
Appendix E

Wetland and Floodplain Management

Final DRAFT

Appendix E: Wetland and Floodplain Management

This appendix presents a detailed summary of the wetlands present on 45th Space Wing (45 SW) installations. For a summary of the management of wetlands on 45 SW installations, see section 7.6 of the Integrated Natural Resources Management Plan (INRMP); for a summary of all water resources, see Section 5.5 of the INRMP.

E.1. Wetlands and Deepwater Habitats within 45 SW

The wetlands summaries here are based primarily on National Wetlands Inventory (NWI) data, which is inherently limited due to the lack of groundtruthing and does not overlap exactly with criteria determining whether a wetland meets US Army Corps of Engineers (USACE) wetland criteria or whether it is jurisdictional under the Clean Water Act. For planning purposes, NWI maps may be consulted to determine if there is a likelihood of wetlands occurring within a project area. A formal wetland delineation and jurisdictional determination is required to identify permitting requirements, in the event of a potential impact to the waters of the US. Rivers, streams and canals can also be considered waters of the US and any jurisdictional determinations must include those water resources as well.

E.1.1. Cape Canaveral Air Force Station (CCAFS)

Mapping and Inventories

Wetlands and deepwater habitats at CCAFS were inventoried in 1988 as part of the National Wetland Inventory (NWI) mapping program (current data available at <http://www.fws.gov/wetlands/Data/Mapper.html>). The USFWS conducted an updated NWI for CCAFS in 2009. There are six wetland types and open water systems within CCAFS: mangrove wetlands, salt marsh wetlands, freshwater wetlands, brackish water impoundments, borrow pits, and drainage canal systems.

E.1.1.1. Mangrove Wetlands

CCAFS estuarine wetlands dominated by woody cover are typically mangrove communities located on the fringes of the Banana River and adjacent impoundments. Several hard freezes experienced in the 1980's drastically reduced the extent of mangrove communities on CCAFS. Emergent grasses typical of salt marshes often succeed former mangrove-lined shorelines. Favorable weather conditions through the 1990s enabled the re-establishment of mangroves along the Banana River shoreline, although exotic species such as Brazilian peppers are now directly competing with the mangroves. Mangrove communities are very fragile and can easily be altered by dredging, flooding, impounding, and clearing. Mangrove leaf detritus is an important energy source within the complex marine food chain. Consequently, all mangroves are protected by the 1996 Mangrove Trimming and Preservation Act.

Mangroves found on CCAFS are listed below with other plant species associated with this community.

Shrubs/Trees

Black Mangrove	<i>Avicennia germinans</i>
Buttonwood	<i>Conocarpus erectus</i>
Red Mangrove	<i>Rhizophora mangle</i>
Salt Bush	<i>Baccharis halimifolia</i>
Sea Oxeye	<i>Borrichia frutescens</i>
White Mangrove	<i>Laguncularia racemosa</i>

Herbs

Black Needle Rush	<i>Juncus roemerianus</i>
Cordgrass	<i>Spartina bakeri</i>
Salt Grass	<i>Distichlis spicata</i>

Due to its riparian location, species diversity within mangrove habitat is widely varied. However, use of mangrove communities on CCAFS by wading birds and migratory waterfowl is extensive.

Common wildlife species associated with the mangroves include the following:

Birds

American Coot	<i>Fulica americana</i>
Anhinga	<i>Anhinga anhinga</i>
Belted Kingfisher	<i>Megaceryle alcyon</i>
Brown Pelican	<i>Pelecanus occidentalis</i>
Cattle Egret	<i>Bubulcus ibis</i>
Great Blue Heron	<i>Ardea Herodias</i>
Great Egret	<i>Casmerodius albus</i>
Little Blue Heron	<i>Egretta caerulea</i>
Osprey	<i>Pandion haliaetus</i>
Roseate Spoonbill	<i>Platalea ajaja</i>
Snowy Egret	<i>Egretta thula</i>
Tricolored Heron	<i>Egretta tricolor</i>
Wood Stork	<i>Mycteria americana</i>

Amphibians and Reptiles

Atlantic Salt Marsh Snake	<i>Nerodia fasciata taeniata</i>
Florida East Coast Terrapin	<i>Malaclemys terrapin tequesta</i>

