



# Tomoka Marsh Aquatic Preserve

## Management Plan



**Florida Department of Environmental Protection**  
**Florida Coastal Office**  
3900 Commonwealth Blvd., MS #235, Tallahassee, FL 32399  
[www.aquaticpreserves.org](http://www.aquaticpreserves.org)





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November 2017



*Tomoka River palms.*



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*Bulow Creek kayakers.*

## Mission Statement

The Florida Coastal Office's mission statement is: Conserving and restoring Florida's coastal and aquatic resources for the benefit of people and the environment.

The four long-term goals of the Florida Coastal Office's Aquatic Preserve Program are to:

1. protect and enhance the ecological integrity of the aquatic preserves;
2. restore areas to their natural condition;
3. encourage sustainable use and foster active stewardship by engaging local communities in the protection of aquatic preserves; and
4. improve management effectiveness through a process based on sound science, consistent evaluation, and continual reassessment.

# Executive Summary

Tomoka Marsh Aquatic Preserve Management Plan	
Lead Agency	Florida Department of Environmental Protection's (DEP) Florida Coastal Office (FCO)
Common Name of Property	Tomoka Marsh Aquatic Preserve
Location	Volusia and Flagler counties
Acreage Total	2,809
Acreage Breakdown According to Florida Natural Areas Inventory (FNAI) Natural Community Type	
FNAI Natural Communities	Acreage according to GIS
Maritime Hammock	36 acres
Shell Mound	1 acre
Hydric Hammock	5 acres
Coastal Grassland	6 acres
Salt Marsh	146 acres
Blackwater Stream	97 acres
Unconsolidated Substrate	unknown
Mollusk Reef	unknown
Algal Bed	The algal beds are ubiquitous, but ephemeral and variable so locations and acreage are constantly changing.
Seagrass Bed	<1 acre
Ruderal	6 (Not classified as a natural community)
Management Agency:	DEP's FCO
Designation:	Aquatic Preserve
Unique Features:	The distinct areas that comprise the Tomoka Marsh Aquatic Preserve provide residents and visitors with exceptional examples and variety of Florida aquatic systems - from the shallow meandering waterway at Bulow Creek bordered by floodplain hardwoods to the long wide estuarine lagoon of the Halifax River, to the expansive open water of the Tomoka Basin. Part of Tomoka Marsh Aquatic Preserve is a federally and state designated manatee refuge. The aquatic preserve provides critical habitats for many threatened and endangered species including Florida manatee ( <i>Trichechus manatus latirostris</i> ).
Archaeological/ Historical Sites:	The Department of State's Division of Historical Resources has identified numerous archaeological sites located along the waterways of Tomoka Marsh Aquatic Preserve. One important large site is Nocoroco, located on the Tomoka Basin and state park lands. This site provides evidence that humans have depended on the waters of the aquatic preserve for thousands of years.
Management Needs (See Management Issues and Goals)	
Ecosystem Science	Stakeholder involvement is required to implement strategies designed to improve water quality in areas of the aquatic preserve with approved Total Maximum Daily Load allocations.
Resource Management	Partnerships are required to continue salt marsh restoration projects in habitats associated with the aquatic preserve, continue diamondback terrapin monitoring, and continue invasive, non-native species control.
Education and Outreach	Education and outreach programs that promote the aquatic preserve are critical to the protection, conservation, and enhancement of aquatic and coastal resources. The intent of the aquatic preserve education and outreach program is to provide and foster responsible public stewardship of aquatic preserve resources. Due to limited staffing, education efforts will be focused on access points and at major events.



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**Public Use** The waters and habitats of Tomoka Marsh Aquatic Preserve are of great economic importance to local and regional recreational and commercial fisheries. State parks and local parks that border the aquatic preserve are popular destinations for residents and visitors. A variety of dramatic vistas of the waterways and adjacent marshes entice visitors and provide diverse opportunities for wildlife viewing, nature study, environmental education, and photography. Canoeing and kayaking on the Tomoka River and Bulow Creek Paddling Trails draw visitors to this area of Florida. The Halifax River, part of the Atlantic Intracoastal Waterway, provides an important corridor for boats traveling along the east coast.

**Public Involvement:** Public support is vital to the success of government conservation programs. The goal is to foster understanding of the problems facing our ecosystems and the steps needed to adequately manage our aquatic habitats. Tomoka Marsh Aquatic Preserve held public and advisory committee meetings June 21 and 22, 2017 at Tomoka State Park to receive input on the draft management plan. An additional public meeting was held in Tallahassee October 20, 2017 when the Acquisition and Restoration Council reviewed the management plan.

In addition, Tomoka Marsh Aquatic Preserve assisted in the formation of a citizen support group, the Aquatic Preserve Alliance of Central Florida, that consists of a variety of stakeholders interested in fostering an awareness of and providing solutions to the challenges facing the aquatic preserve.

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### **FCO/Trustees Approval**

**FCO Approval:** August 1, 2017 **ARC approval:** October 20, 2017 **Trustees approval:** December 13, 2017

**Comments:**

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## Acronym List

Abbreviation	Meaning
<b>AICW</b>	Atlantic Intracoastal Waterway
<b>Alliance</b>	Aquatic Preserve Alliance of Central Florida, Inc.
<b>BMAP</b>	Basin Management Action Plan
<b>Chla</b>	Chlorophyll a
<b>DEP</b>	Florida Department of Environmental Protection
<b>DHR</b>	Florida Division of Historical Resources
<b>EPA</b>	U.S. Environmental Protection Agency
<b>EVMCD</b>	East Volusia Mosquito Control District
<b>F.A.C.</b>	Florida Administrative Code
<b>F.A.R.</b>	Florida Administrative Register
<b>FCCC</b>	Florida Coastline Canal Company
<b>FCO</b>	Florida Coastal Office
<b>FEMA</b>	Federal Emergency Management Agency
<b>FNAI</b>	Florida Natural Areas Inventory
<b>FPS</b>	Florida Park Service
<b>F.S.</b>	Florida Statutes
<b>FWC</b>	Florida Fish & Wildlife Conservation Commission
<b>G</b>	Global
<b>Gamble Rogers</b>	Gamble Rogers State Recreation Area at Flagler Beach
<b>IPMS</b>	Invasive Plant Management Section
<b>L</b>	liter
<b>lbs</b>	pounds
<b>µg/L</b>	micrograms per liter
<b>mg</b>	milligrams
<b>MGD</b>	million gallons per day
<b>MSF</b>	Florida Master Site File
<b>MSL</b>	Mean Sea Level
<b>NCB</b>	Northern Coastal Basin
<b>NERR</b>	National Estuarine Research Reserve
<b>NOAA</b>	National Oceanic and Atmospheric Administration
<b>NPSP</b>	North Peninsula State Park
<b>OFW</b>	Outstanding Florida Water
<b>S</b>	State
<b>SJRWMD</b>	St. Johns River Water Management District
<b>SR</b>	State Road
<b>SWIM</b>	Surface Water Improvement and Management
<b>TMDL</b>	Total Maximum Daily Loads
<b>TN</b>	Total Nitrogen
<b>TP</b>	Total Phosphorus
<b>Trustees</b>	Board of Trustees of the Internal Improvement Trust Fund
<b>USFWS</b>	U.S. Fish and Wildlife Service
<b>USGS</b>	U.S. Geological Survey
<b>VHSPA</b>	Volusia Hammock State Park Association
<b>WBID</b>	Waterbody Identification
<b>WWTF</b>	Wastewater Treatment Facility

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*Tomoka Basin.*

*Part One*

## **Basis for Management**

*Chapter One*

### **Introduction**

The Florida aquatic preserves are administered on behalf of the state by the Florida Department of Environmental Protection's (DEP) Florida Coastal Office (FCO) as part of a network that includes 41 aquatic preserves, three National Estuarine Research Reserves (NERRs), a National Marine Sanctuary, Coral Reef Conservation Program, Florida Coastal Management Program, Outer Continental Shelf Program, and the Florida Oceans and Coastal Council (Map 1). This provides for a system of significant protections to ensure that our most popular and ecologically important underwater ecosystems are cared for in perpetuity. Each of these special places is managed with strategies based on local resources, issues and conditions.

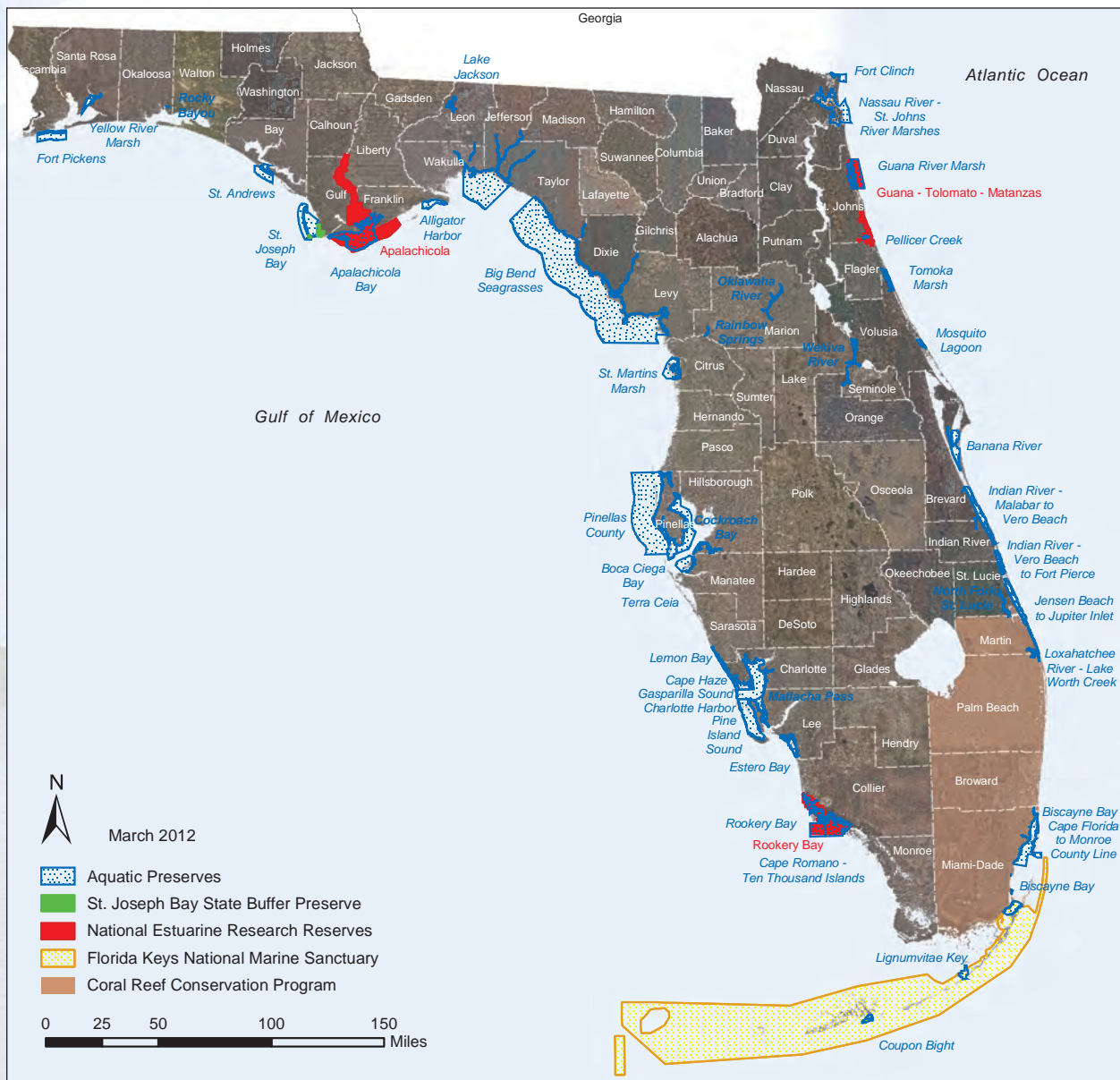
The extensive coastline and wealth of aquatic resources have defined Florida as a subtropical oasis, attracting millions of residents and visitors, and the businesses that serve them. Florida's submerged lands play important roles in maintaining good water quality, hosting a diversity of wildlife and habitats (including economically and ecologically valuable nursery areas), and supporting a treasured quality of life for all. In the 1960s, it became apparent that the ecosystems that had attracted so many people to



