confined to the fringe they are not considered indicative of a Transitional Bayhead.

L4 – Transitional Bayhead Shrubland (SSBT)

2d. Buttonbush (*Cephalanthus occidentalis*) shrubs with 10—100% cover. This is an exception to the Shrubland class because even in the case of Shrubland density (50–100% cover) this community is still considered **L1 – Scrub (C)**.

L4 – Buttonbush Scrub (CSh)

2e. Seasonally flooded dominant to monotypic stands of Cocoplum (*Chrysobalanus icaco*) trees and shrubs in association with other wetland species, e.g., Swamp Bay (*Persea palustris*), Red Bay (*P. borbonia*), Dahoon Holly (*Ilex cassine*), Willow (*Salix caroliniana*), Wax Myrtle (*Morella cerifera*), Sweetbay (*Magnolia virginiana*), Cypress (*Taxodium* spp.), and/or Pond Apple (*Annona glabra*), or upland tree species at higher elevation sites, e.g., Poisonwood (*Metopium toxiferum*) and/or Pigeon Plum (*Coccoloba diversifolia*). This community is usually characterized by a minimum of 50% Cocoplum (*C. icaco*) trees and shrubs. This is an exception to the Forest class because even if

average vegetation height is 5 meters (16.4 ft) or taller, it is still considered **L1 – Shrubland (S)**.

L4 – Cocoplum Shrubland (SSy)

L2 – Upland Shrubland (SU)

1. Coastal Shrubland characterized by a mixed species assemblage of Sea Grape (*Coccoloba uvifera*), Gumbo Limbo (*Bursera simaruba*), Mahogany (*Swietenia mahagoni*), Spanish Stopper (*Eugenia foetida*), Poisonwood (*Metopium toxiferum*), Willow Busic (*Dipholis salicifolia*), Jamaican Dogwood (*Piscidia piscipula*), Florida Thatch Palm (*Thrinax radiata*), Bahama Maidenbush (*Savia bahamensis*), Florida Swampprivet (*Forestiera segregata*), Pride-of-Big-Pine (*Strumpfia maritima*), and Yellow Necklacepod (*Sophora tomentosa*). Common understory components include Pricklypear (*Opuntia stricta*), Triangle Cactus (*Acanthocereus tetragonus*), among others.

L3 – Coastal Hardwood Shrubland (SUC)

2. Mix of Gumbo Limbo (*Bursera simaruba*), Poisonwood (*Metopium toxiferum*), Pigeon Plum (*Coccoloba diversifolia*), White Stopper (*Eugenia axillaris*), Strangler Fig (*Ficus aurea*), Swamp Bay (*Persea borbonia*), Dahoon Holly (*Ilex Cassine*), Saffron Plum (*Sideroxylon celastrinum*), Sugarberry (*Celtis laevigata*), False Mastic (*S. foetidissimum*), Wax Myrtle (*Morella cerifera*), and Myrsine (*Myrsine floridana*); similar to **L4 – Tropical Hardwood Hammock (FHS)** except canopy heights are less than 5 meters (16.4 ft).

L3 – Tropical Hardwood Shrubland (SUH)

L1 – Scrub (C)

Stands of shrubs (shorter than 5 meters [16.4 ft]) that are of low density (10–49% cover) and evenly spaced out in a matrix of graminoids and/or herbaceous vegetation. Mangrove communities with mean canopy heights of 2 meters (6.5 ft) or less with canopy cover greater than 10% are an exception to the Shrubland Class and fall under L1 – Scrub class.

I. Shrubs adapted to regularly flooded conditions.

L2 – Wetland Scrub (CW)

1. Regularly flooded salt tolerant shrubs. These communities typically are found along saltwater shorelines, interior tidal rivers and creeks, or estuarine zones. Mangrove shrubs (taller than 2 meters [6.5 ft] but shorter than 5 meters [16.4 ft]) that are of high density (50–100% cover) are considered **L1 – Shrubland (S)**, and if they are of low density (10–49% cover) they are considered **L1 – Scrub (C)**. Dwarf mangrove shrubs (2 meters [6.5 ft] or shorter) are an exception to the Shrubland class because regardless of density (10–100% cover) they are **L1 – Scrub (C)**.

L3 – Mangrove Scrub (CM)

2. Seasonally to semi-permanently flooded freshwater shrubs primarily found in interior wetlands but may extend well into coastal zone.

L3 – Swamp Scrub (CS)

II. Rarely flooded shrub communities consisting of semi-flood tolerant or flood intolerant woody species found on marl or rocky substrate.

L2 – Upland Scrub (CU)

1. Mix of dwarf trees and/or shrubs such as Poisonwood (*Metopium toxiferum*), Red Bay (*Persea borbonia*), Myrsine (*Myrsine floridana*), Wax Myrtle (*Morella cerifera*), Dahoon Holly (*Ilex cassine*), Buttonwood (*Conocarpus erectus*), Cocoplum (*Chrysobalanus icaco*), Varnish Leaf (*Dodonaea viscosa*), Cabbage Palm (*Sabal palmetto*), West Indian Mahogany (*Swietenia mahagoni*), an/or Saffron Plum (*Sideroxylon celastrinum*) in a matrix of prairie grasses, herbs, and, at times, including various species of vines. Canopy density will range from 10–49%. This community is typically found in marl prairie environments or along the edge of pine rocklands on marl or rocky soils.

L3 – Upland Hardwood Scrub (CUW)

2. Coastal Scrub characterized by a mixed species assemblage of Sea Grape (*Coccoloba uvifera*), Gumbo Limbo (*Bursera simaruba*), Mahogany (*Swietenia mahagoni*), Spanish Stopper (*Eugenia foetida*), Poisonwood (*Metopium toxiferum*), Willow Busic (*Dipholis salicifolia*), Jamaican Dogwood (*Piscidia piscipula*), Florida Thatch Palm (*Thrinax radiata*), Bahama Maidenbush (*Savia bahamensis*), Florida Swampprivet (*Forestiera segregata*), Pride-of-Big-Pine (*Strumpfia maritima*), and Yellow Necklacepod (*Sophora tomentosa*). Common understory components include Pricklypear (*Opuntia stricta*), Triangle Cactus (*Acanthocereus tetragonus*), among others.

L3 – Coastal Hardwood Scrub (CUC)

L2 – Wetland Scrub (CW)

L3 – Mangrove Scrub (CM)

1a. Black Mangrove (*Avicennia germinans*) dominant scrub.

L4 – Black Mangrove Scrub (CMa)

1a.1. Black Mangrove (*Avicennia germinans*) scrub in a matrix composed predominately of graminoids.

L5 – Black Mangrove Scrub-Graminoid Marsh (CMaG)

1a.1i. Black Mangrove (*Avicennia germinans*) scrub in a matrix composed predominately of Sawgrass (*Cladium jamaicense*).

L6 – Black Scrub-Sawgrass Marsh (CMaGc)

1a.2. Black Mangrove (*Avicennia germinans*) scrub in a matrix composed predominately of Open Freshwater Marsh or Open Saltwater Marsh, both of which have less than 15% marsh vegetation. Mangroves can occur in both salt and freshwater dominated marshes.

L5 – Black Mangrove Scrub-Open Marsh (CMaO)

1a.3. Black Mangrove (*Avicennia germinans*) scrub in a matrix composed predominately of succulents.

L5 – Black Mangrove Scrub-Succulent Marsh (CMaS)

1a.4. Black Mangrove (*Avicennia germinans*) scrub with an average height up to 2m, and mangrove cover of 85% or more.

L5 – Black Mangrove Scrub-Dominant (CMaD)

1b. Seaside Oxeye (*Borrchia* spp.) shrubs with 10–100% cover. This is an exception to the Shrubland class because even in the case of Shrubland density (50–100% cover) this community is still considered **L1 – Scrub (C)**.

L4 – Sea-Oxeye Scrub (CMb)

1c. Buttonwood (*Conocarpus erectus*) dominant scrub.

L4 – Buttonwood Scrub (CMc)

1c.1. Buttonwood (*Conocarpus erectus*) scrub in a matrix composed predominately of graminoids.

L5 – Buttonwood Scrub-Graminoid Marsh (CMcG)

1c.1i. Buttonwood (*Conocarpus erectus*) scrub in a matrix composed predominately of Sawgrass (*Cladium jamaicense*).

L6 – Buttonwood Scrub-Sawgrass Marsh (CMcGc)

1c.1ii. Buttonwood (*Conocarpus erectus*) scrub in a matrix composed predominately of Marsh Frimbry (*Fimbristylis spadicea*).

L6 – Buttonwood Scrub-Fimbry Marsh (CMcGf)

1c.2. Buttonwood (*Conocarpus erectus*) scrub in a matrix composed predominately of succulents.

L5 – Buttonwood Scrub-Succulent Marsh (CMcS)

1d. White Mangrove (*Laguncularia racemosa*) dominant scrub.

L4 – White Mangrove Scrub (CMI)

1d.1. White Mangrove (*Laguncularia racemosa*) scrub in a matrix composed predominately of succulents.

L5 – White Mangrove Scrub-Succulent Marsh (CMIS)

1e. Red Mangrove (*Rhizophora mangle*) dominant scrub.

L4 – Red Mangrove Scrub (CMr)

1e.1. Red Mangrove (*Rhizophora mangle*) scrub with an average height up to 2 meters (6.5 ft), and mangrove cover of 85% or more.

L5 – Red Mangrove Scrub-Dominant (CMrD)

1e.2. Red Mangrove (*Rhizophora mangle*) scrub in a matrix composed predominately of graminoids.

L5 – Red Mangrove Scrub-Graminoid Marsh (CMrG)

1e.2i. Red Mangrove (*Rhizophora mangle*) scrub in a matrix composed predominately of Sawgrass (*Cladium jamaicense*).

L6 – Red Mangrove Scrub-Sawgrass Marsh (CMrGc)

1e.2ii. Red Mangrove (*Rhizophora mangle*) scrub in a matrix composed predominately of Spikerush (*Eleocharis* spp.).

L6 – Red Mangrove Scrub-Spikerush Marsh (CMrGe)

1e.2iii. Red Mangrove (*Rhizophora mangle*) scrub in a matrix composed predominately of Black Rush (*Juncus roemerianus*).

L6 – Red Mangrove Scrub-Black Rush Marsh (CMrGj)

1e.2iv. Red Mangrove (*Rhizophora mangle*) scrub in a matrix composed predominately of Cattails (*Typha* spp.).

L6 – Red Mangrove Scrub-Cattail Marsh (CMrGt)

1e.3. Red Mangrove (*Rhizophora mangle*) scrub in a matrix composed predominately of Open Freshwater Marsh or Open Saltwater Marsh, both of which have less than 15% marsh vegetation. Mangroves can occur in both salt and freshwater dominated marshes.

L5 – Red Mangrove Scrub-Open Marsh (CMrO)

1f. Mix of mangrove species with no particular species having dominance.

L4 – Mixed Mangrove Scrub (CMX)

1f.1. Co-dominant mix (20% or less difference in percent cover) of Black Mangrove (*Avicennia germinans*) and Buttonwood (*Conocarpus erectus*) scrub.

L5 – Black Mangrove-Buttonwood Scrub (CMXac)

1f.1i. Black Mangrove-Buttonwood Scrub in a matrix composed predominately of graminoids.

L6 – Black Mangrove-Buttonwood Scrub-Graminoid Marsh (CMXacG)

1f.1ii. Black Mangrove-Buttonwood Scrub in a matrix composed predominately of Open Freshwater Marsh or Open Saltwater Marsh, both of which have less than 15% marsh vegetation. Mangroves can occur in both salt and freshwater dominated marshes.

L6 – Black Mangrove-Buttonwood Scrub-Open Marsh (CMXacO)

1f.1iii. Black Mangrove-Buttonwood Scrub in a matrix composed predominately of succulents.

L6 – Black Mangrove-Buttonwood Scrub-Succulent Marsh (CMXacS)

1f.1iv. Black Mangrove-Buttonwood Scrub with an average height up to 2 meters (6.5 ft), and mangrove cover of 85% or more.

L6 – Black Mangrove-Buttonwood Scrub-Dominant (CMXacD)

1f.2. Co-dominant mix (20% or less difference in percent cover) of Black Mangrove (*Avicennia germinans*) and White Mangrove (*Laguncularia racemosa*) scrub.

L5 – Black Mangrove-White Mangrove Scrub (CMXal)

1f.2i. Black Mangrove-White Mangrove Scrub in a matrix composed predominately of Open Freshwater Marsh or Open Saltwater Marsh, both of which have less than 15% marsh vegetation. Mangroves can occur in both salt and freshwater dominated marshes.

L6 – Black Mangrove-White Mangrove Scrub-Open Marsh (CMXalO)

1f.2ii. Black Mangrove-White Mangrove Scrub in a matrix composed predominately of succulents.

L6 – Black Mangrove-White Mangrove Scrub-Succulent Marsh (CMXalS)

1f.2iii. Black Mangrove-White Mangrove Scrub with an average height up to 2 meters (6.5 ft), and mangrove cover of 85% or more.

L6 – Black Mangrove-White Mangrove Scrub-Dominant (CMXalD)

1f.3. Co-dominant mix (20% or less difference in percent cover) of Black Mangrove (*Avicennia germinans*) and Red Mangrove (*Rhizophora mangle*) scrub.

L5 – Black Mangrove-Red Mangrove Scrub (CMXar)

1f.3i. Black Mangrove-Red Mangrove Scrub in a matrix composed predominately of graminoids.

L6 – Black Mangrove-Red Mangrove Scrub-Graminoid Marsh (CMXarG)

1f.3i.a. Black Mangrove-Red Mangrove Scrub in a matrix composed predominately of Spikerush (*Eleocharis* spp.).

L7 – Black Mangrove-Red Mangrove Scrub-Spikerush Marsh (CMXarGe)

1f.3i.b. Black Mangrove-Red Mangrove Scrub in a matrix composed predominately of Black Rush (*Juncus roemerianus*).

L7 – Black Mangrove-Red Mangrove Scrub-Black Rush Marsh (CMXarGj)

1f.3ii. Black Mangrove-Red Mangrove Scrub in a matrix composed predominately of Open Freshwater Marsh or Open Saltwater Marsh, both of which have less than 15% marsh vegetation. Mangroves can occur in both salt and freshwater dominated marshes.

L6 – Black Mangrove-Red Mangrove Scrub-Open Marsh (CMXarO)

1f.3iii. Black Mangrove-Red Mangrove Scrub in a matrix composed predominately of succulents.

L6 – Black Mangrove-Red Mangrove Scrub-Succulent Marsh (CMXarS)

1f.3iv. Black Mangrove-Red Mangrove Scrub with an average height up to 2 meters (6.5 ft), and mangrove cover of 85% or more.

L6 – Black Mangrove-Red Mangrove Scrub-Dominant (CMXarD)

1f.4. Co-dominant mix (20% or less difference in percent cover) of Buttonwood (*Conocarpus erectus*) and White Mangrove (*Laguncularia racemosa*) scrub.

L5 – Buttonwood-White Mangrove Scrub (CMXcl)

1f.4i. Buttonwood-White Mangrove Scrub in a matrix composed predominately of succulents.

L6 – Buttonwood-White Mangrove Scrub-Succulent Marsh (CMXclS)

1f.5. Co-dominant mix (20% or less difference in percent cover) of Buttonwood (*Conocarpus erectus*) and Red Mangrove (*Rhizophora mangle*) scrub.

L5 – Buttonwood-Red Mangrove Scrub (CMXcr)

1f.5i. Buttonwood-Red Mangrove Scrub in a matrix composed predominately of graminoids.

L6 – Buttonwood-Red Mangrove Scrub-Graminoid Marsh (CMXcrG)

1f.5i.a. Buttonwood-Red Mangrove Scrub in a matrix composed predominately of Sawgrass (*Cladium jamaicense*).

L7 – Buttonwood-Red Mangrove Scrub-Sawgrass Marsh (CMXcrGc)

1f.5i.b. Buttonwood-Red Mangrove Scrub in a matrix composed predominately of Spikerush (*Eleocharis* spp.).

L7 – Buttonwood-Red Mangrove Scrub-Spikerush Marsh (CMXcrGe)

1f.5i.c. Buttonwood-Red Mangrove Scrub in a matrix composed predominately of Black Rush (*Juncus roemerianus*).

L7 – Buttonwood-Red Mangrove Scrub-Black Rush Marsh (CMXcrGj)

1f.5ii. Buttonwood-Red Mangrove Scrub in a matrix composed predominately of Open Freshwater Marsh or Open Saltwater Marsh, both of which have less than 15% marsh vegetation. Mangroves can occur in both salt and freshwater dominated marshes.

L6 – Buttonwood-Red Mangrove Scrub-Open Marsh (CMXcrO)

1f.5iii. Buttonwood-Red Mangrove Scrub in a matrix composed predominately of succulents.