E.1.1.2. Salt Marshes

Salt marsh wetlands are dominated by non-woody vegetation. These areas exist amidst the intertidal shorelines and tidal wetlands of the Indian River Lagoon system throughout CCAFS. The majority of the Banana River-front along CCAFS has been disturbed by the construction of mosquito control ditches and dikes or construction of facilities by the US Air Force (USAF) to support the missile-testing program. Consequently, it is difficult to assess the original extent of salt marshes on the Canaveral peninsula. Some remnants of a salt marsh exist west of LC-40. These areas have been isolated from the waters of the Banana River and are presently experiencing a succession change to a freshwater marsh community. This marsh is currently being restored through reconnection of the impoundment to the Banana River, just west of SLC-40.

Emergent grasses such as black needle rush and cordgrass typically dominate salt marsh wetlands. These and other non-woody dominant wetland plant types identified on CCAFS are listed below.

Shrubs/Trees

Sea Oxeye	<i>Borrichia frutescens</i>
Carolina Willow	<i>Salix caroliniana</i>

Herbs

Black Needle Rush	<i>Juncus roemerianus</i>
Cordgrass	<i>Spartina bakeri</i>
Glassworts	<i>Salicornia spp.</i>
Salt Grass	<i>Distichlis spicata</i>
Sea Blites	<i>Suaeda spp.</i>

Avian species using this habitat include the wading birds described for Mangrove Wetlands as well as various migratory waterfowl (usually wintering ducks), and American white pelicans (*Pelecanus erythrorhynchos*). Associated wildlife species include the following:

Animals

Alligator	<i>Alligator mississippiensis</i>
Armadillo	<i>Dasypus novemcinctus</i>
Feral Hogs	<i>Sus scrofa</i>
Florida East Coast Terrapin	<i>Malaclemys terrapin tequesta</i>
Florida White-tailed Deer	<i>Odocoileus virginianus</i>
Marsh Rabbit	<i>Sylvilagus palustris</i>
Opossum	<i>Didelphis marsupialis</i>
Raccoon	<i>Procyon lotor</i>
Rice Rat	<i>Oryzomys palustris</i>
Salt Marsh Snake	<i>Nerodia spp.</i>

E.1.1.3. Freshwater Wetlands

Freshwater wetlands located on CCAFS include ponds, borrow pits, interdunal swales, drainage canals, or areas undergoing succession and are presently in the marsh stage. Marsh-like conditions exist in some sections of the CCAFS drainage canal system and other low-lying areas associated with topographic undulations between relic dune ridges transecting CCAFS. A number of these marshy areas are temporary resulting from seasonal variation in precipitation. The areas are periodically utilized by resident and migratory wildlife species. One marsh area near the tip of CCAFS is actually the remnants of the only natural permanent freshwater pond that existed on CCAFS prior to US Government acquisition. Freshwater wetland plants observed on CCAFS are listed below:

Plants

Beardgrass	<i>Andropogon</i> spp.
Bladderwort	<i>Utricularia</i> spp
Common Arrowhead	<i>Sagittaria lancifolia</i>
Common Cattail	<i>Typha latifolia</i>
Common Duckweed	<i>Lemna minor</i>
Curtiss' Reedgrass	<i>Calamovilfa curtissii</i>
Elodea	<i>Egeria densa</i>
Hydrilla	<i>Hydrilla verticillata</i>
Maidencane	<i>Panicum hemitomom</i>
Jamaican Sawgrass	<i>Cladium jamaicense</i>
Spatterdock (yellow cow lily)	<i>Nuphar luteum</i>
Torpedoglass	<i>Panicum repens</i>
Water Pennywort	<i>Hydrocotyle umbellata</i>

The few freshwater wetlands on CCAFS are used extensively by raccoons and red-winged blackbirds (*Agelaius phoeniceus*). Raccoons appear to be primarily attracted by the large populations of leopard frogs (*Rana sphenoccephala*) inhabiting these areas. The red-winged blackbirds nest in the marsh vegetation and feed on hatching insects emerging from marsh waters. Additional species observed utilizing freshwater wetlands on CCAFS are listed below:

Mammals

Florida White-tailed Deer	<i>Odocoileus virginianus</i>
Marsh Rabbit	<i>Sylvilagus palustris</i>
Rice Rat	<i>Oryzomys palustris</i>
River Otter	<i>Lutra canadensis</i>

Birds

American Coot	<i>Fulica americana</i>
Belted Kingfisher	<i>Megaceryle alcyon</i>
Common Moorhen	<i>Gallinula chloropus</i>
Double-crested Cormorant	<i>Phalacrocorax auritus</i>

Great Blue Heron	<i>Ardea herodias</i>
Great Egret	<i>Casmerodius albus</i>
Little Blue Heron	<i>Egretta caerulea</i>
Marsh Hawk	<i>Circus cyaneus</i>
Snowy Egret	<i>Egretta thula</i>
Tricolored Heron	<i>Egretta tricolor</i>
Waterfowl	Various species
Wood Stork	<i>Mycteria americana</i>

Reptiles and Amphibians

Alligator	<i>Alligator mississippiensis</i>
Florida Cooter	<i>Pseudemys floridana</i>
Florida Water Snake	<i>Nerodia fasciata pictiventris</i>
Red-eared Slider	<i>Trachemys scripta elegans</i>
Soft Shelled Turtle	<i>Trionyx ferox</i>
Southern Leopard Frog	<i>Rana sphenoccephala</i>
Water Moccasin	<i>Agkistrodon piscivorus</i>

Significant drainage of surface waters and lowering of the groundwater table has resulted from the extensive canal network constructed on CCAFS. Drainage has encouraged encroachment of woody vegetation into existing wetlands and subsequent degradation of these habitats. Application of controlled burning to marsh habitats could reduce coverage by woody species and improve these ecosystems.

E.1.1.4. Brackish Water Impoundments

There are four major brackish water impoundments located on CCAFS. The impoundments were created by construction of a power line access roadway across the tips of convoluted portions of the North Banana River shoreline. This construction was in support of the Air Force's Titan III missile testing project. An additional impounded area exists between SLC-40 and the SLC-41 transporter roadways. This area appears to have originally existed as a salt marsh dominated by non-woody vegetation (see above). Observations show cattails and some woody species are invading this habitat since it is no longer influenced by the Banana River. Wading birds have been observed in this area, but the extent of utilization has not been determined.

The Brevard County Mosquito Control District fit one of the four major impoundments with two culverts (24-inch diameter and 48-inch diameter). The culverts have been opened to allow the exchange of water between the impoundments and adjacent lagoon waters. As a mosquito control project, water levels were fluctuated within this impoundment to prevent egg laying by some salt marsh mosquitoes. Unfortunately, this practice also results in deleterious effects to woody wetland plants (e.g., mangroves) and changes the chemical parameters of the impounded water. The impoundment was opened as a pilot project to determine potential benefits that could be provided by opening the remaining impoundments. Surveys of the study

site have shown numerous fish species had moved through the large culvert into the previously impounded waters.

In 1990, a new 36-inch culvert was installed in the southernmost impoundment under the power line maintenance roadbed. This action was taken as partial mitigation for impacts to an isolated wetland adjacent to the Vertical Integration Building (VIB) extension project. The culvert was installed by the Brevard County Mosquito Control District and was fitted with a riser on the lagoon side to facilitate seasonal mosquito control activity. For the remainder of the year, the culvert is opened to facilitate the nutrient and faunal transfer from this previously isolated system. In 2000, Lockheed Martin removed dikes surrounding the 55-acre impoundment southeast of SLC-40 allowing for natural exchange with the Banana River. This mitigation project is being monitored for success. This project was monitored for five years and considered a successful wetland restoration project. See **Chapter 5, Ecosystems and Biotic Environment** for additional wetlands information.