Florida could not support rapid growth without science-based resource protection and management. To this end, state legislators provided extra protection for certain exceptional aquatic areas by designating them as aquatic preserves.

Title to submerged lands not conveyed to private landowners is held by the Board of Trustees of the Internal Improvement Trust Fund (the Trustees). The Governor and Cabinet, sitting as the Trustees, act as guardians for the people of the state of Florida (§253.03, Florida Statutes [F.S.]) and regulate the use of these public lands. Through statute, the Trustees have the authority to adopt rules related to the management of sovereignty submerged lands (Florida Aquatic Preserve Act of 1975, §258.36, F.S.). A higher layer of protection is afforded to aquatic preserves including areas of sovereignty lands that have been “set aside forever as aquatic preserves or sanctuaries for the benefit of future generations” due to “exceptional biological, aesthetic, and scientific value” (Florida Aquatic Preserve Act of 1975, §258.36, F.S.).

The tradition of concern and protection of these exceptional areas continues, and now includes: the Rookery Bay NERR in Southwest Florida, designated in 1978; the Apalachicola NERR in Northwest Florida, designated in 1979; and the Guana Tolomato Matanzas NERR in Northeast Florida, designated in 1999. In addition, the Florida Oceans and Coastal Council was created in 2005 to develop Florida’s ocean and coastal research priorities, and establish a statewide ocean research plan. The group also coordinates public and private ocean research for more effective coastal management. This dedication to the conservation of coastal and ocean resources is an investment in Florida’s future.



## **1.1 / Management Plan Purpose and Scope**

Florida's aquatic resources are at risk for both direct and indirect impacts of increasing development and recreational use, as well as resulting economic pressures, such as energy generation and increased fish and shellfish harvesting to serve and support the growing population. These potential impacts to resources can reduce the health and viability of the ecosystems that contain them, requiring active management to ensure the long-term health of the entire network. Effective management plans for the aquatic preserves are essential to address this goal and each site's own set of unique challenges. The purpose of these plans is to incorporate, evaluate, and prioritize all relevant information about the site into a cohesive management strategy, allowing for appropriate access to the managed areas while protecting the long-term health of the ecosystems and their resources.

The mandate for developing aquatic preserve management plans is outlined in Section 18-20.013 and Subsection 18-18.013(2) of the Florida Administrative Code (F.A.C.). Management plan development and review begins with the collection of resource information from historical data, research and monitoring, and includes input from individual FCO managers and staff, area stakeholders, and members of the general public. The statistical data, public comment, and cooperating agency information is then used to identify management issues and threats affecting the present and future integrity of the site, its boundaries, and adjacent areas. The information is used in the development and review of the management plan, which is examined for consistency with the statutory authority and intent of the Aquatic Preserve Program. Each management plan is evaluated periodically and revised as necessary to allow for strategic improvements. Intended to be used by site managers and other agencies or private groups involved with maintaining the natural integrity of these resources, the plan includes scientific information about the existing conditions of the site and the management strategies developed to respond to those conditions.

To aid in the analysis and development of the management strategies for the site plans, the FCO identified four comprehensive management programs applicable to all aquatic preserves. To address the goals, objectives, integrated strategies and performance measures of the four programs, relevant information about the specific site has been collected, analyzed, and compiled to provide a foundation for development of the management plan. While it is expected that unique issues may arise with regard to resource or management needs of a particular site, the following management programs will remain constant across the resource protection network:

- Ecosystem Science
- Resource Management
- Education and Outreach
- Public Use

Each aquatic preserve management plan will identify unique local and regional issues and contain the goals, objectives, integrated strategies, and performance measures to address those issues. The plan will also identify the program and facility needs required to meet the goals, objectives, and strategies of the management plan. These components are key elements for achieving the resource protection mission of each aquatic preserve.

This is an update to the previous Tomoka Marsh Aquatic Preserve management plan that was approved April 21, 1992.

## **1.2 / Public Involvement**

FCO recognizes the importance of stakeholder participation and encourages their involvement in the management plan development process. FCO is also committed to meeting the requirements of Florida's Government-in-the-Sunshine Law (§286.011, F.S.), including:

- meetings of public boards or commissions must be open to the public;
- reasonable notice of such meetings must be given; and
- minutes of the meetings must be recorded.

Several key steps are to be taken during management plan development. First, staff compose a draft plan after gathering information of current and historic uses; resource, cultural and historic sites; and other valuable information regarding the property and surrounding area. Staff then organize an advisory committee comprised of key stakeholders, and conduct, in conjunction with the advisory committee, public meetings to engage the stakeholders for feedback on the draft plan and the development of the final draft of the management plan. Additional public meetings are held when the plan is reviewed by the Acquisition and Restoration Council and the Trustees for approval. For additional information about the advisory committee and the public meetings refer to Appendix C - Public Involvement.







*Fishing in the Tomoka River.*

## *Chapter Two*

# The Florida Department of Environmental Protection's Florida Coastal Office

## **2.1 / Introduction**

The Florida Department of Environmental Protection (DEP) protects, conserves and manages Florida's natural resources and enforces the state's environmental laws. DEP is the lead agency in state government for environmental management and stewardship and commands one of the broadest charges of all the state agencies, protecting Florida's air, water and land. DEP is divided into four primary areas: Regulatory Programs, Land and Recreation, Water Policy, and Ecosystem Restoration. Florida's environmental priorities include restoring America's Everglades; improving air quality; restoring and protecting the water quality in our springs, lakes, rivers and coastal waters; conserving environmentally-sensitive lands; and providing citizens and visitors with recreational opportunities, now and in the future.

The Florida Coastal Office (FCO) is the unit within the DEP that manages more than four million acres of submerged lands and select coastal uplands. This includes 41 aquatic preserves, three National Estuarine Research Reserves (NERRs), the Florida Keys National Marine Sanctuary as well as providing management support through the Florida Coastal Management Program, the Outer Continental Shelf Program, and the Coral Reef Conservation Program. The three NERRs, the Florida Keys National Marine Sanctuary, and the Coral Reef Conservation Program are managed in cooperation with the National Oceanic and Atmospheric Administration (NOAA).

FCO manages sites in Florida for the conservation and protection of natural and historical resources and resource-based public use that is compatible with the conservation and protection of these lands. FCO is a strong supporter of the NERR system and its approach to coastal ecosystem management. Florida has three designated NERR sites, each encompassing at least one aquatic preserve within its boundaries.

Rookery Bay NERR includes Rookery Bay Aquatic Preserve and Cape Romano-Ten Thousand Islands Aquatic Preserve; Apalachicola NERR includes Apalachicola Bay Aquatic Preserve; and Guana Tolomato Matanzas NERR includes Guana River Marsh Aquatic Preserve and Pellicer Creek Aquatic Preserve. These aquatic preserves provide discrete areas designated for additional protection beyond that of the surrounding NERR and may afford a foundation for additional protective zoning in the future. Each of the Florida NERR managers serves as a regional manager overseeing multiple other aquatic preserves in their region. This management structure advances FCO's ability to manage its sites as part of the larger statewide system.

## **2.2 / Management Authority**

Established by law, aquatic preserves are exceptional areas of submerged lands and associated waters that are to be maintained in their natural or existing conditions. The intent was to forever set aside submerged lands with exceptional biological, aesthetic, and scientific values as sanctuaries, called aquatic preserves, for the benefit of future generations.

The laws supporting aquatic preserve management are the direct result of the public's awareness of and interest in protecting Florida's aquatic environment. The extensive dredge and fill activities that occurred in the late 1960s spawned this widespread public concern. In 1966, the Board of Trustees of the Internal Improvement Trust Fund (Trustees) created the first offshore reserve, Estero Bay, in Lee County.

In 1967, the Florida Legislature passed the Randall Act (Chapter 67-393, Laws of Florida), which established procedures regulating previously unrestricted dredge and fill activities on state-owned submerged lands. That same year, the Legislature provided the statutory authority (§253.03, Florida Statutes [F.S.]) for the Trustees to exercise proprietary control over state-owned lands. Also in 1967, government focus on protecting Florida's productive water bodies from degradation due to development led the Trustees to establish a moratorium on the sale of submerged lands to private interests. An Interagency Advisory Committee was created to develop strategies for the protection and management of state-owned submerged lands.

In 1968, the Florida Constitution was revised to declare in Article II, Section 7, the state's policy of conserving and protecting natural resources and areas of scenic beauty. That constitutional provision also established the authority for the Legislature to enact measures for the abatement of air and water pollution. Later that same year, the Interagency Advisory Committee issued a report recommending the establishment of 26 aquatic preserves.

The Trustees acted on this recommendation in 1969 by establishing 16 aquatic preserves and adopting a resolution for a statewide system of such preserves. In 1975, the state Legislature passed the Florida Aquatic Preserve Act of 1975 (Act) that was enacted as Chapter 75-172, Laws of Florida, and later became Chapter 258, Part II, F.S. This Act codified the already existing aquatic preserves and established standards and criteria for activities within those aquatic preserves. Additional aquatic preserves were individually adopted at subsequent times up through 1989.