L6 – Buttonwood-Red Mangrove Scrub-Succulent Marsh (CMXcrS)

1f.5iv. Buttonwood-Red Mangrove Scrub with an average height up to 2 meters (6.5 ft), and mangrove cover of 85% or more.

L6 – Buttonwood-Red Mangrove Scrub-Dominant (CMXcrD)

1f.6. Co-dominant mix of shrubs of three or more mangrove species including Black Mangrove (*Avicennia germinans*), Buttonwood (*Conocarpus erectus*), Red Mangrove (*Rhizophora mangle*), and White Mangrove (*Laguncularia racemosa*). This community is characterized by having no particular species in dominance, meaning there is 20% or less difference in percent cover between the most and least abundant mangrove shrub species.

L5 – Mixed Mangrove Scrub-Mixed (CMXX)

1f.6i. Mixed Mangrove Scrub-Mixed in a matrix composed predominately of graminoids.

L6 – Mixed Mangrove Scrub-Mixed-Graminoid Marsh (CMXXG)

1f.6i.a. Mixed Mangrove Scrub-Mixed in a matrix composed predominately of Spikerush (*Eleocharis* spp.).

L7 – Mixed Mangrove Scrub-Mixed-Spikerush Marsh (CMXXGe)

1f.6ii. Mixed Mangrove Scrub-Mixed in a matrix composed predominately of Open Freshwater Marsh or Open Saltwater Marsh, both of which have less than 15% marsh vegetation. Mangroves can occur in both salt and freshwater dominated marshes.

L6 – Mixed Mangrove Scrub-Mixed-Open Marsh (CMXXO)

1f.6iii. Mixed Mangrove Scrub-Mixed in a matrix composed predominately of succulents.

L6 – Mixed Mangrove Scrub-Mixed-Succulent Marsh (CMXXS)

1f.6iv. Mixed Mangrove Scrub-Mixed with an average height up to 2 meters (6.5 ft), and mangrove cover of 85% or more.

L6 – Mixed Mangrove Scrub-Mixed-Dominant (CMXXD)

L3 – Swamp Scrub (CS)

2a. Mixed assemblage of dwarf trees and/or shrubs such as Red Bay (*Persea borbonia*), Sweet Bay (*Magnolia virginiana*), Pond Apple (*Annona glabra*), Willow (*Salix caroliniana*), Wax Myrtle (*Morella cerifera*), Dahoon Holly (*Ilex cassine*), and/or Cocoplum (*Chrysobalanus icaco*) in a matrix of long-hydroperiod grasses, herbs, and, at times, including various species of vines. Canopy density will range from 10–49%. This community is typical of tree island tails or drainage areas with peat soils.

L4 – Bayhead Swamp Scrub (CSB)

2a.1. Bayhead Swamp Scrub in a matrix composed predominately of Freshwater Graminoid Marsh.

L5 – Bayhead Swamp Scrub-Graminoid Marsh (CSBG)

2a.1i. Bayhead Swamp Scrub in a matrix composed predominately of Sawgrass (*Cladium jamaicense*).

L6 – Bayhead Swamp Scrub-Sawgrass Marsh (CSBGc)

2a.1ii. Bayhead Swamp Scrub in a matrix composed predominately of Spikerush (*Eleocharis* spp.).

L6 – Bayhead Swamp Scrub-Spikerush Marsh (CSBGc)

2b. Mixed assemblage of shrubs characterized by Buttonwood (*Conocarpus erectus*), Red Mangrove (*Rhizophora mangle*), Cocoplum (*Chrysobalanus icaco*), Wax Myrtle (*Morella cerifera*), Poisonwood (*Metopium toxiferum*), and occasionally West Indian Mahogany (*Swietenia mahagoni*), Swamp Bay (*Persea palustris*), Red Bay (*P. borbonia*), Sweetbay (*Magnolia virginiana*), and Dahoon Holly (*Ilex cassine*). The signatures for Buttonwood and Dahoon Holly (*I. cassine*) are often confused in regions where the two species co-exist, leaving Red Mangrove (*R. mangle*) as the distinguishing component between the Transitional Bayhead and Bayhead classes in regions where both classes are likely to be found. The significant presence (at least 30% cover) of Buttonwood (*C. erectus*) or Red Mangrove (*R. mangle*) evenly distributed throughout the vegetation matrix sets this class apart from the Bayhead Scrub class. Note that when these species are confined to the outside fringe they are not considered indicative of a Transitional Bayhead. Shrub cover will range from 10–49%.

L4 – Transitional Bayhead Swamp Scrub (CSBT)

2b.1. Transitional Bayhead Swamp Scrub in a matrix composed predominately of Freshwater Graminoid Marsh.

L5 – Transitional Bayhead Swamp Scrub-Graminoid Marsh (CSBTG)

2b.1i. Transitional Bayhead Swamp Scrub in a matrix composed predominately of Sawgrass (*Cladium jamaicense*).

L6 – Transitional Bayhead Swamp Scrub-Sawgrass Marsh (CSBTGc)

2b.1ii. Transitional Bayhead Swamp Scrub in a matrix composed predominately of Spikerush (*Eleocharis* spp.).

L6 – Transitional Bayhead Swamp Scrub-Sawgrass Marsh (CSBTGe)

2b.2. Transitional Bayhead Swamp Scrub in a matrix composed predominately of Open Freshwater Marsh which has less than 15% marsh vegetation.

L5 – Transitional Bayhead Swamp Scrub-Open (CSBTO)

2c. Buttonbush (*Cephalanthus occidentalis*) shrubs with 10–100% cover. This is an exception to the Shrubland class because even in the case of Shrubland density (50–100% cover) this community is still considered **L1 – Scrub (C)**.

L4 – Buttonbush Scrub (CSh)

2c.1. Buttonbush Scrub in a matrix composed predominately of Freshwater Graminoid Marsh.

L5 – Buttonbush Scrub-Graminoid Marsh (CShG)

2c.1i. Buttonbush Scrub in a matrix composed predominately of Sawgrass (*Cladium jamaicense*).

L6 – Buttonbush Scrub-Sawgrass Marsh (CShGc)

2d. Cypress (*Taxodium* spp.) shrubs with 10–100% cover. This is an exception to the Shrubland class because even in the case of Shrubland density (50–100% cover) this community is still considered **L1 – Scrub (C)**.

L4 – Cypress Scrub (CSt)

2d.1. Cypress Scrub in a matrix composed predominately of Freshwater Graminoid Marsh.

L5 – Cypress Scrub-Graminoid Marsh (CStG)

2d.1i. Cypress Scrub in a matrix composed predominately of Sawgrass (*Cladium jamaicense*).

L6 – Cypress Scrub-Sawgrass Marsh (CStGc)

2d.1i.a. Cypress Scrub in a matrix composed predominately of Sawgrass (*Cladium jamaicense*) with average height less than 2 meters (6.5 ft).

L7 – Cypress Scrub-Short Sawgrass Marsh (CStGcS)

2d.1ii. Cypress Scrub in a matrix composed predominately of Spikerush (*Eleocharis* spp.).

L6 – Cypress Scrub-Spikerush Marsh (CStGe)

2d.2. Cypress (*Taxodium* spp.) Scrub in a matrix composed predominately of Freshwater Graminoid Prairie species.

L5 – Cypress Scrub-Graminoid Prairie (CStGP)

2d.2i. Cypress (*Taxodium* spp.) Scrub in a matrix composed predominately of Sawgrass (*Cladium jamaicense*) Prairie.

L6 – Cypress Scrub-Sawgrass Prairie (CStGPc)

L2 – Upland Scrub (CU)

L3 – Upland Hardwood Scrub (CUW)

1a. Upland Hardwood Scrub in a matrix of short-hydroperiod graminoids species such as Muhly Grass (*Muhlenbergia capillaris* var. *filipes*), Sawgrass (*Cladium jamaicense*), Little Bluestem (*Schizachyrium* spp.), among others.

L4 – Upland Hardwood Scrub-Graminoid Prairie (CUWGP)

1a.1. Upland Hardwood Scrub in a matrix composed predominately of short stature Sawgrass (*Cladium jamaicense*) Prairie.

L5 – Upland Hardwood Scrub-Sawgrass Prairie (CUWGPc)

L3 – Coastal Hardwood Scrub (CUC)

2a. Coastal Scrub characterized by a mixed species assemblage of Sea Grape (*Coccoloba uvifera*), Gumbo Limbo (*Bursera simaruba*), Mahogany (*Swietenia mahagoni*), Spanish Stopper (*Eugenia foetida*), Poisonwood (*Metopium toxiferum*), Willow Busic (*Dipholis salicifolia*), Jamaican Dogwood (*Piscidia piscipula*), Florida Thatch Palm (*Thrinax radiata*), Bahama Maidenbush (*Savia bahamensis*), Florida Swampprivet (*Forestiera segregata*), Pride-of-Big-Pine (*Strumpfia maritima*), and Yellow Necklacepod (*Sophora tomentosa*). Common understory components include Pricklypear (*Opuntia stricta*), Triangle Cactus (*Acanthocereus tetragonus*), among others.

L1 – Marsh (M)

Graminoid and/or herbaceous emergent or floating vegetation in shallow water that stands at or above the ground surface for much of the year. Prairie habitat is included in this class. A marsh can have low density (0–9%) tree and shrub cover.

I. A saline wetland consisting of salt tolerant graminoid and/or herbaceous vegetation.

L2 – Salt Marsh (MS)

1. Saltgrass (*Distichlis spicata*), Black Rush (*Juncus roemerianus*), Keysgrass (*Monanthochloe littoralis*), Gulf Cordgrass (*Spartina spartinae*), Marshhay Cordgrass (*S. patens*), and/or Dropseed (*Sporobolus* spp.) dominated salt marsh.

L3 – Graminoid Salt Marsh (MSG)

2. Saltwort (*Batis maritima*), Glasswort (*Salicornia* spp.), and/or Sea Purslane (*Sesuvium* spp.) dominated salt marsh.

L3 – Succulent Salt Marsh (MSS)

II. Freshwater graminoid and/or herbaceous marsh.

L2 – Freshwater Marsh (MF)

1. Golden Leather Fern (*Acrostichum aureum*), Leather Fern (*A. danaeifolium*), Pickerelweed (*Pontederia cordata*), Lanceleaf Arrowhead (*Sagittaria lancifolia*), and/or Alligator Flag (*Thalia geniculata*) broadleaf emergent dominated freshwater marsh.

L3 – Broadleaf Emergent Marsh (MFB)

2. Long hydroperiod marsh consisting of Sawgrass (*Cladium jamaicense*), Spikerush (*Eleocharis* spp.), Soft Rush (*Juncus effusus*), Maidencane (*Panicum hemitomon*), Common Reed (*Phragmites australis*), Cattail (*Typha* spp.) and/or Sand Cordgrass (*Spartina bakeri*), among others.

L3 – Graminoid Freshwater Marsh (MFG)

3. Short hydroperiod marsh characterized by a mix of graminoids that includes low-stature Sawgrass (*Cladium jamaicense*), Muhly Grass (*Muhlenbergia capillaris* var. *filipes*), Little Bluestem (*Schizachyrium rhizomatum*), and Black Sedge (*Schoenus nigricans*), among others.

L3 – Graminoid Freshwater Prairie (MFGP)

4. Herbaceous dominated marsh consisting of Morning Glory (*Ipomoea* spp.), Hempvine (*Mikania* spp.), and/or Smartweed (*Polygonum* spp.) among others.

L3 – Herbaceous Freshwater Marsh (MFH)

5. Open water with less than 15% vegetation cover consisting of a mix of sparse graminoids, herbaceous, and/or emergent freshwater vegetation, such as Spikerush (*Eleocharis* spp.), Panicgrass (*Panicum* spp.), Sawgrass (*Cladium jamaicense*), Cattail (*Typha* spp.), Arrowhead (*Sagittaria* spp.), Pickerelweed (*Pontederia cordata*), Waterlily (*Nymphaea* spp.), Green Arum (*Peltandra virginica*), Swamp-Lily (*Crinum americanum*), Spider-lilies (*Hymenocallis* spp.), among others.

L3 – Open Freshwater Marsh (MFO)

L2 – Salt Marsh (MS)

L3 – Graminoid Salt Marsh (MSG)

1a. Black Rush (*Juncus roemerianus*) dominated salt marsh.

L4 – Black Rush Marsh (MSGj)

L3 – Succulent Salt Marsh (MSS)

L2 – Freshwater Marsh (MF)

L3 – Broadleaf Emergent Marsh (MFB)

1a. Lanceleaf Arrowhead (*Sagittaria lancifolia*) and/or Broadleaf Arrowhead (*S. latifolia*) dominated marsh.

L4 – Arrowhead Marsh (MFBs)

L3 – Graminoid Freshwater Marsh (MFG)

2a. Sawgrass (*Cladium jamaicense*) dominated marsh.

L4 – Sawgrass Marsh (MFGc)

2a.1. Sawgrass Marsh with average height of 2 meters (6.5 ft) or taller.

L5 – Tall Sawgrass Marsh (MFGcT)

2a.1i. Tall Sawgrass Marsh with 50–100% Sawgrass (*Cladium jamaicense*) cover.

L6 – Tall Sawgrass Marsh-Dense (MFGcTD)

2a.2. Sawgrass marsh with average height shorter than 2 meters (6.5 ft).

L5 – Short Sawgrass Marsh (MFGcS)

2a.2i. Short Sawgrass Marsh with 50–100% Sawgrass (*Cladium jamaicense*) cover.

L6 – Short Sawgrass Marsh-Dense (MFGcSD)

2a.2ii. Short Sawgrass Marsh with 15–49% Sawgrass (*Cladium jamaicense*) cover.

L6 – Short Sawgrass Marsh-Sparse (MFGcSS)

2b. Coastal Spikerush (*Eleocharis cellulosa*), Slim Spikerush (*E. elongata*), and/or Knotted Spikerush (*E. interstincta*) dominated marsh.

L4 – Spikerush Marsh (MFGe)

2c. Beakrush (*Rhynchospora* spp.) dominated marsh. Found commonly growing with Sawgrass (*Cladium jamaicense*). Beakrush found in the substantial presence of Little Bluestem (*Schizachyrium scoparium*) and/or Muhly Grass (*Muhlenbergia capillaris* var. *filipes*) is characteristic of a L3 – **Graminoid Freshwater Prairie (MFGP)**.

L4 – Beakrush Marsh (MFGr)

2d. Cattail (*Typha* spp.) dominated marsh.

L4 – Cattail Marsh (MFGt)

2e. Co-dominant mix of two or more graminoid marsh species like Spikerush (*Eleocharis* spp.), Panicgrass (*Panicum* spp.), Sawgrass (*Cladium jamaicense*), and/or Beakrush (*Rhynchospora* spp.). This community is characterized by having no particular graminoid species in dominance, meaning there is 15% or less difference in percent cover between two or more graminoid species.

L4 – Mixed Graminoid Freshwater Marsh (MFGX)

L3 – Graminoid Freshwater Prairie (MFGP)

3a. Sawgrass (*Cladium jamaicense*) dominated wet prairie. Muhly Grass (*Muhlenbergia capillaris* var. *filipes*), Little Bluestem (*Schizachyrium rhizomatum*), Black Sedge (*Schoenus nigricans*) may be present.

L4 – Sawgrass Prairie (MFGPc)

3b. Muhly Grass (*Muhlenbergia capillaris* var. *filipes*) dominated wet prairie. Found commonly growing with Sawgrass (*Cladium jamaicense*) or Little Bluestem (*Schizachyrium rhizomatum*).

L4 – Muhly Grass Prairie (MFGPm)

L3 – Herbaceous Freshwater Marsh (MFH)

4a. Morning Glory (*Ipomoea* spp.) dominated marsh.

L4 – Morning Glory Marsh (MFHi)

L3 – Open Freshwater Marsh (MFO)

5a. Open water with less than 15% vegetation cover consisting of a mix of sparse graminoids, herbaceous, and/or emergent freshwater vegetation, such as Spikerush (*Eleocharis* spp.), Panicgrass (*Panicum* spp.), Sawgrass (*Cladium jamaicense*), Cattail (*Typha* spp.), Arrowhead (*Sagittaria* spp.), Pickerelweed (*Pontederia cordata*), Waterlily (*Nymphaea* spp.), Green Arum (*Peltandra virginica*), Swamp-Lily (*Crinum americanum*), Spider-lilies (*Hymenocallis* spp.), among others

L1 – Exotic (E)

Non-native species assemblages. A cell label should reflect its native vegetation whenever possible. Exotic codes should be secondary. Level 2 codes exist for exotics and treated exotics. Level 3 codes split these into cover classes: Sparse (10–49% cover), Dominant (50–89% cover), and Monotypic (90–100% cover). The structure looks like this:

Users are asked to reference exotic plant species codes in the *Vegetation Classification System for South Florida Natural Areas* (Rutchev et al. 2006) for the complete vegetation classification key for exotic plant species. The species listed therein are as follows:

L2 – Brazilian Pepper (Es) (*Schinus terebinthifolius*)

L1 – Other (O)

Anthropogenic or non-vegetative features.