According to 45 CES/CEIE-C personnel, in 2012 and 2013 new culverts were installed along Centaur Road to allow for impoundment re-connection. Dredging was authorized with installation of bollards in the water to demarcate the authorized dredge zone, and on the east side the bollards also act as manatee exclusion per the permit requirements. Mitigation for the dredge impact involved habitat restoration (invasive plant species removal) in an area south of the culverts. Monitoring is required for five years, and the 45 CES/CEIE will maintain the area within the invasive species management program. An additional piece of the project involved creating swales to open up another impounded area south of the Centaur Road culverts which resulted in a credit ledger by SJRWMD. 45 SW CES/CEIE-C personnel indicate this ledger is not an official bank, but SJRWMD will authorize use of the credits toward future impacts that may occur within the same watershed. Another project is proposed to begin at the end of 2014 for culvert replacement along Patrol Road to increase water flow and circulation within a former impounded area. The culvert pipes will be increased in size and in a design similar to Centaur Road; will be used for in-water bollard installation. A five year wetland monitoring requirement will be managed through 45 CES/CEIE. Additional credits will be acquired and added to the SJRWMD ledger due to the water quality improvement to the formerly constricted impoundment. A Regional Offsite Mitigation Area (ROMA) agreement is planned for development by 45 CES/CEIE to establish a long-term official credit ledger.

E.1.1.5. Borrow Pits

Presently, there are six borrow pits on CCAFS that were excavated in the past to support construction of new facilities. Over the years, ecological succession has transformed these pits into productive fresh water ponds. Two of the ponds are connected to the CCAFS drainage canal system and feature the same wildlife species as described in the major canals. Additionally, wading birds and migratory waterfowl wintering on CCAFS use the ponds for feeding and resting.

E.1.1.6. Drainage Canal System

There are approximately 52 miles of drainage canals comprising 63 acres of surface waters on CCAFS. These canals were constructed by the USAF to provide drainage of low-lying areas

throughout CCAFS to facilitate missile complex construction. The major canals of this system have altered the hydrology on CCAFS but now offer habitat for numerous species of fish and wildlife.

Drainage canal habitats are constantly changing due to the influence of canal maintenance, but a contract is in place to ensure that the canals are maintained. Consequently, the canals are periodically cleaned with a drag-line to remove excessive emergent vegetation from the canals. This practice destroys some environmental attributes temporarily, but observations show habitat stabilization and utilization by wildlife occurs within a few weeks after cleaning.

E.1.2. Patrick Air Force Base (PAFB)

Mapping and Inventories

A comprehensive wetland inventory conducted on PAFB in the 1990s supports the determination that wetlands are very limited at PAFB, which largely agreed with the NWI maps from 1988. Both found no natural, undisturbed wetland habitats on PAFB away from the Banana River. In terms of deepwater habitats, expansive marine and estuarine areas parallel the installation along east and west boundaries. See **Chapter 5, Ecosystems and Biotic Environment** for additional PAFB wetlands information.

In the past, several canals were constructed at PAFB to facilitate drainage around the airfield and roadways. Some canals at PAFB do not directly connect to other surface waters; these canals resemble shallow, straight ponds artificially cut through upland areas. Alternately, other canals at PAFB discharge to the Banana River, either by direct connection or ultimately through an interconnected series of canals; sometimes water is controlled by weirs located at the canals' interface with the Banana River.

In 2006, a jurisdictional delineation was performed for the golf course and other nearby canals to determine the scope and extent of CWA Section 404 jurisdiction in these waters (USACE 2006)). Within the analysis area, USACE certified that the canals with direct, unobstructed connections to the Banana River are considered "navigable waters" subject to CWA jurisdiction. All other canals within the analysis area meet the definition of "upland-cut ditches;" alterations of these waters would not be subject to CWA Section 404 permitting requirements. This determination was valid for a period of 5 years, expiring in 2011. Personnel of the 45 CES/CEIE-C indicate that USACE has acknowledged that the 2006 determination would be upheld unless new legal cases required changes. A Regional Environmental Resource Permit (2011) was established to encompass all of the golf course canals for stormwater management for the south end of PAFB. USACE also has jurisdiction over the Banana River at the Mean High Water (MHW) mark along PAFB's western boundary and at the MHW (highest high tide line) for beaches along the Atlantic Ocean that are PAFB's eastern boundary.

A few small isolated wetlands are anticipated to exist on PAFB based on the amount of land development that resulted with the creation of swales for stormwater management (prior to permitting requirements, in the 1940s to 1960s) to prevent flooding around infrastructure. Also for project areas previously identified by SJRMWD project delineations. Any isolated wetlands

will be identified on a case-by-case basis based on potential impacts. A wetland conservation easement area was established at the east end of the FamCamp primitive camping area for mitigation for the removal of an isolated wetland (SJRWMD jurisdiction) for the construction of the AFTAC building. Monitoring of the easement/mitigation area is ongoing, and the mitigation has not been determined as a success yet due to the encroachment of invasive vegetation.