In 1980, the Trustees adopted the first aquatic preserve rule, Chapter 18-18, Florida Administrative Code (F.A.C.), for the administration of the Biscayne Bay Aquatic Preserve. All other aquatic preserves are administered under Chapter 18-20, F.A.C., which was originally adopted in 1981. These rules apply standards and criteria for activities in the aquatic preserves, such as dredging, filling, building docks and other structures that are stricter than those of Chapter 18-21, F.A.C., which apply to all sovereignty lands in the state.

This plan is in compliance with the Conceptual State Lands Management Plan, adopted March 17, 1981 by the Board of Trustees of the Internal Improvement Trust Fund and represents balanced public utilization, specific agency statutory authority, and other legislative or executive constraints. The Conceptual State Lands Management Plan also provides essential guidance concerning the management of sovereignty lands and aquatic preserves and their important resources, including unique natural features, seagrasses, endangered species, and archaeological and historical resources.

Through delegation of authority from the Trustees, the DEP and FCO have proprietary authority to manage the sovereignty lands, the water column, spoil islands (which are merely deposits of sovereignty lands), and some of the natural islands and select coastal uplands to which the Trustees hold title.

Enforcement of state statutes and rules relating to criminal violations and non-criminal infractions rests with the Florida Fish and Wildlife Conservation Commission law enforcement and local law enforcement agencies. Enforcement of administrative remedies rests with FCO, the DEP Districts, and Water Management Districts.



### **2.3 / Statutory Authority**

The fundamental laws providing management authority for the aquatic preserves are contained in Chapters 258 and 253, F.S. These statutes establish the proprietary role of the Governor and Cabinet, sitting as the Board of Trustees of the Internal Improvement Trust Fund, as Trustees over all sovereignty lands. In addition, these statutes empower the Trustees to adopt and enforce rules and regulations for managing all sovereignty lands, including aquatic preserves. The Florida Aquatic Preserve Act was enacted by the Florida Legislature in 1975 and is codified in Chapter 258, F.S.

The legislative intent for establishing aquatic preserves is stated in Section 258.36, F.S.: “It is the intent of the Legislature that the state-owned submerged lands in areas which have exceptional biological, aesthetic, and scientific value, as hereinafter described, be set aside forever as aquatic preserves or sanctuaries for the benefit of future generations.” This statement, along with the other applicable laws, provides a foundation for the management of aquatic preserves. Management will emphasize the preservation of natural conditions and will include lands that are statutorily authorized for inclusion as part of an aquatic preserve.

Management responsibilities for aquatic preserves may be fulfilled directly by the Trustees or by staff of the DEP through delegation of authority. Other governmental bodies may also participate in the management of aquatic preserves under appropriate instruments of authority issued by the Trustees. FCO staff serves as the primary managers who implement provisions of the management plans and rules applicable to the aquatic preserves. FCO does not “regulate” the lands per se; rather, that is done primarily by the DEP Districts (in addition to the Water Management Districts) which grant regulatory permits. The Florida Department of Agriculture and Consumer Services through delegated authority from the Trustees, may issue proprietary authorizations for marine aquaculture within the aquatic preserves and regulates all aquaculture activities as authorized by Chapter 597, Florida Aquaculture Policy Act, F.S. Staff evaluates proposed uses or activities in the aquatic preserve and assesses the possible impacts on the natural resources. Project reviews are primarily evaluated in accordance with the criteria in the Act, Chapter 18-20, F.A.C., and this management plan.

Comments of FCO staff, along with comments of other agencies and the public are submitted to the appropriate permitting staff for consideration in their issuance of any delegated authorizations in aquatic preserves or in developing recommendations to be presented to the Trustees. This mechanism provides a basis for the Trustees to evaluate public interest and the merits of any project while also considering potential environmental impacts to the aquatic preserves. Any activity located on sovereignty lands requires a letter of consent, a lease, an easement, or other approval from the Trustees.

Florida Statutes that authorize and empower non-FCO programs within DEP or other agencies may also be important to the management of FCO sites. For example, Chapter 403, F.S., authorizes DEP to adopt rules concerning the designation of “Outstanding Florida Waters” (OFWs), a program that provides aquatic preserves with additional regulatory protection. Chapter 379, F.S., regulates saltwater fisheries, and provides enforcement authority and powers for law enforcement officers. Additionally, it provides similar powers relating to wildlife conservation and management. The sheer number of statutes that affect aquatic preserve management prevents an exhaustive list of all such laws from being provided here.

### **2.4 / Administrative Rules**

Chapters 18-18, 18-20 and 18-21, F.A.C., are the three administrative rules directly applicable to the uses allowed in aquatic preserves specifically and sovereignty lands generally. These rules are intended to be cumulative, meaning that Chapter 18-21 should be read together with Chapter 18-18 or Chapter 18-20 to determine what activities are permissible within an aquatic preserve. If Chapter 18-18 or Chapter 18-20 are silent on an issue, Chapter 18-21 will control; if a conflict is perceived between the rules, the stricter standards of Chapter 18-18 or Chapter 18-20 supersede those of Chapter 18-21. Because Chapter 18-21 concerns all sovereignty lands, it is logical to discuss its provisions first.

Originally codified in 1982, Chapter 18-21, F.A.C., is meant “to aid in fulfilling the trust and fiduciary responsibilities of the Board of Trustees of the Internal Improvement Trust Fund for the administration, management and disposition of sovereignty lands; to insure maximum benefit and use of sovereignty lands for all the citizens of Florida; to manage, protect and enhance sovereignty lands so that the public may continue to enjoy traditional uses including, but not limited to, navigation, fishing and swimming; to manage and provide maximum protection for all sovereignty lands, especially those important to public drinking water supply, shellfish harvesting, public recreation, and fish and wildlife propagation and management; to insure that all public and private activities on sovereignty lands which generate



revenues or exclude traditional public uses provide just compensation for such privileges; and to aid in the implementation of the State Lands Management Plan.”

To that end, Chapter 18-21, F.A.C., contains provisions on general management policies, forms of authorization for activities on sovereignty lands, and fees applicable for those activities. In the context of the rule, the term “activity” includes “construction of docks, piers, boat ramps, boardwalks, mooring pilings, dredging of channels, filling, removal of logs, sand, silt, clay, gravel or shell, and the removal or planting of vegetation” (Rule 18-21.003, F.A.C.). In addition, activities on sovereignty submerged lands must be not contrary to the public interest (Rule 18-21.004, F.A.C.). Chapter 18-21 also sets policies on aquaculture, geophysical testing (using gravity, shock wave and other geological techniques to obtain data on oil, gas or other mineral resources), and special events related to boat shows and boat displays. Of particular importance to FCO site management, the rule also addresses spoil islands, preventing their development in most cases.

Chapters 18-18 and 18-20, F.A.C., apply standards and criteria for activities in the aquatic preserves that are stricter than those of Chapter 18-21. Chapter 18-18 is specific to the Biscayne Bay Aquatic Preserve and is more extensively described in that site’s management plan. Chapter 18-20 is applicable to all other aquatic preserves. It further restricts the type of activities for which authorizations may be granted for use of sovereignty lands and requires that structures that are authorized be limited to those necessary to conduct water dependent activities. Moreover, for certain activities to be authorized, “it must be demonstrated that no other reasonable alternative exists which would allow the proposed activity to be constructed or undertaken outside the preserve” (Paragraph 18-20.004(1)(g), F.A.C.).

Chapter 18-20, F.A.C., expands on the definition of “public interest” by outlining a balancing test that is to be used to determine whether benefits exceed costs in the evaluation of requests for sale, lease, or transfer of interest of sovereignty lands within an aquatic preserve. The

rule also provides for the analysis of the cumulative impacts of a request in the context of prior, existing, and pending uses within the aquatic preserve, including both direct and indirect effects. The rule directs management plans and resource inventories to be developed for every aquatic preserve. Further, the rule provides provisions specific to certain aquatic preserves and indicates the means by which the Trustees can establish new or expand existing aquatic preserves.

Aquatic preserve management relies on the application of many other DEP and outside agency rules. Perhaps most notably, Chapter 62-302, F.A.C., concerns the classification of surface waters, including criteria for OFW, a designation that provides for the state’s highest level of protection for water quality. All aquatic preserves contain OFW designations. No activity may be permitted within an OFW that degrades ambient water quality unless the activity is determined to be in the public interest. Once again, the list of other administrative rules that do not directly address FCO’s responsibilities but do affect FCO-managed areas is so long as to be impractical to create within the context of this management plan.