I. Non-Vegetative cover.

L2 – Non-Vegetative (ON)

1. Barren, generally hypersaline, flats found above the high tide mark created by storm-driven tidal events.

L3 – Barren Salt Flat (ONS)

2. Shallow intertidal sand or mud areas, which are regularly exposed to the atmosphere at low tide.

L3 – Tidal Flat (ONT)

3. Open water areas such as ponds, lakes, rivers, bays, and estuaries.

L3 – Water (ONW)

II. Non-natural coverage associated with human infrastructure and/or activities.

L2 – Anthropogenic (OA)

L2 – Non-Vegetative (ON)

L3 – Barren Salt Flat (ONS)

L3 – Tidal Flat (ONT)

L3 – Water (ONW)

L2 – Anthropogenic (OA)

1. A defined path that has been established through a landscape for the purpose of travel from one point to another.

L3 – Trails (OAT)

1a. A hard flat open passageway built for the movement of vehicles, people, and animals between two or more points.

L4 – Road (OATr)

Citations

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Appendix B. Aerial Photo Interpretation Key

- 1a. **Forested Communities:** Stands of trees with canopy cover ranging between 10%–100% and heights five meters (16.4 ft) or taller.
- 2a. High-density, greater than 49% canopy cover, stands of trees five meters (16.4 ft) or taller. Exceptions include communities dominated by Pine (2b. Woodland Community), Willow (3a. Shrubland Community), or Cocoplum (3a. Shrubland Community). **Forest Communities (F1)**
- 2b. Low-density, 10–49% canopy cover, stands of trees five meters (16.4 ft) or taller in a matrix of sparse shrubs (< 50%), graminoids, and/or herbaceous vegetation. If shrub cover exceeds 50%, community should be considered a Shrubland (3a.). Pine dominated communities may exceed 50% canopy cover. **Woodland Communities (W1)**
- 1b. **Non-forested Communities:** Low statured, less than five meters (16.4 ft) tall, woody vegetation in a matrix of graminoids and/or herbaceous vegetation. Emergent canopy trees greater than five meters (16.4 ft) maybe present in low density, less than 50% canopy cover.
- 3a. High density, 50–100%, canopy cover of woody vegetation (shrubs) less than five meters (16.4 ft) tall. Exceptions include mangrove communities where canopy heights are less than or equal to two meters (6.5 ft) (**3c. Scrub Communities**) or in the case of communities dominated by Willow or Cocoplum where canopy heights may exceed five meters (16.4 ft). **Shrubland Communities (S1)**
- 3c. Low density, less than 50%, canopy cover of woody vegetation (shrubs) less than five meters (16.4 ft) in a matrix of graminoids and/or herbaceous vegetation. The canopy cover of mangrove communities less than 2 meters (6.5 ft) (may exceed 50% cover. **Scrub Communities (C1)**
- 3b. Low density, less than 10%, canopy cover of woody vegetation, shrubs or trees, in a matrix of graminoids and/or herbaceous emergent or floating vegetation that is annually inundated by water. **Marshes and Prairies (M1)**
- 1c. **Other:** Non-vegetative landscapes or features shaped by anthropogenic activities. **Other (O1)**

Forest Communities

F1 – Forest

- 1a. Forest communities dominated by broadleaf trees B-2
- 1b. Forest communities dominated by conifers, Cypress. B-7

F2 – Broadleaf

- 2a. Regularly flooded forest consisting of flood tolerant tree species B-3
- 2b. Rarely flooded forests consisting of flood intolerant hardwood tree species of both temperate and tropical origins B-6

F3 – Flood Tolerant

- 3a. Forests consisting of salt tolerant trees that are typically found along saltwater shorelines, interior tidal rivers and creeks, or estuarine zones B-4
- 3b. Seasonally to semi-permanently flooded freshwater forests primarily found in interior wetlands but sometimes extending well into coastal areas B-5

F4 – Salt Tolerant (Mangrove)

- 4a. Very tall trees with large, irregularly textured individual crowns appearing dark purple, grey-red, pink or a desaturated pink in Spectral Channel 3 and 10 and burnt brown-orange in Spectral Channel 2. **Black Mangrove Forest (FMa)**
- 4b. Trees with irregularly textured canopy of bright white, cream-tan, or yellow in Spectral Channel 1, 3, and 10. Trees appear a light purple/lavender in Spectral Channel 6, and a pink with yellow tinting in Spectral Channel 9. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to reveal buttonwood trees that appear a very bright lime green. Light coloring can make edges of crowns appear blurred/soft. White branches may be visible along fringes or sticking up from the crowns. **Buttonwood Forest (FMc)**
- 4c. Trees have small to medium, round crowns with blurred edges that tend to grow packed closely together. Color ranges between a burnt orange-brown to a yellow-white in Spectral Channels 1, 3, and 10. When found as a monoculture, trees appear a darker brown with a connected, bumpy canopy. **White Mangrove Forest (FMl)**
- 4d. Trees have circular crowns that are a bright or muted red in Spectral Channels 1, 2, 3, and 10. Trees are a very bright red when contrasted by other woody vegetation in Spectral Channel 5. When canopies interlock it will have a smooth, carpet like texture. White branches may be visible along fringes or sticking up from the crowns. **Red Mangrove Forest (FMr)**
- 4e. A co-dominant mix (20% or less difference in percent cover) of trees that have irregularly textured crowns of dark purple, grey-red, pink or a desaturated pink, AND a dotting of white, cream-tan, or yellow crowns in Spectral Channel 1, 3, and 10. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to reveal buttonwood trees that appear a very bright lime green. **Black Mangrove-Buttonwood Forest (FMXac)**

- 4f. A co-dominant mix (20% or less difference in percent cover) of trees that have irregularly textured crowns of dark purple, grey-red, pink or a desaturated pink, AND small to medium, round brown or orange-brown crowns that have a tendency to grow closely together and have soft, blurred edges in Spectral Channel 1, 3, and 10. **Black Mangrove-White Mangrove Forest (FMXal)**
- 4g. A co-dominant mix (20% or less difference in percent cover) of irregularly textured large crowns of a purple, grey-red, pink or orange-red, AND round-edged, bright or muted red trees in Spectral Channel 1, 3, or 10. Red Mangrove trees are a very bright red when contrasted by other woody vegetation in Spectral Channel 5. ... **Black Mangrove-Red Mangrove Forest (FMXar)**
- 4h. A co-dominant mix (20% or less difference in percent cover) of an irregularly textured, dotted canopy of white, cream-tan, or yellow, AND larger, rounded brown-orange trees packed closely together in Spectral Channel 1, 3, or 10. Edges of both tree species may appear blurred/soft. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to better reveal buttonwood trees that appear a very bright lime green. Buttonwood trees also appear a light purple/lavender in Spectral Channel 6, and a pink with yellow tinting in Spectral Channel 9. **Buttonwood-White Mangrove Forest (FMXcl)**
- 4i. A co-dominant mix (20% or less difference in percent cover) of a dotted, irregularly textured canopy of white, cream-tan or yellow, AND round-edged, bright red trees in Spectral Channel 1, 3, or 10. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to better reveal buttonwood trees that appear a very bright lime green. Buttonwood trees also appear a light purple/lavender in Spectral Channel 6, and a pink with yellow tinting in Spectral Channel 9. Red mangroves are a very bright red when contrasted by other woody vegetation in Spectral Channel 5. **Buttonwood-Red Mangrove Forest (FMXcr)**
- 4j. A co-dominant mix (20% or less difference in percent cover) of small to medium, round-edged brown or orange-brown crowns that have a tendency to grow closely together and have soft edges, AND rounded, very bright red trees. Red mangroves are a very bright red when contrasted by other woody vegetation in Spectral Channel 5. **White Mangrove-Red Mangrove Forest (FMXlr)**
- 4k. A co-dominant mix of at least three mangrove species (20% or less difference in percent cover between the most and least abundant). In Spectral Channels 1, 3, or 10, trees will appear any mixture of: dotted, irregularly textured white, cream-tan or yellow; small to medium, round, burnt orange-brown shrubs that have a tendency to grow closely together and may have blurred edges; large, irregularly textured crowns of a grey-red, pink or orange-red; and/or very bright, circular red trees. Red Mangrove are a very bright red when contrasted by other woody vegetation in Spectral Channel 5. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to better reveal buttonwood trees that appear a very bright lime green. Buttonwood trees also appear a light purple/lavender in Spectral Channel 6, and a pink with yellow tinting in Spectral Channel 9. **Mixed Mangrove Forest-Mixed (FMXX)**

F5 - Freshwater

- 5a. Small, star shaped canopies clumped together appearing a dull white in Spectral Channel 0 and grey-orange in Spectral Channel 2. Canopy heights of palms are generally greater than 7 meters (22.9 ft) and may over tower the surrounding woody vegetation. **Paurotis Palm Forest (FSw)**

5b. A mixed assemblage of woody vegetation that appears rough in texture, due to varying heights and species. Colors vary according to tree species and can appear any mix of bright red, purple, dark red, dark purple, dark blue, orange, yellow, and grey in spectral channels 1, 2, and 3.
 **Bayhead Swamp Forest (FSB)**

5c. A mixed assemblage of woody vegetation that appears rough in texture, due to varying heights. Colors vary according to tree species and can appear any mix of red, purple, dark red, dark purple, dark blue, orange, yellow and grey in Spectral Channels 1, 2, and 3. There will also be bright red, typically smooth textured and semi-circular edged vegetation and/or clusters of small white to yellow round crowns dotted and clustered throughout the canopy, indicating a transitional community. In Spectral Channel 5, red mangrove can be identified more clearly as they stand out as a much brighter red than other surrounding woody vegetation. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to better reveal buttonwood trees that appear a bright lime green. **Transitional Bayhead Swamp Forest (FSBT)**

F6 – Flood Intolerant (Hammocks)

6a. Highly textured with varying canopy heights. Woody vegetation appears bright orange to bright red in Spectral Channel 3. Lianas appear smokey grey-black in Spectral Channel 3.
 **Buttonwood Hammock (FHCc)**

6b. Highly textured, closed canopy with tree crowns ranging in color from dark red to orange, yellow, and grey in Spectral Channel 3. This community is only found on coastal dunes adjacent to the bay
 **Coastal Dune Hammock (FHCD)**

6c. Texturally diverse signature with tree crowns ranging in color from dark red to deep purple with many crowns also appearing dark blue, orange, yellow, and grey in Spectral Channel 3. West Indian Mahogany may appear bright white in Spectral Channel 0.....
 **West Indian Mahogany Hammock (FHCg)**

6d. Structurally and spectrally identical to **6a. Buttonwood Hammock**, with the addition of Florida Thatch Palm (*Thrinax radiata*) appearing as small, circular, bright green crowns in Spectral Channel 0 and bright yellow or orange in Spectral Channel 3. **Fan Palm Hammock (FHCt)**

6e. Texturally diverse structural signature consisting of small irregular shaped canopies with varying heights that can exceed 10 meters (32.8 ft). Spectrally, tree crowns may appear bright orange, yellow, dark red, or purple in Spectral Channel 3. **Tropical Hardwood Hammock (FHS)**

F7 – Conifer (Cypress)

7a. Tall slender and upright trees with semi-circular canopies appearing white to light pink in Spectral Channel 3, 4, and 5. Canopies have a “fluffy” cotton-like texture. **Cypress Forest (FSt)**

7b. Similar signature to **7a. Cypress Forest** but community has a circular or semi-circular shape with the tallest trees occurring at the center. **Cypress Forest-Dome (FStD)**

7c. Similar signature to **7a. Cypress Forest** but community is arranged as an elongated linear feature.
 **Cypress Forest-Strand (FStS)**

Woodland Communities

W1 – Woodland

- 1a. Woodland communities dominated by broadleaf trees. 2
- 1b. Woodland communities dominated by conifers, Cypress. 9

W2 - Broadleaf

- 2a. Regularly flooded woodland consisting of salt tolerant tree species. These communities are typically found along saltwater shorelines, interior tidal rivers and creeks, or estuarine zone. 3
- 2b. Rarely flooded forests consisting of flood intolerant hardwood tree species of both temperate and tropical origins. 8

W3 – Salt Tolerant (Mangrove)

- 3a. Mangrove woodland with visible understory. 4
- 3b. Mangrove woodland with open understory. 7

W4 – Mangrove with Understory

- 4a. Mangrove woodland with succulent understory. 5
- 4b. Mangrove woodland with graminoid understory. 6

W5 – Mangrove, Succulent Understory

- 5a. Very tall trees with large, irregularly textured individual crowns appearing dark purple, grey-red, pink or a desaturated pink in Spectral Channel 3 and 10 and burnt brown-orange in Spectral Channel 2. Succulent understory has a flat, smooth texture and appears a bright lime green in Spectral Channel 0. Understory appears a dark blue-grey or bright orange in Spectral Channels 2 and 3. **Black Mangrove Woodland-Succulent (WMA5)**
- 5b. Very tall trees with large, irregularly textured individual crowns appearing dark purple, grey-red, pink or a desaturated pink in Spectral Channel 3 and 10 and burnt brown-orange in Spectral Channel 2. Succulent understory has a flat, smooth texture and appears a bright lime green in Spectral Channel 0. Understory appears a dark blue-grey or bright orange in Spectral Channels 2 and 3. **Buttonwood Woodland-Succulent Marsh (WMC5)**
- 5c. A co-dominant mix (20% or less difference in percent cover) of trees that have irregularly textured crowns of dark purple, grey-red, pink or a desaturated pink, AND a dotting of white, cream-tan, or yellow crowns in Spectral Channel 1, 3, and 10. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to reveal buttonwood trees that appear a very bright lime green. Succulent understory has a flat, smooth texture and appears a bright lime green in Spectral Channel 0. Understory appears a dark blue-grey or bright orange in Spectral Channels 2 and 3, and may appear pink in Spectral Channel 5Spectral Channel.....
.....
.....**Black Mangrove-Buttonwood Woodland-Succulent Marsh (WMXac5)**

- 5e. A co-dominant mix (20% or less difference in percent cover) of irregularly textured large crowns of a purple, grey-red, pink or orange-red, and round-edged, bright or muted red trees in Spectral Channel 1, 3, or 10. Red mangrove trees are a very bright red when contrasted by other woody vegetation in Spectral Channel 5. Understory appears a dark blue-grey in Spectral Channel 2, has an orange tint in Spectral Channel 3, and may appear pink in Spectral Channel 5.
..... **Black Mangrove-Red Mangrove Woodland-Succulent (WMXarS)**

W6 – Mangrove, Graminoid Understory

- 6a. Large irregular shaped crowns appearing dark purple, dark grey, or dark pink in Spectral Channel 3. Understory may appear grey, tan, yellow brown, white or blue in Spectral Channel 1, 2, 3, and 10. Understory heights may be anywhere between 0.1 to 5 meters.
..... **Black Mangrove Woodland-Graminoid Marsh (WMAg)**

- 6b. Small irregular shape with moderate textured crowns appearing bright white, cream-tan or yellow in Spectral Channels 1, 3, and 10. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to reveal buttonwood trees that appear a very bright lime green. Understory may appear grey, tan, yellow brown, white or blue in Spectral Channel 1, 2, 3, and 10. Understory heights may be anywhere between 0.1–5 meters (.32–16.4 ft).....
..... **Buttonwood Woodland-Graminoid Marsh (WMcG)**

- 6c. A co-dominant mix (20% or less difference in percent cover) of trees that have irregularly textured crowns of dark purple, grey-red, pink or a desaturated pink, and a dotting of white, cream-tan, or yellow crowns in Spectral Channel 1, 3, and 10. In windstorm-impacted sites, Buttonwood will appear bright white in Spectral Channel 0. Understory may appear grey, tan, yellow brown, white or blue in Spectral Channel 1, 2, 3, and 10.
..... **Black Mangrove-Buttonwood Woodland Graminoid (WMXacG)**

W7 – Mangrove without Understory

- 7a. Very tall trees with large, irregularly textured individual crowns appearing dark purple, grey-red, pink or a desaturated pink in Spectral Channel 3 and 10 and burnt brown-orange in Spectral Channel 2. Understory may appear white, grey, light green or blue in Spectral Channel 1, 2, and 3. Moisture appears purple to pink in spectral channels 4 and 6, peach in Spectral Channel 9 and aqua/cyan in spectral channel 10. **Black Mangrove Woodland-Open Marsh (WMAO)**

- 7b. A co-dominant mix (20% or less difference in percent cover) of irregularly textured large crowns of a purple, grey-red, pink or orange-red, AND round-edged, bright or muted red trees in Spectral Channel 1, 3, or 10. Red Mangrove trees are a very bright red when contrasted by other woody vegetation in Spectral Channel 5. Understory appears white in Spectral Channel 0.....
..... **Black Mangrove-Red Mangrove Woodland-Open (WMXarO)**

W8 – Flood Intolerant (Hardwood)