E.1.3. Malabar Transmitter Annex (MTA)

Mapping and Inventories

NWI maps do not indicate the presence of wetlands on MTA. However, Schultz and Knight (1997) identified general wet area boundaries (including canals, ditches, and swales with wetland plant species) at MTA in August 1996. However, since that survey did not include soil analysis, it is not considered formal, jurisdictional wetland delineation.

The natural communities on MTA are small remnants fragmented by human disturbances. The natural wet areas consist of depression marsh and wet flatwoods with scattered slash pine (*Pinus elliottii*) in the canopy. Regulatory issues aside, these natural wet areas typically provide some functional value in terms of wildlife habitat, especially in a developed setting such as MTA. Using the principle of “no net loss of wetlands”, any area that was defined by Schulz and Knight (1997) as a potential wetland that may be impacted by an action should be analyzed on a case-by-case basis during the Environmental Impact Analysis Process (EIAP) process.

E.1.4. Jonathan Dickinson Missile Tracking Annex (JDMTA)

Mapping and Inventories

The state park adjacent to JDMTA does contain wetlands, but none are found within JDMTA.

E.2. Floodplain Management

Air Force installations have the responsibility to determine if proposed actions will affect a wetland or floodplain. For any proposed action within the 45 SW, the action must comply with Executive Order 11990, *Protection of Wetlands* and Executive Order 11988, *Floodplain Management*. For proposed projects within a floodplain of the four installations of the 45 SW, the proposed action is evaluated, potential effects are documented, and alternatives are considered to avoid effects in the floodplain; including incompatible development in the floodplain. When one or both of the above Executive Orders apply, a Finding of No Practical Alternative (FONPA) must be completed and submitted before action is taken. FONPA is a finding contained in a Finding of No Significant Impact (FONSI) or Record of Decision (ROD) indicating the Air Force evaluated practicable alternatives to siting in a floodplain (or a wetland) and that there is no other practicable alternative to taking the action in the floodplain/wetland. The FONPA finding is based on a rigorous analysis contained in a supporting Environmental Assessment (EA) or Environmental Impact Statement (EIS). Compliance with these Executive Orders may be accomplished as part of the EIAP documentation. Projects with potential impact to wetlands and/or floodplains may require special permits and authorizations. See **Chapter 4, Section 4.4.4** for additional information and figures regarding floodplains within the 45 SW.

E.2.1. CCAFS

CCAFS is included on the FEMA Flood Insurance Rate Maps (FIRMs) 12009C0265G, 12009C0355G, 12009C0360G, 12009C0361G, and 12009C0362G, effective March 2014 (FEMA 2014). Due to the lack of significant variances in topography on CCAFS, floodplains extend beyond the coastal dune and wetlands and into portions of all of the CCAFS upland plant communities. On CCAFS, the 100-year floodplain extends to 7 feet above mean sea level (msl) on the ocean side and 4 feet above msl on the Banana River side. The 500-year floodplain elevations are 10 feet above msl on the ocean side of CCAFS and 6 feet above msl along the Banana River.

E.2.2. PAFB

PAFB is included on FIRMs 12009C0463G, 12009C0526G, and 12009C0528G, effective March 2014 (FEMA 2014). Due to the lack of significant variances in topography on PAFB, floodplains extend beyond the coastal dune and wetlands and into portions of the developed land on PAFB.

E.2.3. MTA

MTA is included on FIRMs 12009C0681G, 12009C0679G, and 12009C0683G, effective March 2014 (FEMA 2014). A small isolated area in the southern region of MTA is designated as Zone A. These areas are subject to inundation by the 1-percent-annual-chance flood event generally determined using approximate methodologies.

E.2.4. JDMTA

JDMTA is included on FIRM 12085C0526F, effective in October 2002 (FEMA 2014). Similar to MTA, JDMTA has a small isolated area to the northeast designated as Zone A, an area subject to inundation by the 1-percent-annual chance flood event.