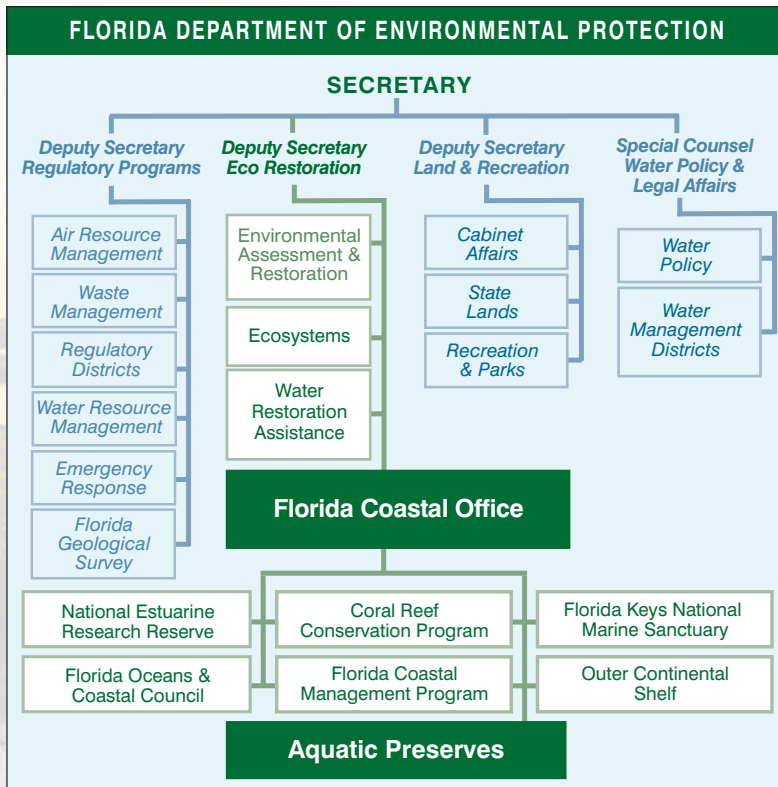
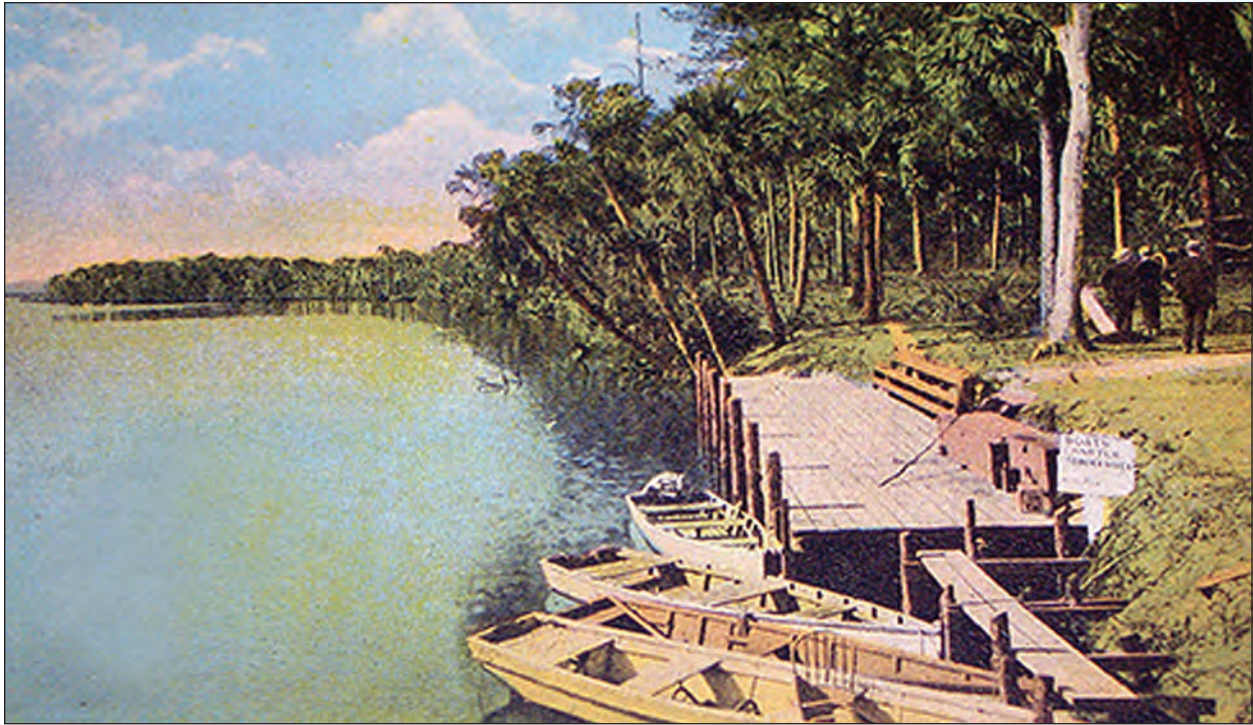


Figure 1 | State management structure.



*Sunset Park on the Tomoka River circa 1950.*

### Chapter Three

## Tomoka Marsh Aquatic Preserve

### 3.1 / Historical Background

The waterways of the Tomoka Marsh Aquatic Preserve with productive tidal lagoons, navigable creeks, and access to marine resources have been utilized by humans for at least 7,000 years.. A large number of historic sites have been preserved on public lands adjacent to the aquatic preserve which represent changing prehistoric cultures, the development of European colonial plantations and the growth of coastal Florida in the 20th century.

A discovery of rare Native American artifacts by A.E. Douglass in the late 19th century revealed an ancient pre-historic culture had once inhabited the Tomoka area. Douglass, an antiquities collector from New York City, published his discovery of eight “bannerstones” at Tomoka in 1882, with illustrations of the finely-crafted stone objects that appeared like miniature axe-heads (Douglass, 1882).

Archaeologists did not understand the cultural context of bannerstones until the mid-20th century when similar artifacts were found in association with “atlatls” or spear throwers. A bannerstone was placed on the shaft of an atlatl, see the opening in the Douglass illustration, giving weight and balance to this device which was used to propel hunting spears with greater accuracy and distance. More than a century after Douglass’ discovery, archaeologist Bruce Piatek did a systematic investigation of the Douglass Mound (Master Site File [MSF] VO00081) and did not find any unusual artifacts, but did reveal human skeletal remains which provided a valuable radio-carbon sample for dating the origin of the mound at 4,629 years before present (Piatek, 1992). This date is consistent with the use of bannerstones in the Late Archaic Period, 3000 B.C.-2000 B.C. (Milanich, 1994).

The appearance of clay pottery in shell middens and mounds is the cultural trademark of the Orange Period, 2000 B.C.-500 B.C., which is represented by several sites on the Halifax River and Smith Creek. The Tomoka Stone site (MSF VO2571) on the Halifax River shoreline is partially underwater, with submerged “stones” that contain fiber-tempered clay pottery in a matrix of cemented coquina shell (Russo & Ste. Claire, 1992). A sample of faunal remains from this early Orange Period site, dated approximately 1500 B.C., indicate that small fish were a primary source of protein at the Tomoka Stone site. The most abundant species identified were Atlantic croaker (*Micropogonias undulatus*), mullet (*Mugil* spp.) and pinfish (*Lagodon rhomboides*). The composition of this small sample is remarkably similar



to the relative abundance of juvenile fish species sampled in the Halifax and Tomoka rivers from 1993-1997. Croaker, mullet, and pinfish were dominant taxa in trawl and seine samples from the shoreline of the Halifax River islands within Tomoka Marsh Aquatic Preserve (Shelley, 2001). The presence of these estuarine-dependent species at Tomoka Stone support the concept that estuarine environments developed in coastal lagoons with the stabilization of barrier islands during the late Holocene, 4,000 years before present, coincident with the Orange Period in northeast Florida (Miller, 1998).

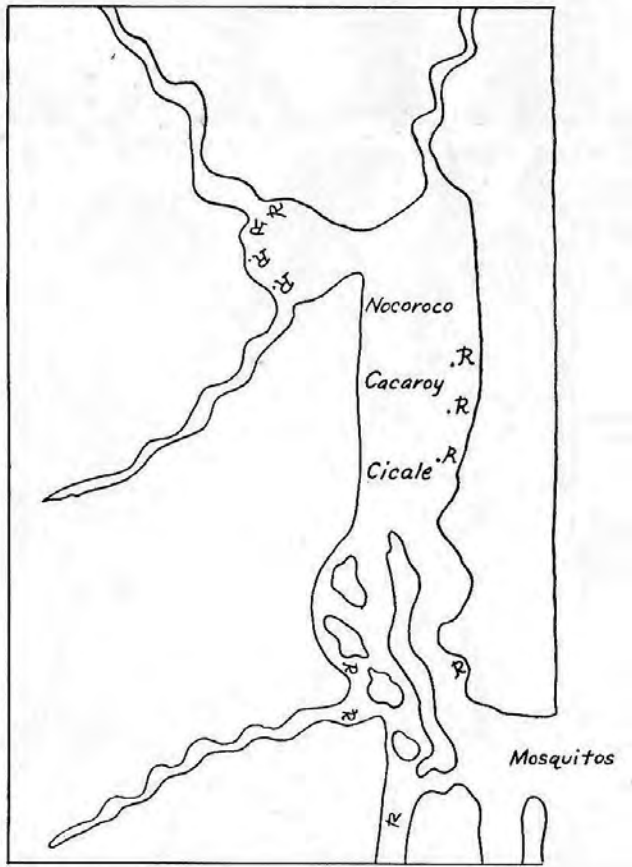
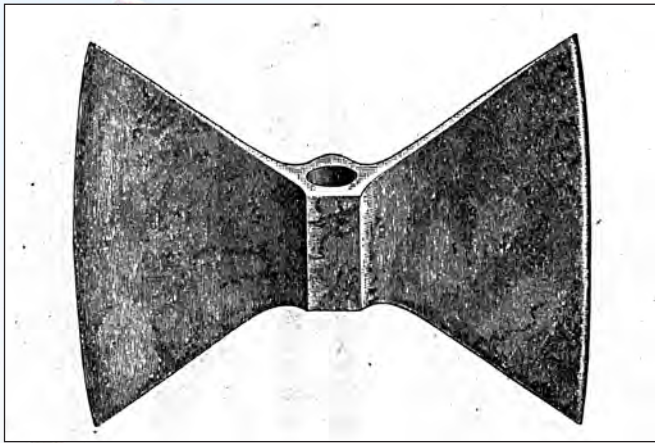


Figure 2 (Top) | Illustration of a Tomoka bannerstone by A. E. Douglass from *The American Antiquarian*, 1882.  
 Figure 3 (Bottom) | "Nocoroco" from Mexia's 1605 map, traced from the original by C.H. Higgs (1951).

The St. Johns culture, 500 B.C. to 1565 A.D., the time of the Spanish settlement of St. Augustine, the United States' oldest city, is represented by numerous shell midden sites along the waterways of Tomoka Marsh Aquatic Preserve. In addition to diagnostic types of pottery, St. Johns shell middens are predominantly Eastern oyster (*Crassostrea virginica*) with quahog clams (*Mercenaria* sp.). The great volume of shells in the larger middens suggest that these mollusks were abundant in the upper Halifax estuary.

The contact of Spanish colonists with Native Americans after the settlement of St. Augustine in 1565 has provided a variety of archival documents on the indigenous cultures of Florida. In 1605, Spanish navigator Alvaro Mexia charted the inland waterways along the east coast south of St. Augustine; his narrative of the expedition described a large Native American settlement called Nocoroco located along the southern reach of the water body now referred to as the Tomoka Basin. A tracing of Mexia's map by C.D. Higgs (1951) shows the town of Nocoroco at Tomoka Point, seasonal sites along the west side of the Tomoka Basin ("R" symbol) and the villages of Cacaroy and Cicale along the east side of the Halifax River (Figure 3). The settlements described by Mexia, from Tomoka Basin to Mosquitoes (currently known as Ponce DeLeon Inlet) comprised the southernmost population of the coastal Timucua (Hann, 1996) the Spanish name for the language that culturally unified a large group of independent tribes in northeast Florida. A century after Mexia's expedition, the Timucua people had vanished from the Tomoka area, leaving archaeological remains that characterize the site of Nocoroco today (MSF VO00082).

With the cession of Spanish Florida to Great Britain in 1763, the British Crown provided large land grants along the Halifax River for the production of agricultural exports. A wealthy Scotsman, Richard Oswald, was granted 20,000 acres between the Halifax River and "Tomako Creek", an early reference to the present Tomoka River on maps by Gerard DeBrahm, the Surveyor General (Piatek, 1992). There were five settlements at the Mt. Oswald Plantation situated on lands suitable for the different requirements of field crops which included indigo, sugarcane, cotton, corn, and rice. The Ferry Settlement (MSF VO7127) was located on a bluff above the ferry landing at the Kings Road crossing of the Tomoka River, near the

present location of the U.S. 1 bridge. In 1780, Oswald's agent reported that a large area of the Tomoka marsh had been dammed-in for the cultivation of rice, which was never harvested, however, due to the disruption of the revolution in the colonies to the north (Schafer, 2000) resulting in the exodus of the British from Florida in 1783. There are remnants of rice dams and ditches in the marshes, which represent the first alteration of the Tomoka River wetlands for water control management.