- 8a. Open canopy forest with small circular crows (palms) and large irregular shaped tree crows appearing bring red or pink in Spectral Channel 1. Lianas appear dark grey or purple in Spectral Chanel 0. **Upland Hardwood Woodland (WUH)**

W9 – Conifer (Cypress)

- 9a. Slender upright, semi-circular canopies, generally appearing white to light pink in spectral channels 3, 4, and 5. Has a “fluffy” cotton-like texture. Understory is flat and clearly visible between trees. Coloring of the understory may appear grey, tan, yellow or brown in Spectral Channel 1, 2, 3, and 10; purplish-grey in Spectral Channel 7; and olive-grey in Spectral Channel 9. Heights may be anywhere between 0.5–3 meters (1.6–9.8 ft).
..... **Cypress Woodland-Sawgrass Marsh (WStGc)**

Shrub Communities

S1 – Shrubland

- 1a. Shrubland communities dominated by broadleaf trees. 2
- 1b. Shrubland communities dominated by conifers, Cypress. 7

S2 - Broadleaf

- 2a. Regularly flooded shrubland consisting of salt tolerant tree species. These communities are typically found along saltwater shorelines, interior tidal rivers and creeks, or estuarine zone. 3
- 2b. Rarely flooded shrubland consisting of flood intolerant hardwood tree species of both temperate and tropical origins. 6

S3 – Flood Tolerant

- 3a. Shrubland consisting of salt tolerant trees that are typically found along saltwater shorelines, interior tidal rivers and creeks, or estuarine zones. 4
- 3b. Seasonally to semi-permanently flooded freshwater shrubland primarily found in interior wetlands but sometimes extending well into coastal areas. 5

S4 – Salt Tolerant (Mangrove)

- 4a. In Spectral Channel 3 and 10, shrubs appear dark purple, grey-red, pink or orange-red. In Spectral Channel 2, black mangrove appears a burnt brown-orange. Appears similarly to some red mangrove scrub signatures, however more textured and less rounded shrub canopies.
..... **Black Mangrove Shrubland (SMa)**
- 4b. In Spectral Channel 1, 3, and 10, shrubs appear as irregularly shaped clusters with dotted texture of bright white, cream-tan or yellow. Light coloring can make edges of crowns appear blurred/ soft. When on a fringe, may extend outward in a finger-like manner. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to reveal buttonwood shrubs that appear a very bright lime green. In Spectral Channel 6, shrubs have a very light purple/ lavender color, and in band 9 can appear pink and/ or possibly have a yellow tint. **Buttonwood Shrubland (SMc)**
- 4c. Very small to medium, round crowns that have a tendency to grow packed closely together. Crown edges tend to appear blurred. In Spectral Channel 1, 3, and 10 shrubs appear a burnt brown-orange color. **White Mangrove Shrubland (SMl)**

- 4d. In Spectral Channel 1, 2, 3, and 10, shrubs may have bright or muted red and grey circular crowns. In Spectral Channel 5, red mangrove is a very bright red when contrasted by other woody vegetation. When canopies interlock, has a smoother, carpet-like texture. At times, white or grey branches may be seen at the top or along the circumference of each shrub.
.....**Red Mangrove Shrubland (SMr)**
- 4e. A co-dominant mix (20% or less difference in percent cover) of black mangrove and buttonwood shrubs. In Spectral Channel 1, 3, and 10, woody vegetation appears a mix of highly textured crowns of a grey-red, pink or orange-red, as well as a dotting of small, somewhat circular bright white, cream-tan or yellow crowns. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to reveal buttonwood shrubs that appear a very bright lime green in contrast to a rich, dark green. In Spectral Channel 6, buttonwood has a very light purple/lavender color, and in band 9 it can appear pink and/ or possibly have a yellow tint.
.....**Black Mangrove-Buttonwood Shrubland (SMXac)**
- 4f. A co-dominant mix (20% or less difference in percent cover) of black mangrove and white mangrove shrubs. In Spectral Channel 1, 3, and 10, woody vegetation appears a mix of highly textured crowns of a grey-red, pink or orange-red, as well as small to medium, round brown or brown-orange crowns that have a tendency to grow closely together and have soft edges.
.....**Black Mangrove-White Mangrove Shrubland (SMXal)**
- 4g. A co-dominant mix (20% or less difference in percent cover) of black mangrove and red mangrove shrubs. In Spectral Channel 1, 3, and 10, woody vegetation appears a mix of highly textured crowns of a grey-red, pink or orange-red, as well as rounded, very bright red shrubs. In Spectral Channel 5, red mangrove can be identified more clearly as they stand out as a much brighter red than other surrounding woody vegetation.
.....**Black Mangrove-Red Mangrove Shrubland (SMXar)**
- 4h. A co-dominant mix (20% or less difference in percent cover) of buttonwood and white mangrove shrubs. In Spectral Channel 1, 3, and 10, shrubs appear as irregularly-shaped clusters with dotted texture of bright white, cream-tan or yellow, as well as larger, round, burnt brown-orange shrubs packed close together. Light coloring of buttonwood and soft texture of white mangrove can make edges of crowns appear blurred/soft. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to better reveal buttonwood shrubs that appear a very bright lime green. In Spectral Channel 6, buttonwood has a very light purple/lavender color, and in band 9 it can appear pink and/or possibly have a yellow tint.
.....**Buttonwood-White Mangrove Shrubland (SMXcl)**
- 4i. A co-dominant mix (20% or less difference in percent cover) of buttonwood and red mangrove shrubs. In Spectral Channel 1, 3, and 10, shrubs appear as irregularly shaped clusters with dotted texture of bright white, cream-tan or yellow, as well as rounded, very bright red shrubs. In Spectral Channel 5, red mangrove can be identified more clearly as they stand out as a much brighter red than other surrounding woody vegetation. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to reveal buttonwood shrubs that appear a very bright lime green. In Spectral Channel 6, buttonwood has a very light purple/lavender color, and in band 9 it can appear pink and/or possibly have a yellow tint. White sticks and branches may also be seen fanning out.
.....**Buttonwood-Red Mangrove Shrubland (SMXcr)**

- 4j. A co-dominant mix (20% or less difference in percent cover) of white mangrove and red mangrove shrubs. In Spectral Channel 1, 3, and 10, woody vegetation appears a mix of small to medium, round brown or brown-orange crowns that have a tendency to grow closely together and have soft edges, as well as rounded, very bright red shrubs. In Spectral Channel 5, red mangrove can be identified more clearly as they stand out as a much brighter red than other surrounding woody vegetation. **White Mangrove-Red Mangrove Shrubland (SMXlr)**
- 4k. A co-dominant mix (20% or less difference in percent cover) of red mangrove and cocoplum shrubs. In Spectral Channel 1, 3, and 10, woody vegetation appears a mix of rounded, very bright red shrubs as well as very dark purple-red to dark grey shrubs that have an even, carpet-like texture. In Spectral Channel 5, red mangrove can be identified more clearly as they stand out as a much brighter red than other surrounding woody vegetation.
..... **Red Mangrove-Cocoplum Shrubland (SMXry)**
- 4l. A co-dominant mix of at least three mangrove species (20% or less difference in percent cover between the most and least abundant). They could be buttonwood, white mangrove, black mangrove, or red mangrove shrubs. In Spectral Channel 1, 3, or 10, shrubs will appear any combined mix of irregularly shaped clusters with dotted texture of bright white, cream-tan or yellow; small to medium, round, burnt brown-orange shrubs that have a tendency to grow closely together and may have soft edges; highly textured crowns of a grey-red, pink or orange-red; very bright red shrubs. In Spectral Channel 5, red mangrove can be identified more clearly as they stand out as a much brighter red than other surrounding woody vegetation. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to better reveal buttonwood shrubs that appear a very bright lime green. In Spectral Channel 6, buttonwood has a very light purple/ lavender color, and in band 9 it can appear pink and/or possibly have a yellow tint.
..... **Mixed Mangrove Shrubland-Mixed (SMXX)**

S5 – Salt Intolerant (Bayhead)

- 5a. A mixed assemblage of woody vegetation that appears rough in texture, due to varying species and heights. Colors vary according to tree species and can appear bright red, purple, dark red, dark purple, dark blue, orange, yellow, and grey in spectral channels 1, 2, and 3.
..... **Bayhead Shrubland (SSB)**
- 5b. Similar to the **5a. Bayhead Shrubland** signature. In Spectral Channel 1, 3, and 10, there will also be bright red, typically smooth textured and semi-circular edged shrubs and/or clusters of small white to yellow round crowns dotted throughout the canopy, indicating a transitional community. In Spectral Channel 5, red mangrove can be identified more clearly as they stand out as a much brighter red than other surrounding woody vegetation. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to reveal buttonwood shrubs that appear a very bright lime green. In Spectral Channel 6, buttonwood has a very light purple/lavender color, and in band 9 it can appear pink and/or possibly have a yellow tint. **Transitional Bayhead Shrubland (SSBT)**
- 5c. In Spectral Channel 1, 3, and 10, shrubs appear very dark purple-red to dark grey and have an even, carpet-like texture. **Cocoplum Shrubland (SSy)**

S6 – Flood Intolerant (Hardwood)

- 6a. A mixed assemblage of woody vegetation that appears rough in texture. Colors vary according to tree species and can appear bright red, purple, dark red, dark purple, dark blue, orange, yellow, and

grey in Spectral Channel 3. This community is typically found on coastal dunes adjacent to bays. At interior locations with windstorm damage, the canopy is generally more open revealing the understory and appears bright orange in Spectral Channel 2.
 **Coastal Hardwood Shrubland (SUC)**

6b. A mixed assemblage of woody vegetation with a closed rough textured canopy appearing tan, orange, and dark purple-red in Spectral Channel 3. This community is spectrally similar to the **5b. Transitional Bayhead Shrubland** community. However, the distinctive red signature of Red Mangrove is not present when viewed in Spectral Channel 5.
 **Tropical Hardwood Shrubland (SUH)**

S7 – Conifer (Cypress)

7a. Slender upright, semi-circular canopies, generally appearing white to light pink in spectral channels 3, 4, and 5. Has a “fluffy” cotton-like texture. Due to the exception, even where percent cover is 100%, cypress that are under 5 meters (16.4 ft) are classified as a **C15 Scrub Community.**

Scrub Communities

C1 – Scrub

1a. Scrubland communities dominated by broadleaf trees. 2

1b. Scrubland communities dominated by conifers, Cypress. 15

C2 - Broadleaf

2a. Regularly flooded scrubland, including salt tolerant tree species. These communities are typically found along saltwater shorelines, interior tidal rivers and creeks, or estuarine zone. 3

2b. Rarely flooded scrubland consisting of flood intolerant hardwood tree species of both temperate and tropical origins. 14

C3 – Flood Tolerant

3a. Scrubland consisting of salt tolerant trees that are typically found along saltwater shorelines, interior tidal rivers and creeks, or estuarine zones. 4

3b. Seasonally to semi-permanently flooded freshwater scrubland primarily found in interior wetlands but sometimes extending well into coastal areas. 11

C4 – Salt Tolerant (Mangrove)

4a. Mangrove scrubland with visible understory. 5

4b. Mangrove scrubland with (no visible ground layer vegetation) open understory. 8

C5 – Mangrove with Understory

4a. Mangrove scrubland with graminoid understory. 6

4b. Mangrove scrubland with succulent understory. 7

C6 – Mangrove, Graminoid Understory

- 6a. In Spectral Channel 3 and 10, shrubs appear dark purple, grey-red, pink or orange-red. In Spectral Channel 2, black mangrove appears a burnt brown-orange. Appears similarly to some red mangrove scrub signatures, however more textured and less rounded shrub canopies. Understory may appear grey, tan, yellow brown, white or blue in Spectral Channel 1, 2, 3, and 10. Understory heights may be anywhere between 0.1–5 meters (.32–16.4 ft). **Black Mangrove Scrub-Graminoid Marsh (CMaG)**
- 6b. In Spectral Channel 3 and 10, shrubs appear dark purple, grey-red, pink or orange-red. In Spectral Channel 2, black mangrove appears a burnt brown-orange. Appears similarly to some red mangrove scrub signatures, however more textured and less rounded shrub canopies. Understory may appear grey, tan, yellow or brown in Spectral Channel 1, 2, 3, and 10; purplish-grey in Spectral Channel 7; and olive-grey in Spectral Channel 9. Heights may be anywhere between 0.5–3 meters (1.6–9.8 ft). **Black Mangrove Scrub-Sawgrass Marsh (CMaGc)**
- 6c. Highly textured open mangrove canopy with understory appearing grey-green and light orange-red in Spectral Channel 3. **Sea-Oxeye Scrub (CMB)**
- 6d. In Spectral Channel 1, 3, and 10, shrubs appear as irregularly shaped clusters with dotted texture of bright white, cream-tan or yellow. When on a fringe, may extend outward in a finger-like manner. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to reveal buttonwood shrubs that appear a very bright lime green. In Spectral Channel 6, shrubs have a very light purple/ lavender color, and in band 9 can appear pink and/ or possibly have a yellow tint. Understory appears white, grey, tan, yellow, or brown in Spectral Channel 1, 2, 3, or 10. Heights may be anywhere between 0.1–5 meters (.32–16.4 ft). **Buttonwood Scrub-Graminoid (CMcG)**
- 6e. In Spectral Channel 1, 3, and 10, shrubs appear as irregularly shaped clusters with dotted texture of bright white, cream-tan or yellow. When on a fringe, may extend outward in a finger-like manner. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to reveal buttonwood shrubs that appear a very bright lime green. In Spectral Channel 6, shrubs have a very light purple/ lavender color, and in band 9 can appear pink and/ or possibly have a yellow tint. Understory appears grey, tan, yellow, or brown in Spectral Channel 1, 2, 3, and 10; purplish-grey in Spectral Channel 7; and olive-grey in Spectral Channel 9. May have heights anywhere between 0.5–3 meters (1.6–9.8 ft). **Buttonwood Scrub-Sawgrass Marsh (CMcGc)**
- 6f. In Spectral Channel 1, 3, and 10, shrubs appear as irregularly shaped clusters with dotted texture of bright white, cream-tan or yellow. When on a fringe, may extend outward in a finger-like manner. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to reveal buttonwood shrubs that appear a very bright lime green. In Spectral Channel 6, shrubs have a very light purple/ lavender color, and in band 9 can appear pink and/ or possibly have a yellow tint. Only way to distinguish this class' understory is based on field data. **Buttonwood Scrub-Fimbry Marsh (CMcGf)**
- 6g. In Spectral Channel 1, 2, 3, and 10, shrubs may have bright or muted red and grey circular crowns. In Spectral Channel 5, red mangrove is a very bright red when contrasted by other woody vegetation. When canopies interlock, has a smoother, carpet-like texture. At times, white or grey

branches may be seen at the top or along the circumference of each shrub. Understory appears white, grey, tan, yellow, or brown in Spectral Channel 1, 2, 3, or 10. Heights may be anywhere between 0.1–5 meters (.32–16.4 ft).

.....**Red Mangrove Scrub-Graminoid Marsh (CMrG)**

- 6h. In Spectral Channel 1, 2, 3, and 10, shrubs may have bright or muted red and grey circular crowns. In Spectral Channel 5, red mangrove is a very bright red when contrasted by other woody vegetation. When canopies interlock, has a smoother, carpet-like texture. At times, white or grey branches may be seen at the top or along the circumference of each shrub. Understory appears grey, brown, or tan in Spectral Channel 1, 2, and 3; purplish-grey in Spectral Channel 7; and olive-grey in Spectral Channel 9. May have heights anywhere between 0.5–3 meters (1.6–9.8 ft). . **Red Mangrove Scrub-Sawgrass Marsh (CMrGc)**

- 6i. In Spectral Channel 1, 2, 3, and 10, shrubs may have bright or muted red and grey circular crowns. In Spectral Channel 5, red mangrove is a very bright red when contrasted by other woody vegetation. When canopies interlock, has a smoother, carpet-like texture. At times, white or grey branches may be seen at the top or along the circumference of each shrub.. Understory has a smooth, even-texture and appears a bright white, tan, or light grey in Spectral Channel 1, 2, and 3; light purple to pink in Spectral Channel 4; green-gray to bright green OR purple-pink in Spectral Channel 6; and yellow to brown in Spectral Channel 7.

.....**Red Mangrove Scrub-Spikerush Marsh (CMrGe)**

- 6j. In Spectral Channel 1, 2, 3, and 10, shrubs may have bright or muted red and grey circular crowns. In Spectral Channel 5, red mangrove is a very bright red when contrasted by other woody vegetation. When canopies interlock, has a smoother, carpet-like texture. At times, white or grey branches may be seen at the top or along the circumference of each shrub. Understory is highly textured and wavy in appearance. Crests appear bright white while troughs are light to dark grey in Spectral Channels 0 and 3.