During the 2<sup>nd</sup> Spanish Period, 1783-1821, British planters emigrated from the Bahama Islands to cultivate sea island cotton on Spanish land grants in the upper Halifax area, including Carrickfergus, John Addison's plantation and Captain James Ormond's plantation, Damietta. The wealthy Bulow family of Charleston, South Carolina acquired 4,675 acres in Graham Swamp in 1821, the year that Florida became a territory of the United States. The demand for raw sugar in European markets motivated Bulow and other planters to invest in steam-powered sugar mills. John James Audubon was a guest of John Bulow in 1831 and in a letter datelined "Bulowville, December 31", commented on an unusual building stone, "a concrete of shell" (coquina limestone) that Bulow had quarried for "erecting some extensive buildings for a sugar house" (Audubon 1831, in Strickland, 1985). Bulow and Thomas Dummett at Tomoka Basin enlisted the help of Seminoles during the fall harvest of sugarcane. This cooperative arrangement was not encouraged by the United States government whose solution to territorial conflicts was the removal of the Seminoles to the West. Warfare broke out at New Smyrna and the plantations along the Halifax and Tomoka rivers were destroyed by raiding parties of Seminoles and fugitive slaves at the start of the of the 2<sup>nd</sup> Seminole War, 1835-1842.

The abandoned plantation lands remained vacant during the mid-19<sup>th</sup> century until the 1870s when northern settlers established towns at Daytona (1870) and New Britain (1875, later Ormond) on the west side of the Halifax River. In 1879, L.B. Knox and G.F. Beed of Iowa bought the Mound Grove tract at the south end of the Bulow Grant. Knox and Beed planted about 100 acres of citrus and dredged a canal from Mound Grove to Smith Creek to ship fruit down the Halifax River. Knox and local merchants lobbied state officials to open a canal connection from Smith Creek to the port of St. Augustine. The state contracted the Florida Coastline Canal Company (FCCC) to excavate the canal and in 1907, FCCC completed an eighteen-mile channel, 50 feet wide and five feet deep, from the south end of the Matanzas River to the north end of the Halifax River (Florida Inland Navigation District, n.d.). In 1904, Volusia County constructed a drawbridge at Smith Creek (later site of L.B. Knox Bridge) to connect Mound Grove with the Halifax River road that followed the shoreline south to the Ormond Hotel (Fitzgerald, 1904). Donald B. Knox, the son of L.B. Knox, planted date palm seeds as a boy along the roadway adjacent to the Mound Grove Canal (Kipp, 1967), which over a century later remain a distinctive feature of the Highbridge Road section of the Ormond Scenic Loop. The state authorized FCCC to maintain a "toll chain" at Smith Creek, one of six tolls along the East Coast Canal, which required vessels to pay the toll keeper to lower the chain (Crawford, 2006). Residents of Ormond village would walk several miles along the empty beach north of the drawbridge to visit the family of the resident keeper at the Smith's Creek Life-Saving Station which operated from 1886-1918. The station was reactivated in 1924 as a U.S. Coast Guard Station until about 1940. In 1954 the federal property was donated to the state of Florida which opened Flagler Beach State Recreation Area in 1961 (DEP, n.d.).

The arrival of the automobile in the 20<sup>th</sup> century, starting with the beach races at Ormond, created opportunities for tourism and land development. The Dixie Highway was paved through Ormond in 1915 and went north through arching live oaks to the new bridge over the Tomoka River. Ernest Mills, a Canadian, acquired five acres in 1918 on the northeast side of the bridge and opened Sunset Park as a wayside stop for motorists with a boat dock, picnic pavilions, and a tea room (Strickland, 1980).

In 1935, during the Depression years, the Volusia Hammock State Park Association (VHSPA) was founded by Alexina Wilder of the Garden Club of Halifax County. The mission of VHSPA was to acquire areas with exceptional scenic value and botanical interest, and to preserve the unique coquina ruins on the old plantations (Hanson, 1937). The core parcels for Tomoka State Park were acquired in 1937-38. Addison Blockhouse, Ormond Tomb, and Bulow Plantation Ruins were deeded from VHSPA to the Florida Board of Forestry and Parks in 1945. This early conservation initiative continued into the post-World War II era of rapid population growth and increased tourism. In 1969, the Tomoka Marsh Aquatic Preserve, approximately 2,800 acres, was adopted by the Florida Legislature for the protection and management of the coastal waterways in northeast Volusia and southeast Flagler counties. In the following decades, more than 6,000 acres of state park lands were added to this conservation corridor to preserve the natural resources and cultural heritage of the Tomoka-Halifax region.

### **3.2 / General Description**

#### **International/National/State/Regional Significance**

The Tomoka River system has long been recognized as one of the state's exceptional water resources. Portions of the Halifax River and Smith Creek serve as part of the Atlantic Intracoastal Waterway (AICW) providing an important inland corridor for recreational and commercial vessels traveling along the east coast. All of the aquatic preserve is designated as an Outstanding Florida Water. The aquatic preserve

provides an important summer refuge to Florida manatee (*Trichechus manatus latirostris*). The Halifax River and associated waterbodies were federally designated by the U.S. Fish and Wildlife Service (USFWS) under 50 Code of Federal Regulations 17.102 as the Halifax and Tomoka River Manatee Refuge. The Tomoka River and its tributaries, Strickland Creek, Thompson Creek, and Dodson Creek are designated as part of the Florida Manatee Sanctuary Act under 68C-22.012 Florida Administrative Code (F.A.C.). While portions of the aquatic preserve are developed along the Halifax River, significant areas of undeveloped shoreline and open water are located within all the reaches of the aquatic preserve.





Boat traffic, however, remains a threat to manatees inhabiting the aquatic preserve. Within the aquatic preserve, residents and visitors can access and experience parts of Florida that have remained relatively unchanged for hundreds of years. For many, visiting the aquatic preserve is like stepping back in time to experience the natural beauty that attracted early settlers to the Tomoka area. Such experiences create a public appreciation for the natural functions of the ecosystems that provide the variety of commercial and recreational experiences for all to enjoy.

### Location/Boundaries

Tomoka Marsh Aquatic Preserve is located in Volusia and Flagler counties in east central Florida (Map 2), and its boundaries are described in the Official Records of Flagler County in Book 33, pages 135-138, and in the Official Records of Volusia County in Book 1244, pages 615-618. The aquatic preserve is about six miles north of Daytona Beach and 50 miles south of St. Augustine.

The aquatic preserve includes the 376 acre Tomoka Basin, approximately five miles of the Halifax River and Smith Creek north of the basin, nine miles of Bulow Creek from its mouth at Smith Creek, three miles of the Halifax River south of the basin, and four miles of the Tomoka River. The lower reach of the aquatic preserve, along the Tomoka River, can be accessed by travelling east from Interstate 95 and State Road 40 (Granada Boulevard) and then north on North Beach Street to Tomoka State Park. Access points for the northern reach of the Halifax River and Smith Creek are located off Highway A1A at Highbridge Park and at Gamble Rogers State Recreation Area at Flagler Beach (Gamble Rogers), respectively. John Anderson Drive in Ormond Beach and Ormond-by-the-Sea in Volusia County parallels much of the length of the AICW along the Halifax River reach of the aquatic preserve. The State Road 40/Granada Avenue bridge over the Halifax River provides views of the Halifax River and, when travelling east over the bridge, a glimpse of the Atlantic Ocean.

### 3.3 / Resource Description

The information in this section describes the resources found in the aquatic preserve.

#### Surrounding Population Data and Future Projected Changes

Tomoka Marsh Aquatic Preserve is located in coastal east central Florida in Volusia and Flagler counties. Approximately 75 percent of the population of Florida, which was 18,801,310 in 2010, is geographically concentrated in the 35 coastal counties of the state (DEP, 2012a).

Volusia County was the 11th largest county in Florida with a population of 494,593 in 2010, an 11.6 percent increase from the 2000 census (Florida Office of Economic and Demographic Research, 2016) (Table 1). The population of the City of Ormond Beach, adjacent to the southern boundary of Tomoka Marsh Aquatic Preserve, was 38,137 in 2010, an increase of 5.1 percent from 2000. Projections of the future growth of Volusia County estimate a population of 529,000 in 2020 and 595,077 by 2040, which represents an increase of 100,000 residents from the 2010 census (Florida Office of Economic and Demographic Research, 2016). The continued growth of Ormond Beach and the larger municipalities of Daytona Beach, currently with 61,005 residents, and Port Orange, currently with 56,048 residents in the Halifax River area will comprise a significant proportion of this population increase. Ormond Beach, like many coastal cities, is approaching the residential capacity of its existing land area, but resources, such as public water supply, do not appear to be limiting growth. Municipal boundaries are expanding by annexation and land use changes. In 2004, Ormond Beach annexed 3,095 acres in Volusia County for the Ormond Crossings planned development with 2,095 residential units and a large commercial park (City of Ormond Beach, 2015).