.....**Red Mangrove Scrub-Black Rush Marsh (CMrGj)**

- 6k. In Spectral Channel 1, 2, 3, and 10, shrubs may have bright or muted red and grey circular crowns. In Spectral Channel 5, red mangrove is a very bright red when contrasted by other woody vegetation. When canopies interlock, has a smoother, carpet-like texture. At times, white or grey branches may be seen at the top or along the circumference of each shrub. Understory appears a white-yellow color sometimes with a faint green tint in Spectral Channel 3, or a cream-tan in Spectral Channel 0, forming a highly textured mat with heights anywhere from 1–4 meters (3.2–13.1 ft).

.....**Red Mangrove Scrub-Cattail Marsh (CMrGt)**

- 6l. A co-dominant mix (20% or less difference in percent cover) of black mangrove and buttonwood shrubs. In Spectral Channel 1, 3, and 10, woody vegetation appears a mix of highly textured crowns of a grey-red, pink or orange-red, as well as a dotting of small, somewhat circular bright white, cream-tan or yellow crowns. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to reveal buttonwood shrubs that appear a very bright lime green in contrast to a rich, dark green. In Spectral Channel 6, buttonwood has a very light purple/ lavender color, and in band 9 it can appear pink and/ or possibly have a yellow tint. Understory appears white, grey, tan, yellow, or brown in Spectral Channel 1, 2, 3, or 10. Heights may be anywhere between 0.1–5 meters (.32–16.4 ft).

.....**Black Mangrove-Buttonwood Scrub-Graminoid Marsh (CMXacG)**

- 6m. A co-dominant mix (20% or less difference in percent cover) of black mangrove and red mangrove shrubs. In Spectral Channel 1, 3, and 10, woody vegetation appears a mix of highly textured crowns

of a grey-red, pink or orange-red, as well as rounded, very bright red shrubs. In Spectral Channel 5, red mangrove can be identified more clearly as they stand out as a much brighter red than other surrounding woody vegetation. Understory appears white, grey, tan, yellow, or brown in Spectral Channel 1, 2, 3, or 10. Heights may be anywhere between 0.1–5 meters (.32–16.4 ft). **Black Mangrove-Red Mangrove Scrub-Graminoid Marsh (CMXArG)**

6n. A co-dominant mix (20% or less difference in percent cover) of black mangrove and red mangrove shrubs. In Spectral Channel 1, 3, and 10, woody vegetation appears a mix of highly textured crowns of a grey-red, pink or orange-red, as well as rounded, very bright red shrubs. In Spectral Channel 5, red mangrove can be identified more clearly as they stand out as a much brighter red than other surrounding woody vegetation. Understory has a smooth, even-texture and appears a bright white, tan, or light grey in Spectral Channel 1, 2, and 3; light purple to pink in Spectral Channel 4; green-gray to bright green OR purple-pink in Spectral Channel 6; and yellow to brown in Spectral Channel 7.
..... **Black Mangrove-Red Mangrove Scrub-Spikerush Marsh (CMXArGe)**

6o. A co-dominant mix (20% or less difference in percent cover) of black mangrove and red mangrove shrubs. In Spectral Channel 1, 3, and 10, woody vegetation appears a mix of highly textured crowns of a grey-red, pink or orange-red, as well as rounded, very bright red shrubs. In Spectral Channel 5, red mangrove can be identified more clearly as they stand out as a much brighter red than other surrounding woody vegetation. Understory is highly textured and wavy in appearance. Crests appear bright white while troughs are light to dark grey in Spectral Channel 0 and 3. **Black Mangrove-Red Mangrove Scrub-Black Rush Marsh (CMXArGj)**

6p. A co-dominant mix (20% or less difference in percent cover) of buttonwood and red mangrove shrubs. In Spectral Channel 1, 3, and 10, shrubs appear as irregularly shaped clusters with dotted texture of bright white, cream-tan or yellow, as well as rounded, very bright red shrubs. In Spectral Channel 5, red mangrove can be identified more clearly as they stand out as a much brighter red than other surrounding woody vegetation. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to reveal buttonwood shrubs that appear a very bright lime green. In Spectral Channel 6, buttonwood has a very light purple/ lavender color, and in band 9 it can appear pink and/ or possibly have a yellow tint. White sticks and branches may also be seen fanning out. Understory appears white, grey, tan, yellow, or brown in Spectral Channel 1, 2, 3, or 10. Heights may be anywhere between 0.1–5 meters (.32–16.4 ft).
..... **Buttonwood-Red Mangrove Scrub-Graminoid (CMXCrG)**

6q. A co-dominant mix (20% or less difference in percent cover) of buttonwood and red mangrove shrubs. In Spectral Channel 1, 3, and 10, shrubs appear as irregularly shaped clusters with dotted texture of bright white, cream-tan or yellow, as well as rounded, very bright red shrubs. In Spectral Channel 5, red mangrove can be identified more clearly as they stand out as a much brighter red than other surrounding woody vegetation. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to reveal buttonwood shrubs that appear a very bright lime green. In Spectral Channel 6, buttonwood has a very light purple/ lavender color, and in band 9 it can appear pink and/ or possibly have a yellow tint. White sticks and branches may also be seen fanning out. Understory appears grey, brown, or tan in Spectral Channel 1, 2, and 3; purplish-grey in Spectral Channel 7; and olive-grey in Spectral Channel 9. May have heights anywhere between 0.5 and 3 meters. **Buttonwood-Red Mangrove Scrub -Sawgrass (CMXCrGc)**

- 6r. A co-dominant mix (20% or less difference in percent cover) of buttonwood and red mangrove shrubs. In Spectral Channel 1, 3, and 10, shrubs appear as irregularly shaped clusters with dotted texture of bright white, cream-tan or yellow, as well as rounded, very bright red shrubs. In Spectral Channel 5, red mangrove can be identified more clearly as they stand out as a much brighter red than other surrounding woody vegetation. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to reveal buttonwood shrubs that appear a very bright lime green. In Spectral Channel 6, buttonwood has a very light purple/ lavender color, and in band 9 it can appear pink and/or possibly have a yellow tint. White sticks and branches may also be seen fanning out. Understory has a smooth, even-texture and appears a bright white, tan, or light grey in Spectral Channel 1, 2, and 3; light purple to pink in Spectral Channel 4; green-gray to bright green OR purple-pink in Spectral Channel 6; and yellow to brown in Spectral Channel 7.
 **Buttonwood-Red Mangrove Scrub Spikerush (CMXcrGe)**
- 6s. A co-dominant mix (20% or less difference in percent cover) of buttonwood and red mangrove shrubs. In Spectral Channel 1, 3, and 10, shrubs appear as irregularly shaped clusters with dotted texture of bright white, cream-tan or yellow, as well as rounded, very bright red shrubs. In Spectral Channel 5, red mangrove can be identified more clearly as they stand out as a much brighter red than other surrounding woody vegetation. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to reveal buttonwood shrubs that appear a very bright lime green. In Spectral Channel 6, buttonwood has a very light purple/ lavender color, and in band 9 it can appear pink and/ or possibly have a yellow tint. White sticks and branches may also be seen fanning out. Understory is highly textured and wavy in appearance. Crests appear bright white while troughs are light to dark grey in Spectral Channel 0 and 3.
 **Buttonwood-Red Mangrove Scrub-Black Rush Marsh (CMXcrGj)**
- 6t. A co-dominant mix of at least three mangrove species (20% or less difference in percent cover between the most and least abundant). They could be buttonwood, white mangrove, black mangrove, or red mangrove shrubs. In Spectral Channel 1, 3, or 10, shrubs will appear any combined mix of irregularly shaped clusters with dotted texture of bright white, cream-tan or yellow; small to medium, round, burnt brown-orange shrubs that have a tendency to grow closely together and may have soft edges; highly textured crowns of a grey-red, pink or orange-red; very bright red shrubs. In Spectral Channel 5, red mangrove can be identified more clearly as they stand out as a much brighter red than other surrounding woody vegetation. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to better reveal buttonwood shrubs that appear a very bright lime green. In Spectral Channel 6, buttonwood has a very light purple/lavender color, and in band 9 it can appear pink and/or possibly have a yellow tint. Understory appears white, grey, tan, yellow, or brown in Spectral Channel 1, 2, 3, or 10. Heights may be anywhere between 0.1–5 meters (.32–16.4 ft).
 **Mixed Mangrove Scrub-Mixed-Graminoid Marsh (CMXXG)**
- 6u. A co-dominant mix of at least three mangrove species (20% or less difference in percent cover between the most and least abundant). They could be buttonwood, white mangrove, black mangrove, or red mangrove shrubs. In Spectral Channel 1, 3, or 10, shrubs will appear any combined mix of irregularly shaped clusters with dotted texture of bright white, cream-tan or yellow; small to medium, round, burnt brown-orange shrubs that have a tendency to grow closely together and may have soft edges; highly textured crowns of a grey-red, pink or orange-red; very bright red shrubs. In Spectral Channel 5, red mangrove can be identified more clearly as they stand out as a much brighter red than other surrounding woody vegetation. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to better reveal buttonwood shrubs that appear a

very bright lime green. In Spectral Channel 6, buttonwood has a very light purple/lavender color, and in band 9 it can appear pink and/or possibly have a yellow tint. Understory has a smooth, even-texture and appears a bright white, tan, or light grey in Spectral Channel 1, 2, and 3; light purple to pink in Spectral Channel 4; green-gray to bright green OR purple-pink in Spectral Channel 6; and yellow to brown in Spectral Channel 7.

..... **Mixed Mangrove Scrub-Mixed-Spikerush Marsh (CMXXGe)**

C7 – Mangrove, Succulent Understory

7a. In Spectral Channel 3 and 10, shrubs appear dark purple, grey-red, pink or orange-red. In Spectral Channel 2, black mangrove appears a burnt brown-orange. Appears similarly to some red mangrove scrub signatures, however more textured and less rounded shrub canopies. Succulent understory has a flat, smooth texture and appears a bright lime green in Spectral Channel 0. In Spectral Channel 2 and 3, understory appears a dark blue-grey and in some cases, has an orange tint. **Black Mangrove Scrub-Succulent (CMaS)**

7b. In Spectral Channel 1, 3, and 10, shrubs appear as irregularly shaped clusters with dotted texture of bright white, cream-tan or yellow. Light coloring can make edges of crowns appear blurred/soft. When on a fringe, may extend outward in a finger-like manner. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to reveal buttonwood shrubs that appear a very bright lime green. In Spectral Channel 6, shrubs have a very light purple/ lavender color, and in band 9 can appear pink and/ or possibly have a yellow tint. Succulent understory has a flat, smooth texture and appears a bright lime green in Spectral Channel 0. In Spectral Channel 2 and 3, understory appears a dark blue-grey and in some cases, has an orange tint. **Buttonwood Scrub-Succulent (CMcS)**

7c. Very small to medium, round crowns that have a tendency to grow packed closely together. Crown edges tend to appear blurred. In Spectral Channel 1, 3, and 10 shrubs appear a burnt brown-orange color. Succulent understory has a flat, smooth texture and appears a bright lime green in Spectral Channel 0. In Spectral Channel 2 and 3, understory appears a dark blue-grey and in some cases, has an orange tint. **White Mangrove Scrub-Succulent Marsh (CMIS)**

7d. A co-dominant mix (20% or less difference in percent cover) of black mangrove and buttonwood shrubs. In Spectral Channel 1, 3, and 10, woody vegetation appears a mix of highly textured crowns of a grey-red, pink or orange-red, as well as a dotting of small, somewhat circular bright white, cream-tan or yellow crowns. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to reveal buttonwood shrubs that appear a very bright lime green in contrast to a rich, dark green. In Spectral Channel 6, buttonwood has a very light purple/ lavender color, and in band 9 it can appear pink and/or possibly have a yellow tint. Succulent understory has a flat, smooth texture and appears a bright lime green in Spectral Channel 0. In Spectral Channel 2 and 3, understory appears a dark blue-grey and in some cases, has an orange tint. **Black Mangrove-Buttonwood Scrub-Succulent Marsh (CMXacS)**

7e. A co-dominant mix (20% or less difference in percent cover) of black mangrove and white mangrove shrubs. In Spectral Channel 1, 3, and 10, woody vegetation appears a mix of highly textured crowns of a grey-red, pink or orange-red, as well as small to medium, round brown or brown-orange crowns that have a tendency to grow closely together and have soft edges., with a succulent understory has a flat, smooth texture and appears a bright lime green in Spectral Channel

0. In Spectral Channel 2 and 3, understory appears a dark blue-grey and in some cases, has an orange tint **Black Mangrove-White Mangrove Scrub-Succulent Marsh (CMXalS)**
- 7f. A co-dominant mix (20% or less difference in percent cover) of black mangrove and red mangrove shrubs. In Spectral Channel 1, 3, and 10, woody vegetation appears a mix of highly textured crowns of a grey-red, pink or orange-red, as well as rounded, very bright red shrubs. In Spectral Channel 5, red mangrove can be identified more clearly as they stand out as a much brighter red than other surrounding woody vegetation. Succulent understory has a flat, smooth texture and appears a bright lime green in Spectral Channel 0. In Spectral Channel 2 and 3, understory appears a dark blue-grey and in some cases, has an orange tint.
..... **Black Mangrove-Red Mangrove Scrub-Succulent Marsh (CMXarS)**
- 7g. A co-dominant mix (20% or less difference in percent cover) of buttonwood and white mangrove shrubs. In Spectral Channel 1, 3, and 10, shrubs appear as irregularly shaped clusters with dotted texture of bright white, cream-tan or yellow, as well as larger, round, burnt brown-orange shrubs packed close together. Light coloring of buttonwood and soft texture of white mangrove can make edges of crowns appear blurred/soft. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to better reveal buttonwood shrubs that appear a very bright lime green. In Spectral Channel 6, buttonwood has a very light purple/ lavender color, and in band 9 it can appear pink and/or possibly have a yellow tint. Succulent understory has a flat, smooth texture and appears a bright lime green in Spectral Channel 0. In Spectral Channel 2 and 3, understory appears a dark blue-grey and in some cases, has an orange tint.
.....
.....
.....**Buttonwood-White Mangrove Scrub-Succulent Marsh (CMXclS)**
- 7h. A co-dominant mix (20% or less difference in percent cover) of buttonwood and red mangrove shrubs. In Spectral Channel 1, 3, and 10, shrubs appear as irregularly shaped clusters with dotted texture of bright white, cream-tan or yellow, as well as rounded, very bright red shrubs. In Spectral Channel 5, red mangrove can be identified more clearly as they stand out as a much brighter red than other surrounding woody vegetation. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to reveal buttonwood shrubs that appear a very bright lime green. In Spectral Channel 6, buttonwood has a very light purple/lavender color, and in band 9 it can appear pink and/or possibly have a yellow tint. White sticks and branches may also be seen fanning out. Succulent understory has a flat, smooth texture and appears a bright lime green in Spectral Channel 0. In Spectral Channel 2 and 3, understory appears a dark blue-grey and in some cases, has an orange tint. **Buttonwood-Red Mangrove Scrub-Succulent (CMXcrS)**
- 7i. A co-dominant mix of at least three mangrove species (20% or less difference in percent cover between the most and least abundant). They could be buttonwood, white mangrove, black mangrove, or red mangrove shrubs. In Spectral Channel 1, 3, or 10, shrubs will appear any combined mix of irregularly shaped clusters with dotted texture of bright white, cream-tan or yellow; small to medium, round, burnt brown-orange shrubs that have a tendency to grow closely together and may have soft edges; highly textured crowns of a grey-red, pink or orange-red; very bright red shrubs. In Spectral Channel 5, red mangrove can be identified more clearly as they stand out as a much brighter red than other surrounding woody vegetation. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to better reveal buttonwood shrubs that appear a very bright lime green. In Spectral Channel 6, buttonwood has a very light purple/lavender color, and in band 9 it can appear pink and/or possibly have a yellow tint. Succulent understory has a flat,

smooth texture and appears a bright lime green in Spectral Channel 0. In Spectral Channel 2 and 3, understory appears a dark blue-grey and in some cases, has an orange tint. **Mixed Mangrove Scrub-Mixed-Succulent Marsh (CMXXS)**

C8 – Mangrove without Understory

- 8a. Shrub layer impairs a view of the ground cover. 9
- 8b. Ground is visible, but no ground cover is present. 10

C9 – Mangrove, Dominant

- 9a. In Spectral Channel 3 and 10, shrubs appear dark purple, grey-red, pink or orange-red. In Spectral Channel 2, black mangrove appears a burnt brown-orange. Looks similar to some red mangrove scrub signatures, however more textured and less rounded shrub canopies. Understory type is irrelevant, as the shrubs occupy 85% or more of the cell.
.....**Black Mangrove Scrub-Dominant (CMaD)**
- 9b. In Spectral Channel 1, 2, 3, and 10, shrubs may have bright or muted red and grey circular crowns. In Spectral Channel 5, red mangrove is a very bright red when contrasted by other woody vegetation. When canopies interlock, has a smoother, carpet-like texture. At times, white or grey branches may be seen at the top or along the circumference of each shrub. Understory type is irrelevant, as the shrubs occupy 85% or more of the cell.
.....**Red Mangrove Scrub Dominant (CMrD)**
- 9c. A co-dominant mix (20% or less difference in percent cover) of black mangrove and buttonwood shrubs. In Spectral Channel 1, 3, and 10, woody vegetation appears a mix of highly textured crowns of a grey-red, pink or orange-red, as well as a dotting of small, somewhat circular bright white, cream-tan or yellow crowns. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to reveal buttonwood shrubs that appear a very bright lime green in contrast to a rich, dark green. In Spectral Channel 6, buttonwood has a very light purple/lavender color, and in band 9 it can appear pink and/or possibly have a yellow tint. Understory type is irrelevant, as the shrubs occupy 85% or more of the cell.
.....**Black Mangrove-Buttonwood Scrub Dominant (CMXacD)**
- 9d. A co-dominant mix (20% or less difference in percent cover) of black mangrove and white mangrove shrubs. In Spectral Channel 1, 3, and 10, woody vegetation appears a mix of highly textured crowns of a grey-red, pink or orange-red, as well as small to medium, round brown or brown-orange crowns that have a tendency to grow closely together and have soft edges. Understory type is irrelevant, as the shrubs occupy 85% or more of the cell.
.....**Black Mangrove-White Mangrove Scrub-Dominant (CMXalD)**
- 9e. A co-dominant mix (20% or less difference in percent cover) of black mangrove and red mangrove shrubs. In Spectral Channel 1, 3, and 10, woody vegetation appears a mix of highly textured crowns of a grey-red, pink or orange-red, as well as rounded, very bright red shrubs. In Spectral Channel 5, red mangrove can be identified more clearly as they stand out as a much brighter red than other surrounding woody vegetation. Understory type is irrelevant, as the shrubs occupy 85% or more of the cell.
.....**Black Mangrove-Red Mangrove Scrub-Dominant (CMXarD)**

9f. A co-dominant mix (20% or less difference in percent cover) of buttonwood and red mangrove shrubs. In Spectral Channel 1, 3, and 10, shrubs appear as irregularly shaped clusters with dotted texture of bright white, cream-tan or yellow, as well as rounded, very bright red shrubs. In Spectral Channel 5, red mangrove can be identified more clearly as they stand out as a much brighter red than other surrounding woody vegetation. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to reveal buttonwood shrubs that appear a very bright lime green. In Spectral Channel 6, buttonwood has a very light purple/lavender color, and in band 9 it can appear pink and/or possibly have a yellow tint. White sticks and branches may also be seen fanning out. Understory type is irrelevant, as the shrubs occupy 85% or more of the cell.

..... **Buttonwood-Red Mangrove Scrub Dominant (CMXcrD)**

9g. A co-dominant mix of at least three mangrove species (20% or less difference in percent cover between the most and least abundant). They could be buttonwood, white mangrove, black mangrove, or red mangrove shrubs. In Spectral Channel 1, 3, or 10, shrubs will appear any combined mix of irregularly shaped clusters with dotted texture of bright white, cream-tan or yellow; small to medium, round, burnt brown-orange shrubs that have a tendency to grow closely together and may have soft edges; highly textured crowns of a grey-red, pink or orange-red; very bright red shrubs. In Spectral Channel 5, red mangrove can be identified more clearly as they stand out as a much brighter red than other surrounding woody vegetation. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to better reveal buttonwood shrubs that appear a very bright lime green. In Spectral Channel 6, buttonwood has a very light purple/lavender color, and in band 9 it can appear pink and/or possibly have a yellow tint. Understory type is irrelevant, as the shrubs occupy 85% or more of the cell.

..... **Mixed Mangrove Scrub-Mixed-Dominant (CMXXD)**

C10 - Mangrove, Open Understory

10a. In Spectral Channel 3 and 10, shrubs appear dark purple, grey-red, pink or orange-red. In Spectral Channel 2, black mangrove appears a burnt brown-orange. Appears similarly to some red mangrove scrub signatures, however more textured and less rounded shrub canopies. Understory may appear white, grey, light green or blue in Spectral Channel 1, 2, and 3. Moisture appears purple to pink in spectral channels 4 and 6, peach in Spectral Channel 9 and aqua/cyan in spectral channel 10. **Black Mangrove Scrub-Open Marsh (CMaO)**

10b. In Spectral Channel 1, 2, 3, and 10, shrubs may have bright or muted red and grey circular crowns. In Spectral Channel 5, red mangrove is a very bright red when contrasted by other woody vegetation. When canopies interlock, has a smoother, carpet-like texture. At times, white or grey branches may be seen at the top or along the circumference of each shrub. The understory appears white, grey, light green or blue in Spectral Channel 1, 2, and 3. Moisture appears purple to pink in spectral channels 4 and 6, peach in Spectral Channel 9 and aqua/cyan in spectral channel 10. **Red Mangrove Scrub-Open Marsh (CMrO)**

10c. A co-dominant mix (20% or less difference in percent cover) of black mangrove and buttonwood shrubs. In Spectral Channel 1, 3, and 10, woody vegetation appears a mix of highly textured crowns of a grey-red, pink or orange-red, as well as a dotting of small, somewhat circular bright white, cream-tan or yellow crowns. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to reveal buttonwood shrubs that appear a very bright lime green in contrast to a rich, dark green. In Spectral Channel 6, buttonwood has a very light purple/lavender color, and in band

9 it can appear pink and/ or possibly have a yellow tint. The understory appears white, grey, light green or blue in Spectral Channel 1, 2, and 3. Moisture appears purple to pink in spectral channels 4 and 6, peach in Spectral Channel 9 and aqua/cyan in spectral channel 10.
 **Black Mangrove-Buttonwood Scrub-Open Marsh (CMXacO)**

10d. A co-dominant mix (20% or less difference in percent cover) of black mangrove and white mangrove shrubs. In Spectral Channel 1, 3, and 10, woody vegetation appears a mix of highly textured crowns of a grey-red, pink or orange-red, as well as small to medium, round brown or brown-orange crowns that have a tendency to grow closely together and have soft edges. The understory appears white, grey, light green or blue in Spectral Channel 1, 2, and 3. Moisture appears purple to pink in spectral channels 4 and 6, peach in Spectral Channel 9 and aqua/cyan in spectral channel 10.**Black Mangrove-White Mangrove Scrub- Open Marsh (CMXalO)**

10e. A co-dominant mix (20% or less difference in percent cover) of black mangrove and red mangrove shrubs. In Spectral Channel 1, 3, and 10, woody vegetation appears a mix of highly textured crowns of a grey-red, pink or orange-red, as well as rounded, very bright red shrubs. In Spectral Channel 5, red mangrove can be identified more clearly as they stand out as a much brighter red than other surrounding woody vegetation. The understory appears white, grey, light green or blue in Spectral Channel 1, 2, and 3. Moisture appears purple to pink in spectral channels 4 and 6, peach in Spectral Channel 9 and aqua/cyan in spectral channel 10.
 **Black Mangrove-Red Mangrove Scrub-Open Marsh (CMXarO)**

10f. A co-dominant mix (20% or less difference in percent cover) of buttonwood and red mangrove shrubs. In Spectral Channel 1, 3, and 10, shrubs appear as irregularly shaped clusters with dotted texture of bright white, cream-tan or yellow, as well as rounded, very bright red shrubs. In Spectral Channel 5, red mangrove can be identified more clearly as they stand out as a much brighter red than other surrounding woody vegetation. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to reveal buttonwood shrubs that appear a very bright lime green. In Spectral Channel 6, buttonwood has a very light purple/lavender color, and in band 9 it can appear pink and/or possibly have a yellow tint. White sticks and branches may also be seen fanning out. The understory appears white, grey, light green or blue in Spectral Channel 1, 2, and 3. Moisture appears purple to pink in spectral channels 4 and 6, peach in Spectral Channel 9 and aqua/cyan in spectral channel 10.**Buttonwood-Red Mangrove Scrub-Open Marsh (CMXcrO)**

10g. A co-dominant mix of at least three mangrove species (20% or less difference in percent cover between the most and least abundant). They could be buttonwood, white mangrove, black mangrove, or red mangrove shrubs. In Spectral Channel 1, 3, or 10, shrubs will appear any combined mix of irregularly shaped clusters with dotted texture of bright white, cream-tan or yellow; small to medium, round, burnt brown-orange shrubs that have a tendency to grow closely together and may have soft edges; highly textured crowns of a grey-red, pink or orange-red; very bright red shrubs. In Spectral Channel 5, red mangrove can be identified more clearly as they stand out as a much brighter red than other surrounding woody vegetation. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to better reveal buttonwood shrubs that appear a very bright lime green. In Spectral Channel 6, buttonwood has a very light purple/lavender color, and in band 9 it can appear pink and/or possibly have a yellow tint. The understory appears white, grey, light green or blue in Spectral Channel 1, 2, and 3. Moisture appears purple to pink in spectral channels 4 and 6, peach in Spectral Channel 9 and aqua/cyan in spectral channel 10.**Mixed Mangrove Scrub-Mixed-Open Marsh (CMXXO)**

C11 - Salt Intolerant (Bayheads)

- 11a. Bayhead Scrubland Community with Mangroves. 12
- 11b. Bayhead Scrubland Community with No Mangroves. 13

C12 – Bayhead with Mangroves

- 12a. Same as **13a. Bayhead Swamp Scrub** signature. In Spectral Channel 1, 3, and 10, there will also be bright red, typically smooth textured and semi-circular edged shrubs and/or clusters of small white to yellow round crowns dotted throughout the canopy, indicating a transitional community. In Spectral Channel 5, red mangrove can be identified more clearly as they stand out as a much brighter red than other surrounding woody vegetation. In Spectral Channel 0, first zoom in and adjust the histogram, then zoom out to reveal buttonwood shrubs that appear a very bright lime green. In Spectral Channel 6, buttonwood has a very light purple/ lavender color, and in band 9 it can appear pink and/or possibly have a yellow tint. Understory type may be any kind, and can appear white, grey, green, blue, tan, yellow, brown, or black.
..... **Transitional Bayhead Swamp Scrub (CSBT)**

- 12b. Same as **12a. Transitional Bayhead Swamp Scrub** signature. Understory appears white, grey, tan, yellow, or brown in Spectral Channel 1, 2, 3, or 10. Understory heights may be anywhere between 0.1–5 meters (.32–16.4 ft).
.....
.....
..... **Transitional Bayhead Swamp Scrub-Graminoid Marsh (CSBTG)**

- 12c. Same as **12a. Transitional Bayhead Swamp Scrub** signature. Understory appears grey, brown, or tan in Spectral Channel 1, 2, and 3; purplish-grey in Spectral Channel 7; and olive-grey in Spectral Channel 9. May have heights anywhere between 0.5–3 meters (1.6–9.8 ft).
.....
.....
..... **Transitional Bayhead Swamp Scrub-Sawgrass Marsh (CSBTGc)**

- 12d. Same as **12a. Transitional Bayhead Swamp Scrub** signature. Understory has a smooth, even-texture and appears a bright white, tan, or light grey in Spectral Channel 1, 2, and 3; light purple to pink in Spectral Channel 4; green-gray to bright green OR purple-pink in Spectral Channel 6; and yellow to brown in Spectral Channel 7.
..... **Transitional Bayhead Swamp Scrub-Spikerush Marsh (CSBTGe)**

- 12e. Same as **12a. Transitional Bayhead Swamp Scrub** signature. Understory may appear white, grey, light green or blue in Spectral Channel 1, 2, and 3. Moisture appears purple to pink in spectral channels 4 and 6, peach in Spectral Channel 9 and aqua/cyan in spectral channel 10.
.....
.....
..... **Transitional Bayhead Swamp Scrub-Open Marsh (CSBTO)**

C13 – Bayhead without Mangroves

- 13a. A mixed assemblage of woody vegetation that appears rough in texture, due to varying species and heights. Individual shrubs are identifiable, and have gaps in the canopy so that the understory is visible. Colors vary according to tree species and can appear red, purple, dark red, dark purple,

dark blue, orange, yellow, and grey in spectral channels 1, 2, and 3. Understory type may be any kind, and can appear white, grey, green, blue, tan, yellow, brown, or black.
 **Bayhead Swamp Scrub (CSB)**

13b. Same as **13a. Bayhead Swamp Scrub** signature. Understory appears white, grey, tan, yellow, or brown in Spectral Channel 1, 2, 3, or 10. Heights may be anywhere between 0.1–5 meters (.32–16.4 ft).
 **Bayhead Swamp Scrub-Graminoid Marsh (CSBG)**

13c. Same as **13a. Bayhead Swamp Scrub** signature. Understory appears grey, brown, or tan in Spectral Channel 1, 2, and 3; purplish-grey in Spectral Channel 7; and olive-grey in Spectral Channel 9. May have heights anywhere between 0.5 to 3 meters (1.6–9.8 ft).
 **Bayhead Swamp Scrub-Sawgrass Marsh (CSBGc)**

13d. Same as **13a. Bayhead Swamp Scrub** signature. Understory has a smooth, even-texture and appears a bright white, tan, or light grey in Spectral Channel 1, 2, and 3; light purple to pink in Spectral Channel 4; green-gray to bright green OR purple-pink in Spectral Channel 6; and yellow to brown in Spectral Channel 7.
 **Bayhead Swamp Scrub-Spikerush Marsh (CSBGe)**

13e. Small shrubs with variable heights appearing dark red with black shadows in Spectral Channel 3. Sawgrass understory is highly textured and appears grey-blue in Spectral Channel 3 and grey-green in Spectral Channel 6.
 **Buttonbush Scrub-Sawgrass Marsh (CShGc)**

C14 – Flood Intolerant (Hardwood)

14a. A mixed assemblage of woody vegetation that appears rough in texture. Colors vary according to tree species and can appear bright red, purple, dark red, dark purple, dark blue, orange, yellow, and grey in Spectral Channel 3. This community is typically found on coastal dunes adjacent to bays. At interior locations with windstorm damage, dead trees appear white with the understory appearing white to light grey in Spectral Channel 3.
 **Coastal Hardwood Scrub (CUC)**

14b. Highly textured with variable heights. Shrubs appear bright red, orange, and yellow with small black shadows in Spectral Channel 3. Understory ranges from bright white to dark grey in Spectral Channel 3.
 **Upland Hardwood Scrub-Sawgrass Prairie (CUWGPc)**

C15 – Conifer (Cypress)

15b. Slender upright, semi-circular canopies, generally appearing white to light pink in spectral channels 3, 4, and 5. Has a “fluffy” cotton-like texture. Understory appears white, grey, tan, yellow, or brown in Spectral Channel 1, 2, 3, or 10. Heights may be anywhere between 0.1–5 meters (.32–16.4 ft).
 **Cypress Scrub-Graminoid Marsh (CStG)**

15c. Slender upright, semi-circular canopies, generally appearing white to light pink in spectral channels 3, 4, and 5. Has a “fluffy” cotton-like texture. Understory height is less than two meters, has flat, smooth texture and appears a bright lime green in Spectral Channel 0. In Spectral Channel 2 and 3, understory appears a dark blue-grey and in some cases, has an orange tint.

 **Cypress Scrub-Short Sawgrass Marsh (CStGcS)**

- 15d. Slender upright, semi-circular canopies, generally appearing white to light pink in spectral channels 3, 4, and 5. Has a “fluffy” cotton-like texture. Understory has a smooth, even-texture and appears a bright white, tan, or light grey in Spectral Channel 1, 2, and 3; light purple to pink in Spectral Channel 4; green-gray to bright green OR purple-pink in Spectral Channel 6; and yellow to brown in Spectral Channel 7. **Cypress Scrub-Spikerush Marsh (CStGe)**
- 15e Slender upright, semi-circular canopies, generally appearing white to light pink in spectral channels 3, 4, and 5. Has a “fluffy” cotton-like texture. Understory is a patched, mottled texture of grey-brown to tan in Spectral Channels 0, 1, 2, 3, and 10 and olive-grey in Spectral Channel 9.