The population of Flagler County, one of the smallest coastal counties in the area, was 95,696 in 2010, a 92 percent increase from 2000, the highest percent change in Florida (Florida Office of Economic

County	2000		2010		2015		2020		2030		2040	
	Census*	Census*	%+	Est.**	%+	Proj'd	%+	Proj'd	%+	Proj'd	%+	
Flagler	49,832	95,696	92.0%	105,392	10.1%	124,863	30.5%	160,705	28.7%	191,861	19.4%	
Volusia	443,343	494,593	11.6%	517,887	4.7%	529,447	7.0%	566,999	7.1%	595,077	5.0%	

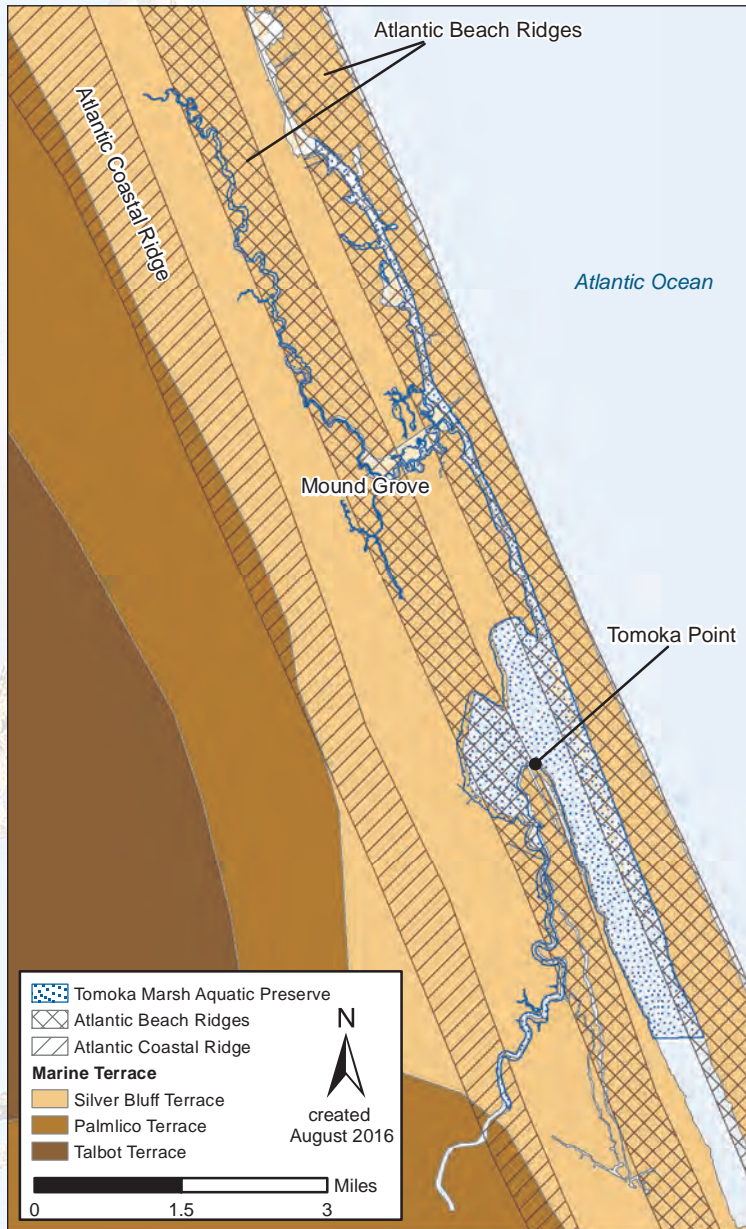
\*Census counts from U.S. Census Bureau data for 2000 and 2010.

\*\*July 1, 2015 population estimates from the U.S. Census Bureau.

Table 1 | Projected trends in population growth in Flagler and Volusia counties. (Florida Office of Economic and Demographic Research, 2016)



and Demographic Research, 2016). Most of the population increase was attributed to residential growth in the city of Palm Coast. In 1999, the city of Palm Coast incorporated 32,315 acres from the ITT Community Development Corporation. ITT Corporation developed one of the largest planned communities in Florida in the 1970s with multiple subdivisions, 500 miles of roads, and service utilities (Dycke, n.d.). Flagler County was a rural county in 1970 with 4,454 residents, but immigration to Palm Coast in the following decades resulted in the population expansion that is documented in recent census data. With a land area greater than 50 square miles, Palm Coast continues to expand its boundaries. Flagler County growth is expected to continue with an increase of approximately 25,000 residents each decade to reach an estimated population of 191,861 in 2040. In 2010, 942 acres were annexed along Old Kings Road south of State Road 100 on uplands adjacent to the Bulow Creek headwaters in Graham Swamp (City of Palm Coast, 2009).



Map 3 | Geomorphology of Tomoka Marsh Aquatic Preserve.

The urban growth of coastal municipalities in Volusia and Flagler counties resulted in the creation of an area designated by the U.S. Census Bureau as the Deltona-Daytona Beach-Port Orange Metropolitan Statistical Area (U.S. Office of Management and Budget, 2013).

### Topography and Geomorphology

The topography and landforms of east central Florida are the result of fluctuations in sea level during the advance and retreat of continental glaciers during the Pleistocene Epoch, 2.6 million to 10,000 years ago (Scott, 1979). In the watershed area of Tomoka Marsh Aquatic Preserve, geologists have delineated three marine terraces, the Silver Bluff, Palmlico, and Talbot terraces (Map 3) that were submerged sea beds when sea levels of the Atlantic Ocean were five to 40 feet above the present elevation (Healy, 1975). The marine terraces are associated with relict barrier islands comprised of beach and dune deposits that have persisted as coast-parallel ridges. The Atlantic Coastal Ridge has elevations of 25-40 feet above mean sea level (msl) and extends the length of Volusia County and Flagler County. The ridge is three to five miles inland from the present beach and barrier island and is locally known as “the peninsula.” The Atlantic Beach Ridges, barrier islands along the east central coast of Florida, formed during the most recent rise in sea level during the Holocene Epoch, 10,000 years ago to present and appear to be retreating landward (Parkinson, 1995). The Atlantic Coastal Lagoon is the lowland basin situated between the active barrier islands and the Atlantic Coastal Ridge on the mainland (Arthur, 1988). The Atlantic Coastal Lagoon contains numerous waterways and wetlands with inlet connections to ocean tides that support estuarine systems of exceptional

biological diversity. A significant portion of the coastal estuary has been preserved in Mosquito Lagoon Aquatic Preserve in east Volusia County and Tomoka Marsh Aquatic Preserve in northeast Volusia County and southeast Flagler County.

The Halifax River is a lagoon that formed as a “bar-built estuary” along the protected inland side of the barrier island, with a connection to the ocean at Ponce De Leon Inlet. The lagoon extends 23 miles from the inlet north to the Tomoka Basin. The lower Halifax River (closer to the inlet) has an average depth of 5.6 feet; the upper Halifax River has an average depth of 4.6 feet, excluding the AICW. The Halifax

River is 0.5 to 0.6 miles wide and has a narrow intertidal shoreline that is fringed predominantly with marsh grasses and scattered mangroves, except where the banks have been bulkheaded or eroded. The Halifax River continues north of the Tomoka Basin as “Smith Creek” where the river narrows and continues past High Bridge into south Flagler County. The historical course of Smith Creek meandered through narrow channels and open marsh lakes and was navigable to the north end of Flagler County where upland sediments blocked the channel. This is reflected on 19<sup>th</sup> century maps which show Smith Creek as “Haulover Creek.” In the early 1900s, the East Coast Canal Company excavated a channel, 50 feet wide and five feet deep, through the uplands in north Flagler to open a navigation channel and tidal connection from Matanzas Inlet to the Halifax River (Florida Inland Navigation District, n.d.).

The Halifax River islands in the aquatic preserve (Map 4) were created when the channel was re-dredged to 10 feet in the 1930s under the Florida Inland Navigation District as the AICW. The AICW

was dredged along the east side of the upper Halifax River, leaving a string of dredge deposits 300-600 feet from the shoreline. The enlargement of the AICW channel in the 1950s to a 12-foot depth and 125-foot width added overburden to the existing deposits resulting in the present topography of the Halifax River islands. The highest mounds of sand and shell sediments are seven to nine feet above msl. Eight of the 12 islands, interconnected by tidal wetlands, form an archipelago two miles long that is a physical and visual barrier separating the AICW from the shallow lagoon of the Tomoka Basin and along the west side of the Halifax River. The Halifax islands comprise approximately 76 acres.

The Tomoka River originates southwest of the City of Daytona Beach in flatwoods and swamp depressions that comprise the Pamlico Terrace, a former Pleistocene sea bed with an elevation approximately 25 feet above msl (Knochenmus, 1968). The narrow channel of upper Tomoka has a relatively steep gradient. The elevation of the bottom of the channel declines from 20 feet above msl south of the SR 92 bridge in Daytona to 10 feet below msl at the SR 40 bridge in Ormond Beach, a change of 30 feet in 10 miles (Camp Dresser & McKee Inc., 1995). The drainage of wetlands for silviculture in the interior of Volusia County has expanded the historical watershed area of the upper Tomoka River. In the mid-20<sup>th</sup> century, the Tiger Bay Canal was dug 10 miles southwest from the Tomoka River, cutting through Rima Ridge, an eroded beach ridge, into Tiger Bay Swamp in the Talbot Terrace which has an elevation of 40 feet above msl.

The channel width of the Tomoka River increases notably north of SR 40 where it flows at a depth of approximately 10 feet below msl through a gap in the Atlantic Coastal Ridge into the Tomoka Basin (elevations <3 feet above

msl) where freshwater is mixed with saltwater tides from the Halifax River. Tomoka Point, located at the confluence of the two rivers is the north end of a relic beach ridge. The ridge is approximately 15 feet above msl and extends parallel to the west bank of the Halifax River from Ormond Beach to the City of Daytona Beach. The geological origin of Tomoka Point and Mound Grove peninsula (see below) is attributed to oscillations of sea-level during an interglacial period when the Pamlico Terrace and Atlantic Coastal Ridge were formed about 340,000 years ago (Arthur, 1988).



Map 4 | The Halifax islands in Tomoka Marsh Aquatic Preserve.



Bulow Creek originates in Graham Swamp in south Flagler County. The creek flows 10 miles south through a coastal basin situated between the eastern slope of the Atlantic Coastal Ridge and Mound Grove, the south end of a peninsular ridge that extends north along John Anderson Highway to SR 100 in the City of Flagler Beach. The channel of Bulow Creek flows easterly from Mound Grove to the confluence of Smith Creek just below the High Bridge. Cedar Creek is a tidal tributary of lower Bulow Creek which originates in a brackish pond on the north side of Walter Boardman Lane. Cedar Creek has a dendritic drainage pattern with small creeks branching off the main channel separated by islands of slash pine. The pine islands have a uniform elevation of approximately five feet above msl which geologists interpret as remnants of a late Pleistocene sea bed which is identified along the coast of Florida as the Silver Bluff Terrace, elevations from one to 10 feet above msl (Bermes, Leve, & Tarver, 1963).

## Geology

The geology of Tomoka Marsh Aquatic Preserve is known from well records which provide a profile of mineral sediments and rock strata representing both marine and terrestrial environments in the geologic history of east central Florida.