 **Cypress Scrub-Sawgrass Prairie (CStGPc)**

Marsh and Prairies Communities

M1 – Marshes and Prairies

- 1a. Marshes found along coastal, intertidal, and estuarine zones. 2
- 1b. Marshes found in interior, non-coastal zones. 3

M2 – Salt Tolerant

- 2a. Mottled texture appearing tan in Spectral Channel 0 and grey-green to khaki in Spectral Channel 3. **Graminoid Salt Marsh (MSG)**
- 2b. Highly textured and wavy in appearance. Crest appear bright white while trough is light to dark grey in Spectral Channels 0 and 3. **Black Rush Marsh (MSGj)**
- 2c. Very smooth, flat, even textured understory that appears a light mossy green or dark blue-grey in Spectral Channel 0. In Spectral Channel 2, 3 and 10, succulents may appear pink or grey with strong orange tint. Very low heights. **Succulent Salt Marsh (MSS)**

M3 – Salt Intolerant

- 3a. Mottled texture of orange-grey in Spectral Channel 0 and bright yellow to yellow-grey in Spectral Channel 3. Canopy heights less than 0.5 meters (1.6 ft). **Arrowhead Marsh (MFBs)**
- 3c. Patched, mottled texture of grey-brown to tan in Spectral Channels 0, 1, 2, 3, and 10 and olive-grey in Spectral Channel 9. May be uneven. Heights are less than 2 meters (6.5 ft).
 **Short Sawgrass Marsh-Sparse (MFGcSS)**
- 3d. Smooth, even texture of a dark grey-brown to tan in Spectral Channels 0, 1, 2, 3, and 10 and olive-grey in Spectral Channel 9. May be uneven. May have some mottled texture. Heights less than 2 meters (6.5 ft)..... **Short Sawgrass Marsh-Dense (MFGcSD)**
- 3d. Smooth, even texture of a dark grey-brown to tan in Spectral Channels 0, 1, 2, 3, and 10 and olive-grey in Spectral Channel 9. May be uneven. May have some mottled texture. Heights over 2 meters (6.5 ft). **Tall Sawgrass Marsh-Dense (MFGcTD)**

- 3e. In Spectral Channel 1, 2, and 3 graminoid appears a smooth, even texture of white, tan or light grey with possible hints of light green or blue in Spectral Channel 3. May have some mottled texture. In Spectral Channel 2 and 3, appears tan/brown if very dense, and Spectral Channel 7 appears yellow to brown. In Spectral Channel 4 and 6, it may appear white or pink/purple, or, may also appear green-grey to bright green in Spectral Channel 6. **Spikerush Marsh** (MFGe)
- 3f. Even, mottled texture of dark grey-black with white speckling in Spectral Channel 0, 1, and 3. There is no dotting as in found in the **3g. Muhly Grass Prairie** (MFGPm) class below.....
..... **Sawgrass Prairie** (MFGPc)
- 3g. Even, mottled texture of grey-brown to tan in Spectral Channels 0 and 3. Muhly appears as random small black dots in Spectral Channel 3. Canopy heights are less than 1.5 meters (4.9 ft).
.....
..... **Muhly Grass Prairie** (MFGPm)
- 3h. Spectrally and structurally identical to **3e. Spikerush Marsh** (MFGe); it is distinguished from the former based on field data (TP/BT or VP data points). **Beakrush Marsh** (MFGr)
- 3i. Tall, fluffy textured graminoid that can form in thick, broad patches or scattered clumps. In Spectral Channel 3, appears a light tan or white color with tints of yellow or red at times. In Spectral Channel 7, cattail is a lighter pastel green compared to the darker green for sawgrass and woody vegetation. In Spectral Channel 9, it can appear a white-lavender, with possible hints of a lime green. Tends to be taller than sawgrass (up to 9 meters [29.5 ft]). **Cattail Marsh** (MFGt)
- 3j. Smooth, even texture of any combination of grey, brown, tan, or white. May also have a mix of mottled, patchy and smooth texture. In Spectral Channel 4, 6, and 8, graminoids may also appear a light purple/pink, light green, or yellow. **Mixed Graminoid Freshwater Marsh** (MFGX)
- 3k. Low lying, continuous carpet like mat of herbaceous cover that appears red to red-orange in Spectral Channel 3; orange in Spectral Channel 2; lavender in Spectral Channel 8; and a rich, bright purple in Spectral Channel 9. **Morning Glory Marsh** (MFHi)
- 3l. Blue, aqua-green, or black dominated regions (in Spectral Channels 1, 2 and 3) with less than 15% graminoid/herbaceous cover that may appear pink, very light grey, lime green, or remain unapparent. Standing water appears as pink/purple in spectral channels 4 and 6, bright lime green in Spectral Channel 2, and peach in Spectral Channel 7 or 9. **Open Marsh** (MFO)

Other

O1 – Other

- 1a. Non-natural coverage associated with human infrastructure and/or activities. 2
- 1b. Non-vegetative cover due to natural processes. 3

O2 - Anthropogenic

- 2a. Non-natural coverage associated with human infrastructure and/or activities.
..... **Anthropogenic** (OA)

2b. A flat, paved cut through vegetation community, wide enough for a vehicle to travel on it. Appears grey or black in Spectral Channel 0, 1, 2, 3, 5, and 6, may have white lines periodically along center.**Road** (OATr)

O3 – Natural non-vegetation

3a. Flat, exposed ground that appears brown, black, or tan in Spectral Channel 0, 1, and 3. May have some uneven layers. May be dry or moist.**Mud** (ONM)

3b. Flat, exposed ground near a saline water source; sometimes can be set inland from source. Typically appearing bright white to tan in Spectral Channel 0.**Barren Salt Flat** (ONS)

3c. Flat exposed intertidal zone having a smooth surface with very low texture appearing white to light grey in Spectral Channel 0. **Tidal Flat** (ONT)

3d. A smooth, flat area that appears black, blue and aqua-green in Spectral Channel 1, 2, 3, and has no standing vegetation. Appears as a purple or pink in Spectral Channel 4 and 6, and green in Spectral Channel 8. **Water** (ONW)

Exotic Classification

Non-native and often Invasive Vegetation

N1 – Exotics

1a. Highly textured closed canopy forest or shrubland appearing grey-green in Spectral Channel 0 and grey-orange in Spectral Channel 3. **Brazilian Pepper** (Es)

Appendix C. Vegetation Code Area and Percentage of Each Vegetation Code Mapped in Region 2 of the Everglades National Park and Big Cypress National Preserve Vegetation Map

Table C-1. Vegetation Code Area and Percentage of Each Vegetation Code Mapped in Region 2 of EVER and BICY Vegetation Map.

Vegetation Code	Vegetation Name	Hierarchical Level	Area (ha)	Total Area (%)
OA	Anthropogenic	2	1.5	0.003%
MFBS	Arrowhead Marsh	4	4.8	0.008%
ONS	Barren Salt Flat	3	80.8	0.137%
FSB	Bayhead Forest	4	67.0	0.113%
SSB	Bayhead Shrubland	4	284.8	0.481%
CSBGc	Bayhead Swamp Scrub-Sawgrass Marsh	6	612.0	1.035%
CSBGe	Bayhead Swamp Scrub-Spikerush Marsh	6	10.3	0.017%
MFGr	Beakrush Marsh	4	1.8	0.003%
FMa	Black Mangrove Forest	4	1267.8	2.143%
CMaD	Black Mangrove Scrub-Dominant	5	4.3	0.007%
CMaG	Black Mangrove Scrub-Graminoid Marsh	5	31.0	0.052%
CMaO	Black Mangrove Scrub-Open Marsh	5	211.0	0.357%
CMaGc	Black Mangrove Scrub-Sawgrass Marsh	6	0.5	0.001%
CMaS	Black Mangrove Scrub-Succulent Marsh	5	604.5	1.022%
SMa	Black Mangrove Shrubland	4	608.8	1.029%
WMa	Black Mangrove Woodland	4	1.0	0.002%
WMaG	Black Mangrove Woodland-Graminoid Marsh	5	4.8	0.008%
WMaO	Black Mangrove Woodland-Open Marsh	5	12.0	0.020%
WMaS	Black Mangrove Woodland-Succulent Marsh	5	91.8	0.155%
FMXac	Black Mangrove-Buttonwood Forest	5	381.5	0.645%
CMXacD	Black Mangrove-Buttonwood Scrub-Dominant	6	2.0	0.003%
CMXacG	Black Mangrove-Buttonwood Scrub-Graminoid Marsh	6	7.0	0.012%
CMXacO	Black Mangrove-Buttonwood Scrub-Open Marsh	6	3.5	0.006%
CMXacS	Black Mangrove-Buttonwood Scrub-Succulent Marsh	6	84.5	0.143%

Vegetation Code	Vegetation Name	Hierarchical Level	Area (ha)	Total Area (%)
SMXac	Black Mangrove-Buttonwood Shrubland	5	245.8	0.416%
WMXacG	Black Mangrove-Buttonwood Woodland-Graminoid Marsh	6	0.3	0.000%
WMXacS	Black Mangrove-Buttonwood Woodland-Succulent Marsh	6	3.0	0.005%
FMXar	Black Mangrove-Red Mangrove Forest	5	707.3	1.196%
CMXarGj	Black Mangrove-Red Mangrove Scrub-Black Rush Marsh	7	0.3	0.000%
CMXarD	Black Mangrove-Red Mangrove Scrub-Dominant	6	27.8	0.047%
CMXarG	Black Mangrove-Red Mangrove Scrub-Graminoid Marsh	6	18.0	0.030%
CMXarO	Black Mangrove-Red Mangrove Scrub-Open Marsh	6	138.3	0.234%
CMXarGe	Black Mangrove-Red Mangrove Scrub-Spikerush Marsh	7	0.5	0.001%
CMXarS	Black Mangrove-Red Mangrove Scrub-Succulent Marsh	6	8.5	0.014%
SMXar	Black Mangrove-Red Mangrove Shrubland	5	198.3	0.335%
WMXarO	Black Mangrove-Red Mangrove Woodland-Open	6	1.8	0.003%
WMXarS	Black Mangrove-Red Mangrove Woodland-Succulent Marsh	6	1.8	0.003%
FMXal	Black Mangrove-White Mangrove Forest	5	47.5	0.080%
CMXalD	Black Mangrove-White Mangrove Scrub-Dominant	6	0.5	0.001%
CMXalO	Black Mangrove-White Mangrove Scrub-Open Marsh	6	0.5	0.001%
CMXalS	Black Mangrove-White Mangrove Scrub-Succulent Marsh	6	0.5	0.001%
SMXal	Black Mangrove-White Mangrove Shrubland	5	12.8	0.022%
MSGj	Black Rush Marsh	4	1.0	0.002%
Es	Brazilian Pepper	2	1.0	0.002%
CShGc	Buttonbush Scrub-Sawgrass Marsh	6	4.3	0.007%
FMc	Buttonwood Forest	4	581.5	0.983%
FHCc	Buttonwood Hammock	5	156.5	0.265%
CMcGf	Buttonwood Scrub-Fimbry Marsh	6	0.5	0.001%
CMcG	Buttonwood Scrub-Graminoid Marsh	5	1.5	0.003%
CMcGc	Buttonwood Scrub-Sawgrass Marsh	6	62.0	0.105%
CMcS	Buttonwood Scrub-Succulent	5	62.8	0.106%
SMc	Buttonwood Shrubland	4	275.5	0.466%
WMc	Buttonwood Woodland	4	6.0	0.010%
WMcG	Buttonwood Woodland-Graminoid Marsh	5	1.0	0.002%

Vegetation Code	Vegetation Name	Hierarchical Level	Area (ha)	Total Area (%)
WMcS	Buttonwood Woodland-Succulent Marsh	5	10.3	0.017%
FMXcr	Buttonwood-Red Mangrove Forest	5	646.8	1.094%
CMXcrGj	Buttonwood-Red Mangrove Scrub-Black Rush Marsh	7	0.5	0.001%
CMXcrD	Buttonwood-Red Mangrove Scrub-Dominant	6	39.5	0.067%
CMXcrG	Buttonwood-Red Mangrove Scrub-Graminoid Marsh	6	6.8	0.011%
CMXcrO	Buttonwood-Red Mangrove Scrub-Open Marsh	6	826.5	1.397%
CMXcrGc	Buttonwood-Red Mangrove Scrub-Sawgrass Marsh	7	1329.3	2.247%
CMXcrGe	Buttonwood-Red Mangrove Scrub-Spikerush Marsh	7	55.5	0.094%
CMXcrS	Buttonwood-Red Mangrove Scrub-Succulent Marsh	6	0.3	0.000%
SMXcr	Buttonwood-Red Mangrove Shrubland	5	1196.5	2.023%
FMXcl	Buttonwood-White Mangrove Forest	5	88.3	0.149%
CMXclS	Buttonwood-White Mangrove Scrub-Succulent Marsh	6	1.5	0.003%
SMXcl	Buttonwood-White Mangrove Shrubland	5	31.8	0.054%
MFGt	Cattail Marsh	4	3.5	0.006%
FHCD	Coastal Dune Hammock	5	2.0	0.003%
CUC	Coastal Hardwood Scrub	3	3.8	0.006%
SUC	Coastal Hardwood Shrubland	3	43.8	0.074%
SSy	Cocoplum Shrubland	4	102.3	0.173%
FSt	Cypress Forest	4	19.0	0.032%
FStD	Cypress Forest-Dome	5	4.3	0.007%
FStS	Cypress Forest-Strand	5	1.3	0.002%
CStG	Cypress Scrub-Graminoid Marsh	5	83.0	0.140%
CStGPc	Cypress Scrub-Sawgrass Prairie	6	26.3	0.044%
CStGcS	Cypress Scrub-Short Sawgrass Marsh	7	403.0	0.681%
CStGe	Cypress Scrub-Spikerush Marsh	6	7.3	0.012%
WStGc	Cypress Woodland-Sawgrass Marsh	6	0.5	0.001%
FHCt	Fan Palm Hammock	5	10.5	0.018%
MSG	Graminoid Salt Marsh	3	7.3	0.012%
MFGX	Mixed Graminoid Freshwater Marsh	4	1251.8	2.116%
FMXX	Mixed Mangrove Forest-Mixed	5	636.0	1.075%
CMXXD	Mixed Mangrove Scrub-Mixed-Dominant	6	1.3	0.002%

Vegetation Code	Vegetation Name	Hierarchical Level	Area (ha)	Total Area (%)
CMXXG	Mixed Mangrove Scrub-Mixed-Graminoid Marsh	6	2.8	0.005%
CMXXO	Mixed Mangrove Scrub-Mixed-Open Marsh	6	0.3	0.000%
CMXXGe	Mixed Mangrove Scrub-Mixed-Spikerush Marsh	7	0.3	0.000%
CMXXS	Mixed Mangrove Scrub-Mixed-Succulent Marsh	6	0.5	0.001%
SMXX	Mixed Mangrove Shrubland-Mixed	5	110.0	0.186%
MFHi	Morning Glory Marsh	4	0.3	0.000%
MFGPm	Muhly Grass Prairie	4	33.0	0.056%
MFO	Open Freshwater Marsh	3	94.0	0.159%
FSw	Paurotis Palm Forest	4	1.0	0.002%
FMr	Red Mangrove Forest	4	184.3	0.312%
CMrGj	Red Mangrove Scrub-Black Rush Marsh	6	1.3	0.002%
CMrGt	Red Mangrove Scrub-Cattail Marsh	6	10.3	0.017%
CMrD	Red Mangrove Scrub-Dominant	5	363.0	0.614%
CMrG	Red Mangrove Scrub-Graminoid Marsh	5	3.0	0.005%
CMrO	Red Mangrove Scrub-Open Marsh	5	10231.5	17.299%
CMrGc	Red Mangrove Scrub-Sawgrass Marsh	6	3200.8	5.412%
CMrGe	Red Mangrove Scrub-Spikerush Marsh	6	2740.5	4.634%
SMr	Red Mangrove Shrubland	4	247.0	0.418%
SMXry	Red Mangrove-Cocoplum Shrubland	5	1.3	0.002%
OATr	Road	4	41.3	0.070%
MFGPc	Sawgrass Prairie	4	395.8	0.669%
CMb	Sea-Oxeye Scrub	4	0.5	0.001%
MFGcSD	Short Sawgrass Marsh-Dense	6	5078.8	8.587%
MFGcSS	Short Sawgrass Marsh-Sparse	6	66.5	0.112%
MFGe	Spikerush Marsh	4	2067.8	3.496%
MSS	Succulent Salt Marsh	3	224.8	0.380%
MFGcTD	Tall Sawgrass Marsh-Dense	6	16.0	0.027%
ONT	Tidal Flat	3	48.3	0.082%
FSBT	Transitional Bayhead Forest	4	675.8	1.143%
SSBT	Transitional Bayhead Shrubland	4	4252.3	7.190%
CSBTO	Transitional Bayhead Swamp Scrub-Open Marsh	5	66.5	0.112%

Vegetation Code	Vegetation Name	Hierarchical Level	Area (ha)	Total Area (%)
CSBTGc	Transitional Bayhead Swamp Scrub-Sawgrass Marsh	6	1505.0	2.545%
CSBTGe	Transitional Bayhead Swamp Scrub-Spikerush Marsh	6	10.0	0.017%
FHS	Tropical Hardwood Hammock	4	12.3	0.021%
SUH	Tropical Hardwood Shrubland	3	2.3	0.004%
CUWGPe	Upland Hardwood Scrub-Sawgrass Prairie	5	1.5	0.003%
WUH	Upland Woodland	3	0.5	0.001%
ONW	Water	3	13618.7	23.026%
FHCg	West Indian Mahogany Hammock	5	2.8	0.005%
FMI	White Mangrove Forest	4	3.5	0.006%
CMIS	White Mangrove Scrub-Succulent Marsh	5	2.0	0.003%
SMI	White Mangrove Shrubland	4	7.0	0.012%
FMXlr	White Mangrove-Red Mangrove Forest	5	10.3	0.017%
SMXlr	White Mangrove-Red Mangrove Shrubland	5	25.3	0.043%

Appendix D. Accuracy Assessment Table

Table D-1. Accuracy assessment table for the Region 2 vegetation map.