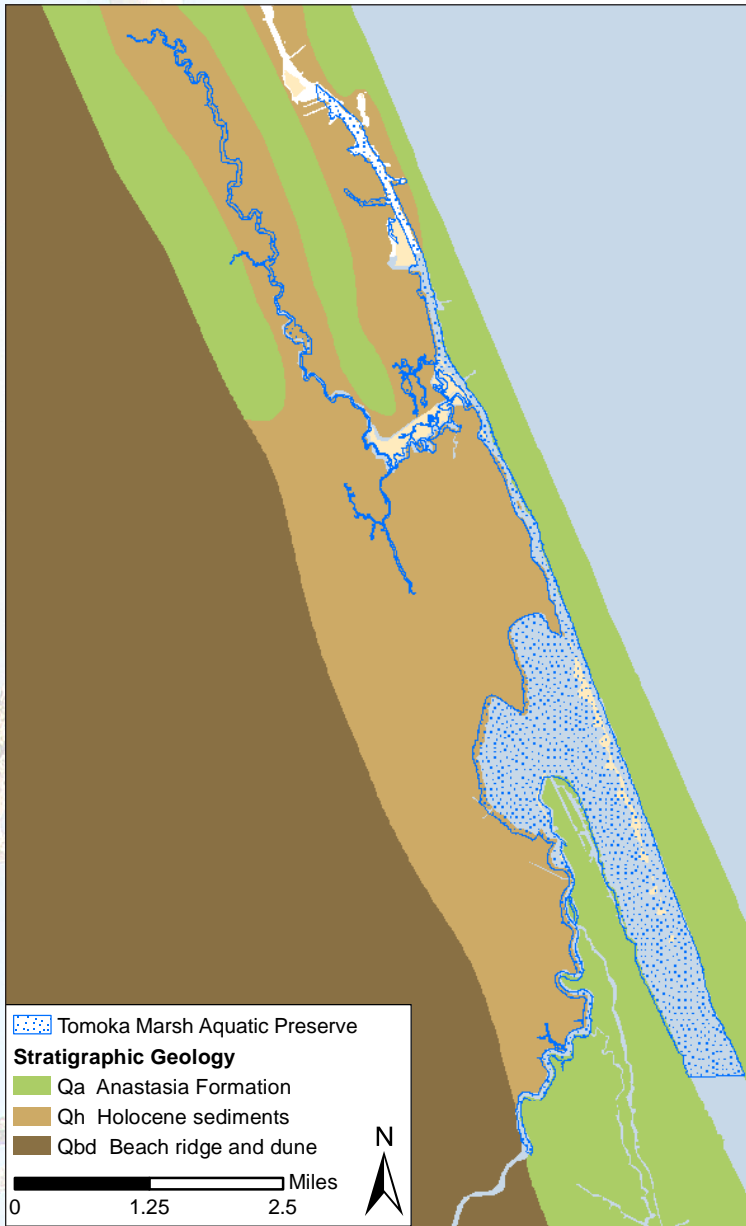
The surface geology largely consists of unconsolidated sands, clay, and shell deposits (Map 5) dating from the Holocene Epoch, 10,000 years ago to the present, and the Pleistocene Epoch, 2.6 million to 10,000 years ago (Scott, 1992a, 1992b). Coquina limestone is the only sedimentary rock that outcrops at the surface or is interbedded with unconsolidated sediments. Coquina is comprised of beach shells from the coquina clam (*Donax* spp.) and quartz sand which are cemented by calcium carbonate. Coquina outcrops can be observed at Buckhead Bluff just upstream from the U.S. 1 bridge and at Tomoka Point where erosion has exposed coquina bedrock.

Coquina limestone has been used as a building stone in east Florida since the 1672 construction of St. Augustine's Castillo de San Marcos (Gannon, 1996). In the early 19th century, coquina was quarried locally for the construction of sugarmills at the Bulow, Dummett, and McCrae plantations. In the mid-20th century, the Lehigh Portland Cement Company acquired several thousand acres along Bulow Creek and the Tomoka Basin. Lehigh planned to mine coquina limestone from former plantation lands for the production of Portland cement at its Flagler County plant (Florida Roundup, 1948). The Lehigh plant closed in 1965 before any commercial coquina was removed from company-owned land along Bulow Creek.

Lands along Bulow Creek and Tomoka

Basin were later sold and split into parcels that became a private residential development and Bulow Creek State Park.

There is a unique submerged stratum in the Tomoka River, described as the Bone Valley Formation, which contains late Pleistocene epoch fossils of terrestrial animals preserved in riverine deposits. In 1968, divers discovered fossil remains of a variety of late Ice Age mammals including mastodons, prehistoric camels, and horses. The intact skull of a giant sloth (*Eremotherium* sp.), a major paleontological discovery, was transferred to the Florida Museum in Gainesville (Volusia Anthropological Society, 1993). Groundwater wells intersect the Ocala Formation approximately 100 feet below msl





in coastal Volusia County (Phelps, 1990). The Ocala Formation dates to the late Eocene Epoch, 30 million years ago, and is comprised of layers of fossiliferous limestone, chalky limestone and dolomitic limestone which contains magnesium carbonates. The Avon Park Formation lies below the Ocala limestone at approximately 250 feet below msl and extends to a depth of 500 feet below msl. The Ocala Formation and Avon Park Formation have porous limestone layers and caverns which store and transmit large volumes of ground water. They comprise the Upper Floridan aquifer which is the primary source of public water supply and Florida's artesian springs (Florida Department of Environmental Protection, 1994). Sequences of older limestone in the Lower Floridan aquifer extend to a depth of approximately 2,000 feet.

There are no large artesian springs in the Tomoka Marsh Aquatic Preserve watershed. The nearest large spring is the Crescent Beach Submarine Spring which is 2.5 miles offshore from the south end of Anastasia Island (Lane, 1986).

### Soils

The soils in the watershed of Tomoka Marsh Aquatic Preserve formed in the geological surface sediments of the ridges, terraces, and basins that comprise the landforms of this geographical region. As a substrate for the growth of terrestrial and wetland plants, soils are complex micro-environments that reflect the mineral composition of the sediments, climate, topographic relief, and biological activity. The regional soils map for Tomoka Marsh Aquatic Preserve (Map 6), which includes northeast Volusia County and southeast Flagler County, is adapted from Soil Survey Geographic database produced by the United States Department of Agriculture's Natural Resources Conservation Service (DEP, 2011). The soil descriptions are from the Soil Survey of Volusia County published by the United States Department of Agriculture (Baldwin et al., 1980) and the Soil Survey for Flagler County (Readle, Baldwin, Goerg, & Leppo, 1997). Those soils are defined by type and those types are grouped as components. Soil components that individually represent less than two percent on the regional soils map of Tomoka Marsh Aquatic Preserve are depicted on the regional soil map as "other."

### Barrier Island Soils

The predominate soils of the barrier island are in the Palm Beach component and include the Palm Beach-Paola complex, Palm Beach gravelly sand, and Palm Beach-Urban Land-Paola. The soils of natural dunes are predominantly quartz sand mixed with shell fragments. Barrier island soils are well drained with rapid permeability and a water table at depths ranging from 72 to 120 inches. They are infertile and receive variable levels of salt spray depending on their proximity to the ocean. Extensive construction of subdivisions on the barrier island in the 1960s and 1970s resulted in large areas of natural dunes displaced by residential structures and suburban infrastructure. These impervious surfaces resulted in rapid runoff of stormwater that carried sediments, nutrients from fertilizer and other pollutants into the Halifax River estuary. The deep water table and permeability of dune soils was



*Top: Coquina rock exposed by erosion at the northern point of Tomoka State Park.  
Bottom: Giant sloth skeleton excavated from Pleistocene sediments in Volusia County. The skull in the background was excavated from the Tomoka River. Photo courtesy: The Museum of Arts & Sciences, Daytona Beach.*



favorable for the construction of septic systems, which remain in widespread use on the barrier island; however, systems that are not maintained properly may result in effluent leaching into groundwater flow that ultimately reaches the Halifax River.

### Sand Ridge Soils

Sand ridge soils were formed in relict dunes of Pleistocene shorelines which comprise a series of linear ridges that parallel the present coastline. These prominent topographic features include the Atlantic Coastal Ridge, Mound Grove, and Tomoka Point at the south end of the Tomoka Basin. This soil type is also found in uplands along the Tomoka River, Groover Branch, and the Little Tomoka River. The major soil components of the sand ridges and Tomoka uplands are Astatula, Paola, and Cocoa (including the Cocoa-Bulow complex). These soils are excessively drained sandy soils with high infiltration rates, rapid permeability and a deep water table that exceeds 72 inches. The Astatula and Paola sands are droughty with very low fertility and support sand pine scrub and sandhill communities. The Cocoa-Bulow soils have coquina limestone in the subsoil at depths ranging from 20 to 60 inches below the ground surface. The coquina layers reduce

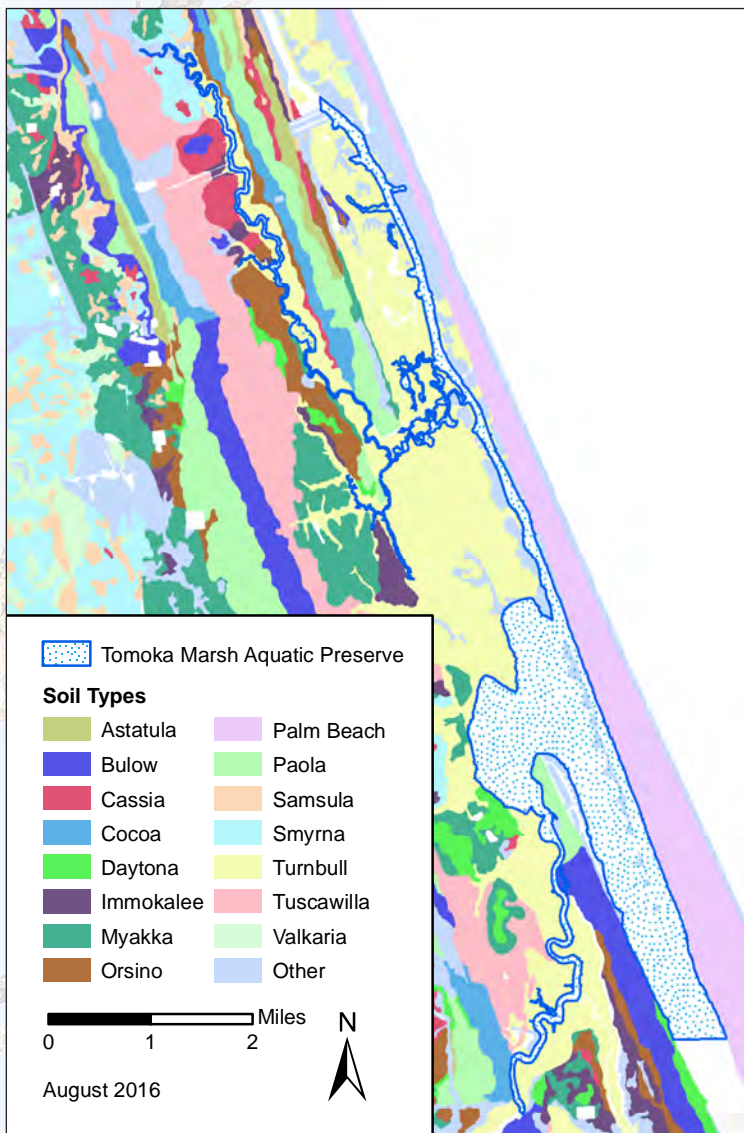
permeability and provide calcareous nutrients to Cocoa-Bulow soils.