Map Annotation	Accuracy Assessment Annotation	One-to-One Matched Points	Number of Accepted Points	Number of Accuracy Assessment Points	One-to-One Match Correct (%)	Final Map Annotation Assessment (%)
Barren Salt Flat	Barren Salt Flat	1	1	1	--	--
Barren Salt Flat Total	--	1	1	1	100	100
Bayhead Scrub-Sawgrass	Bayhead Scrub-Sawgrass	1	1	1	--	--
Bayhead Scrub-Sawgrass Total	--	1	1	1	100	100
Bayhead Shrubland	Bayhead Shrubland	2	2	2	--	--
Bayhead Shrubland Total	--	2	2	2	100	100
Black Mangrove Forest	Black Mangrove Forest	2	2	2	--	--
Black Mangrove Forest Total	--	2	2	2	100	100
Black Mangrove Scrub-Graminoid	Black Mangrove Woodland-Graminoid ¹	0	1	1	--	--
Black Mangrove Scrub-Graminoid Total	--	0	1	1	0	100
Black Mangrove Scrub-Open Water	Black Mangrove Shrubland ²	0	1	1	--	--
Black Mangrove Scrub-Open Water Total	--	0	1	1	0	100

¹accepted vegetation height discrepancy

²accepted vegetation cover discrepancy

³accepted species discrepancy

⁴accepted modifier discrepancy.

Table D-1 (continued). Accuracy assessment table for the Region 2 vegetation map.

Map Annotation	Accuracy Assessment Annotation	One-to-One Matched Points	Number of Accepted Points	Number of Accuracy Assessment Points	One-to-One Match Correct (%)	Final Map Annotation Assessment (%)
Black Mangrove Scrub-Succulents	Black Mangrove Scrub-Succulents	1	1	1	--	--
Black Mangrove Scrub-Succulents Total	--	1	1	1	100	100
Black Mangrove Shrubland	Black Mangrove Forest ¹	0	5	5	--	--
Black Mangrove Shrubland Total	--	0	5	5	0	100
Black Mangrove Woodland-Succulents	Black Mangrove Woodland-Succulents	1	1	1	--	--
Black Mangrove Woodland-Succulents Total	--	1	1	1	100	100
Black Mangrove-Buttonwood Forest	Mixed Mangrove Forest ³	0	1	1	--	--
Black Mangrove-Buttonwood Forest Total	--	0	1	1	0	100
Black Mangrove-Buttonwood Shrubland	Black Mangrove-Buttonwood Woodland ¹	0	1	1	--	--
	Black Mangrove-Red Mangrove Forest	0	0	1	--	--
	Black Mangrove Shrubland ³	0	1	1	--	--
Black Mangrove-Buttonwood Shrubland Total	--	0	2	3	0	67

¹accepted vegetation height discrepancy

²accepted vegetation cover discrepancy

³accepted species discrepancy

⁴accepted modifier discrepancy.

Table D-1 (continued). Accuracy assessment table for the Region 2 vegetation map.

Map Annotation	Accuracy Assessment Annotation	One-to-One Matched Points	Number of Accepted Points	Number of Accuracy Assessment Points	One-to-One Match Correct (%)	Final Map Annotation Assessment (%)
Black Mangrove-Red Mangrove Forest	Black Mangrove-Red Mangrove Forest	1	1	1	--	--
Black Mangrove-Red Mangrove Forest Total	--	1	1	1	100	100
Black-Red Mangrove Scrub-Graminoid	Black Mangrove Shrubland	0	0	1	--	--
Black-Red Mangrove Scrub-Graminoid Total	--	0	0	1	0	0
Buttonwood Forest	Buttonwood Forest	12	0	12	--	--
	Buttonwood Woodland-Succulents	0	1	1	--	--
Buttonwood Forest Total	--	12	13	13	92	100
Buttonwood Shrubland	Buttonwood Shrubland	1	1	1	--	--
	Buttonwood Forest ¹	0	3	3	--	--
	Buttonwood Woodland-Graminoid ²	0	1	1	--	--
	Buttonwood Woodland-Succulents ²	0	1	1	--	--
Buttonwood Shrubland Total	--	1	6	6	17	100

¹accepted vegetation height discrepancy

²accepted vegetation cover discrepancy

³accepted species discrepancy

⁴accepted modifier discrepancy.

Table D-1 (continued). Accuracy assessment table for the Region 2 vegetation map.

Map Annotation	Accuracy Assessment Annotation	One-to-One Matched Points	Number of Accepted Points	Number of Accuracy Assessment Points	One-to-One Match Correct (%)	Final Map Annotation Assessment (%)
Buttonwood-Red Mangrove Forest	Buttonwood-Red Mangrove Forest	1	1	1	--	--
Buttonwood-Red Mangrove Forest Total	--	1	1	1	100	100
Buttonwood-Red Mangrove Scrub-Dominant	Red Mangrove Scrub-Open water	0	0	1	--	--
Buttonwood-Red Mangrove Scrub-Dominant Total	--	0	0	1	0	0
Buttonwood-Red Mangrove Scrub-Sawgrass Marsh	Red Mangrove Scrub-Open Water	0	0	1	--	--
Buttonwood-Red Mangrove Scrub-Sawgrass Total	--	0	0	1	0	0
Buttonwood-Red Mangrove Shrubland	Buttonwood-Red Mangrove Shrubland	2	2	2	--	--
	Buttonwood Forest	0	0	1	--	--
	Transitional Bayhead Shrubland	0	0	1	--	--
Buttonwood-Red Mangrove Shrubland Total	--	2	2	4	50	50

¹accepted vegetation height discrepancy

²accepted vegetation cover discrepancy

³accepted species discrepancy

⁴accepted modifier discrepancy.

Table D-1 (continued). Accuracy assessment table for the Region 2 vegetation map.

Map Annotation	Accuracy Assessment Annotation	One-to-One Matched Points	Number of Accepted Points	Number of Accuracy Assessment Points	One-to-One Match Correct (%)	Final Map Annotation Assessment (%)
Cocoplum Shrubland	Cocoplum Shrubland	2	2	2	--	--
Cocoplum Shrubland Total	--	2	2	2	100	100
Cypress Scrub-Graminoid Marsh	Cypress Scrub-Graminoid Marsh	1	1	1	--	--
Cypress Scrub-Graminoid Total	--	1	1	1	100	100
Cypress Scrub-Sparse Sawgrass Marsh	Cypress Scrub-Sparse Sawgrass Marsh	3	3	3	--	--
	Cypress Scrub-Sawgrass Marsh ⁴	0	1	1	--	--
	Short Sparse Sawgrass Marsh ^{2,3}	0	1	1	--	--
Cypress Scrub-Sparse Sawgrass Total	--	3	5	5	60	100
Mixed Graminoid Freshwater Marsh	Short-Sparse Sawgrass Marsh ³	0	4	4	--	--
	Sawgrass-Beakrush Marsh ³	0	2	2	--	--
	Wax Myrtle Scrub-Sawgrass ³	0	0	1	--	--
Mixed Graminoid Freshwater Marsh Total	--	0	6	7	0	85.7

¹accepted vegetation height discrepancy

²accepted vegetation cover discrepancy

³accepted species discrepancy

⁴accepted modifier discrepancy.

Table D-1 (continued). Accuracy assessment table for the Region 2 vegetation map.

Map Annotation	Accuracy Assessment Annotation	One-to-One Matched Points	Number of Accepted Points	Number of Accuracy Assessment Points	One-to-One Match Correct (%)	Final Map Annotation Assessment (%)
Mixed Mangrove Forest	Mixed Mangrove Forest	1	1	1	--	--
Mixed Mangrove Forest Total	--	1	1	1	100	100
Muhly Grass Prairie	Muhly Grass Prairie	1	1	1	--	--
	Mixed Graminoid Prairie ³	0	1	1	--	--
Muhly Grass Prairie Total	--	1	2	2	50	100
Open Water	Open Water	11	11	11	--	--
Open Water Total	--	11	11	11	100	100
Red Mangrove Forest	Red Mangrove Forest	2	2	2	--	--
	Buttonwood-Red Mangrove Forest ³	0	1	1	--	--
Red Mangrove Forest Total	--	2	3	3	67	100
Red Mangrove Scrub-Dominant	Red Mangrove Scrub-Open Water ²	0	1	1	--	--
Red Mangrove Scrub-Dominant Total	--	0	1	1	0	100

¹accepted vegetation height discrepancy

²accepted vegetation cover discrepancy

³accepted species discrepancy

⁴accepted modifier discrepancy.

Table D-1 (continued). Accuracy assessment table for the Region 2 vegetation map.

Map Annotation	Accuracy Assessment Annotation	One-to-One Matched Points	Number of Accepted Points	Number of Accuracy Assessment Points	One-to-One Match Correct (%)	Final Map Annotation Assessment (%)
Red Mangrove Scrub-Spikerush Marsh	Red Mangrove Scrub-Spikerush Marsh	5	5	5	--	--
	Red Mangrove Scrub-Open Water ^{2,3}	0	8	8	--	--
Red Mangrove Scrub-Spikerush Marsh Total	--	5	13	13	38	100
Red Mangrove Scrub-Open Water	Red Mangrove Scrub-Open Water	37	37	37	--	--
	Buttonwood Scrub-Open Water	0	0	1	--	--
	Red Mangrove Scrub-Dominant ²	0	1	1	--	--
	Red Mangrove Scrub-Spikerush Marsh ^{2,3}	0	2	2	--	--
	Red Mangrove Scrub-Sawgrass ^{2,3}	0	1	1	--	--
Red Mangrove Scrub-Open Marsh Total	--	37	41	42	88	98

¹accepted vegetation height discrepancy

²accepted vegetation cover discrepancy

³accepted species discrepancy

⁴accepted modifier discrepancy.

Table D-1 (continued). Accuracy assessment table for the Region 2 vegetation map.

Map Annotation	Accuracy Assessment Annotation	One-to-One Matched Points	Number of Accepted Points	Number of Accuracy Assessment Points	One-to-One Match Correct (%)	Final Map Annotation Assessment (%)
Red Mangrove Scrub-Sawgrass Marsh	Red Mangrove Scrub-Sawgrass Marsh	11	11	11	--	--
	Red Mangrove Scrub-Open Water ³	0	3	3	--	--
	Buttonwood-Red Mangrove Scrub-Sawgrass Marsh ³	0	1	1	--	--
Red Mangrove Scrub-Sawgrass Total	--	11	15	15	73	100
Red Mangrove Shrubland	Red Mangrove Shrubland	1	1	1	--	--
	Red Mangrove Forest ¹	0	1	1	--	--
Red Mangrove Shrubland Total	--	1	2	2	50	100
Sawgrass Prairie	Sawgrass Prairie	1	1	1	--	--
	Mixed Graminoid Prairie ³	0	2	2	--	--
Sawgrass Prairie Total	--	1	3	3	33	100

¹accepted vegetation height discrepancy

²accepted vegetation cover discrepancy

³accepted species discrepancy

⁴accepted modifier discrepancy.

Table D-1 (continued). Accuracy assessment table for the Region 2 vegetation map.

Map Annotation	Accuracy Assessment Annotation	One-to-One Matched Points	Number of Accepted Points	Number of Accuracy Assessment Points	One-to-One Match Correct (%)	Final Map Annotation Assessment (%)
Short-Dense Sawgrass Marsh	Short-Dense Sawgrass Marsh	1	1	1	--	--
	Short-Sparse Sawgrass Marsh ⁴	0	12	12	--	--
	Tall-Dense Sawgrass Marsh ⁴	0	3	3	--	--
	Tall-Short Sawgrass Marsh ⁴	0	2	2	--	--
	Sawgrass Prairie	0	0	1	--	--
	Mixed Prairie	0	0	1	--	--
Short-Dense Sawgrass Marsh (continued)	Sawgrass-Beakrush Marsh ³	0	4	4	--	--
	Red Mangrove Scrub-Sawgrass Marsh	0	1	2	--	--
	Transitional Bayhead Swamp Scrub-Sawgrass Marsh ³	0	1	1	--	--
	Cypress Scrub-Graminoid Marsh	0	0	1	--	--
Short-Dense Sawgrass Marsh Total	--	1	24	28	4	86

¹accepted vegetation height discrepancy

²accepted vegetation cover discrepancy

³accepted species discrepancy

⁴accepted modifier discrepancy.

Table D-1 (continued). Accuracy assessment table for the Region 2 vegetation map.

Map Annotation	Accuracy Assessment Annotation	One-to-One Matched Points	Number of Accepted Points	Number of Accuracy Assessment Points	One-to-One Match Correct (%)	Final Map Annotation Assessment (%)
Short-Sparse Sawgrass Marsh	Short-Sparse Sawgrass Marsh	2	2	2	--	--
	Mixed Graminoid Marsh ³	0	1	1	--	--
Short-Sparse Sawgrass Marsh Total	--	2	3	3	67	100
Spikerush Marsh	Spikerush Marsh	11	11	11	--	--
	Mixed Graminoid Marsh ³	0	1	1	--	--
Spikerush Marsh Total	--	11	11	12	92	100
Succulent Salt Marsh	Saltwort Salt Marsh ³	0	0	1	--	--
Succulent Salt Marsh Total	--	0	1	1	0	100
Transitional Bayhead Scrub-Spikerush Marsh	Transitional Bayhead Swamp Scrub-Sawgrass Marsh ⁴	0	0	1	--	--
Transitional Bayhead Swamp Scrub-Spikerush Marsh Total	--	0	0	1	0	0

¹accepted vegetation height discrepancy

²accepted vegetation cover discrepancy

³accepted species discrepancy

⁴accepted modifier discrepancy.

Table D-1 (continued). Accuracy assessment table for the Region 2 vegetation map.

Map Annotation	Accuracy Assessment Annotation	One-to-One Matched Points	Number of Accepted Points	Number of Accuracy Assessment Points	One-to-One Match Correct (%)	Final Map Annotation Assessment (%)
Transitional Bayhead Swamp Scrub-Sawgrass Marsh	Transitional Bayhead Swamp Scrub-Sawgrass Marsh	1	1	1	--	--
	Red Mangrove Scrub-Open Water	0	0	1	--	--
	Buttonwood-Red Mangrove Scrub-Sawgrass Marsh	0	0	1	--	--
Transitional Bayhead Swamp Scrub-Sawgrass Marsh (continued)	Buttonwood-Red Mangrove Shrubland	0	0	2	--	--
	Transitional Bayhead Shrubland ¹	0	5	5	--	--
Transitional Bayhead Swamp Scrub-Sawgrass Total	--	1	6	10	10	60

¹accepted vegetation height discrepancy

²accepted vegetation cover discrepancy

³accepted species discrepancy

⁴accepted modifier discrepancy.

Table D-1 (continued). Accuracy assessment table for the Region 2 vegetation map.

Map Annotation	Accuracy Assessment Annotation	One-to-One Matched Points	Number of Accepted Points	Number of Accuracy Assessment Points	One-to-One Match Correct (%)	Final Map Annotation Assessment (%)
Transitional Bayhead Shrubland	Transitional Bayhead Shrubland	8	8	8	--	--
	Transitional Bayhead Swamp Scrub-Sawgrass Marsh ³	0	1	1	--	--
	Bayhead Shrubland ⁴	0	1	1	--	--
	Buttonwood Scrub-Sawgrass Marsh	0	0	1	--	--
	Buttonwood-Red Mangrove Forest	0	0	1	--	--
	Buttonwood-Red Mangrove Shrubland	0	0	1	--	--
	Buttonwood-Red Mangrove Scrub-Sawgrass Marsh	0	0	1	--	--
	Red Mangrove Shrubland	0	0	1	--	--
	Red Mangrove Scrub-Open Water	0	0	1	--	--
	Cocoplum Shrubland	0	0	2	--	--
Transitional Bayhead Shrubland Total	--	8	10	18	44	56

¹accepted vegetation height discrepancy

²accepted vegetation cover discrepancy

³accepted species discrepancy

⁴accepted modifier discrepancy.

Table D-1 (continued). Accuracy assessment table for the Region 2 vegetation map.

Map Annotation	Accuracy Assessment Annotation	One-to-One Matched Points	Number of Accepted Points	Number of Accuracy Assessment Points	One-to-One Match Correct (%)	Final Map Annotation Assessment (%)
Tropical Hardwood Shrubland	Transitional Bayhead Forest	0	0	1	--	--
Tropical Hardwood Shrubland Total	--	0	0	1	0	0
Total	--	124	201	229	54	88

¹accepted vegetation height discrepancy

²accepted vegetation cover discrepancy

³accepted species discrepancy

⁴accepted modifier discrepancy.

The Department of the Interior protects and manages the nation's natural resources and cultural heritage; provides scientific and other information about those resources; and honors its special responsibilities to American Indians, Alaska Natives, and affiliated Island Communities.

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