### Rima Ridge Soils

Rima Ridge is a relict dune ridge of the Pleistocene era that is the natural watershed divide between the Talbot Terrace and Pamlico Terrace. Daytona sand is the major soil type that is found on eroded remnants of the original ridge. Daytona sand is characterized by variable sand grain sizes in the subsoil, from fine sands (0.1-0.25 millimeter [mm]) to coarse sands (0.5-1.0 mm). Daytona sand is moderately well drained and has the water table at a depth of 40 to 60 inches during the wet season.

### Flatwoods Soils

Flatwoods soils include several types of soils that formed in the relict marine terraces of the Pleistocene era, including the Talbot Terrace, Pamlico Terrace, and Silver Bluff Terrace. The major soil types are Immokalee fine sand, Myakka fine sand, and Smyrna fine sands. These soils have a surface layer of fine sand above a spodic horizon or “hardpan” at depths of 30-50 inches. Hardpan is quartz sand that is cemented by the accumulation of organic humic compounds and iron oxides. Flatwoods soils are characterized by slow infiltration due to a high water table in the wet season and reduced permeability in the hardpan layer. When the water table recedes below the hardpan during the dry season, the surface layer can become very dry and stressful to plant growth. The soils are acidic with low fertility and low organic matter content. To accommodate silviculture or other types of development, the high water table of flatwoods soils were often controlled to some extent by drainage with outfall ditches. Large



Map 6 / Regional soils of Tomoka Marsh Aquatic Preserve.

tracts of flatwoods often contain areas with artificially drained soils and other areas of unaltered soils. These areas can have characteristics of moderately well drained and undrained conditions.

### Low Hammock Soils

An elongated strand of low hammocks and hardwood swamps occurs along the base of the eastern slope of the Atlantic Coastal Ridge, from the Addison Blockhouse Historic State Park to the headwaters of Bulow Creek in Graham Swamp. The hammock forest is predominantly associated with one soil type,



Tuscawilla fine sand. The Tuscawilla soils have a more diverse mineral content than the typical sand soils of the ridges and terraces. These soils are characterized by clay loams in the subsoil and contain lagoon deposits with shells, marl, and limestone nodules. The Tuscawilla soils are poorly drained due to the high water table in the wet season and moderate permeability in the clay loam subsoil. Carbonate lagoon deposits increase soil fertility by the addition of calcium. Elevated areas of the hydric hammock along Bulow Creek have some exceptionally large live oak trees, most notably the Fairchild Oak at Bulow Creek State Park.

### **Basin Swamp Soils**

The flatwoods terraces of Volusia and Flagler counties have relatively uniform ground level elevations that reflect their origin as marine sea beds. Over geological time, however, numerous depressions, or wetland basins were formed in the topographic surface. These depressions range in size from small cypress domes to large basin swamps such as Tiger Bay, Bennett Swamp, and Hull Cypress Swamp. The major soils component of basin swamps is Samsula (Samsula muck, and Samsula and Hontoon soils, depressional) (less than one percent coverage). The swamps are characteristically flooded for most of the year and may have water depths of two feet. The basins have a surface layer of muck, largely comprised of finely decomposed organic matter, which may extend to a depth of three feet. A variant type of basin swamp soil occurs in Flagler County in a relatively small area near the headwaters of Bulow Creek and Graham Swamp. This variant is also in the Samsula component, and includes Placid, Basinger, and St. Johns, depressional soils which are sandy mineral soils with less than 10 percent organic matter. The water table is at or above the ground surface for most of the year except during extended dry periods.

### **Salt Marsh Soils**

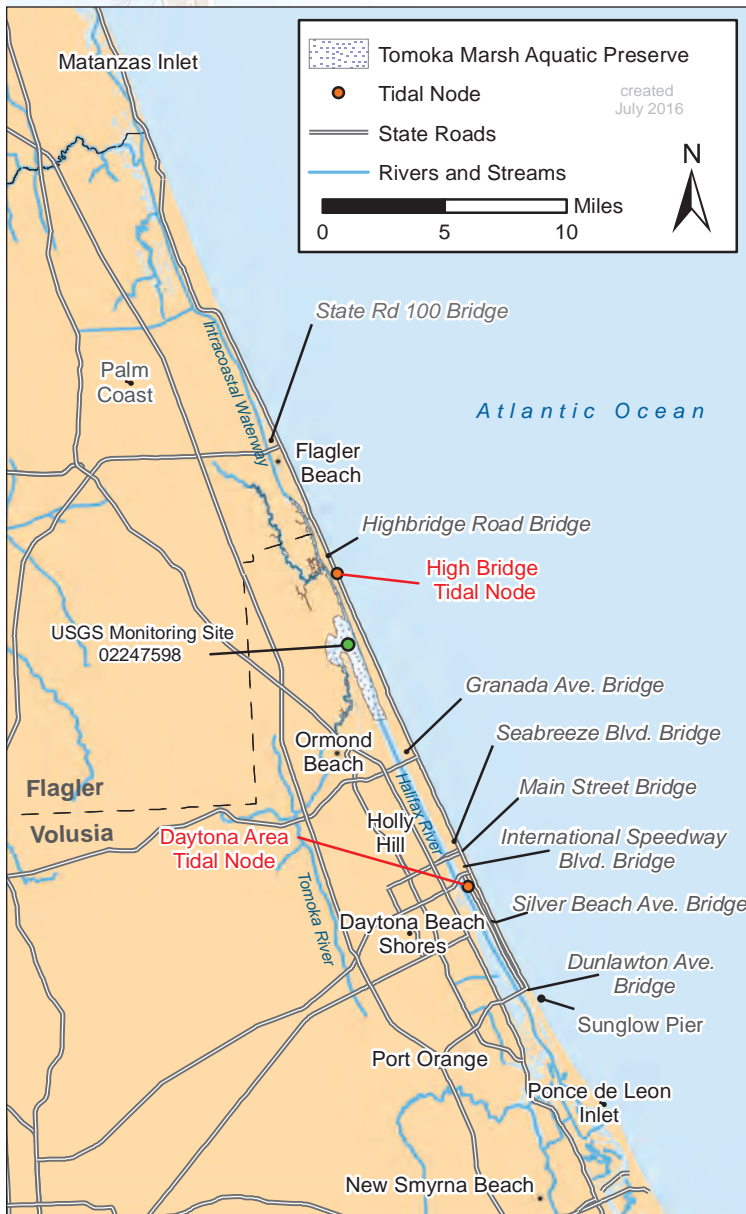
Extensive salt marshes are adjacent to the waterways in Tomoka Marsh Aquatic Preserve. Turnbull is the primary salt marsh soil component, and is identified as Turnbull muck in Volusia County (Baldwin et al., 1980) and Turnbull-Pellicer soils, tidal in Flagler County (Readle et al., 1997). The Turnbull soils have fine-textured minerals, clays and silt that were derived from the deposition of riverine sediments in a shallow estuary protected by a stable barrier island. Turnbull soils have a surface layer of dark muck with a high content of organic matter generated from the decomposition of plant detritus on the marsh surface. The subsoil is typically a layer of clay, which may extend to a depth of three feet above a base layer of fine sand and shell. Inundation by tidal water is the primary influence on the hydrology and chemical properties of saltmarsh soils. The Turnbull soils are saturated to flooded under varying tidal conditions and have saline, anaerobic subsoils below a shallow oxidized surface layer. Salt marsh soils have very poor drainage and slow permeability through the clay subsoils. The salt marshes along the Tomoka Basin, Tomoka River and Smith Creek were disturbed by dragline ditching in 1950s and 60s conducted by the East Volusia Mosquito Control District (EVMCD) for the control of salt marsh mosquitos (*Aedes sollicitans* and *A. taeniorhynchus*). The objective of the ditching was to increase the drainage of marsh soils to prevent the development of aquatic mosquito larvae in flooded depressions. The modification of the drainage properties of Turnbull soils required intensive ditching. The dragline drainage design included excavation of ditches, five feet deep and 15 feet wide, every 500 feet. These ditches accelerated the removal of surface water before aquatic larvae reached the pupal stage and hatched out as flying adults (Norris, 1958). Although EVMCD indicated positive results in mosquito control from ditching the salt marsh soils, the alteration of marsh hydrology and disturbance of biological habitats resulted in the discontinuation of dragline ditching in the late 1960s. In 2000, SJRWMD back-filled numerous dragline ditches as part of a Tomoka Marsh restoration project (DEP, 2012b). Several other saltmarsh restoration projects are mentioned in in the Resource Management section in Chapter Four.

### **Hydrology and Watershed**

The mixing of saltwater and freshwater in Tomoka Marsh Aquatic Preserve is a complex process influenced by wind, ocean tides, freshwater inputs, the physical characteristics of the waterways, and climate.

The Tomoka Marsh Aquatic Preserve estuary has two Atlantic Ocean connections via the Halifax River (Map 7); the Ponce DeLeon Inlet, 24 miles to the south, and Matanzas Inlet approximately 28 miles to the north of the Tomoka Basin. In the south channel at Ponce DeLeon Inlet, the mean tide range is 3.04 feet (National Oceanic and Atmospheric Administration [NOAA], 2015e) and the amplitude declines as tides move north in the lower Halifax River which is approximately 0.6 mile wide and 5.6 feet deep. In a 10 mile section of the river from Port Orange to Ormond Beach, there are seven bridges with variable amounts of causeway fill which restrict circulation, to some degree, in the Halifax estuary (U.S. Environmental Protection Agency [EPA], 2012). The mean tide range at the Granada Avenue bridge in Ormond Beach is 0.59 feet (NOAA, 2015d) with high tide about 3.5 hours later than Ponce DeLeon Inlet. The Halifax River

north of Ormond has a mean depth of about 4.6 feet and opens into the Tomoka Basin at the confluence of the Tomoka River. NOAA does not maintain a tide station in the upper Halifax River, but other data is available to indicate the tide range. In 1992, a survey for the Florida Department of Natural Resources (now DEP) determined a mean high water elevation of 0.77 feet in the Tomoka Basin (Upham, 1992). Avirom and Associates, Inc. (2007) determined a mean tide range of 0.75 feet in the Tomoka Basin during their topographic survey for a Florida Power & Light Company transmission corridor. The water depths in Tomoka Basin were less than four feet below mean high water in the survey transect. The upper Halifax River narrows to about 500 feet in width at the north end of Tomoka Basin and continues past High Bridge as Smith Creek into Flagler County. The original meander of Smith Creek was largely displaced by the excavation of the AICW which is 125 feet wide and 12 feet deep and is the primary conduit of tidal flow to Matanzas Inlet. The mean tide range at the Smith Creek tidal station near the State Road 100 bridge in Flagler Beach is 0.88 feet (NOAA, 2015f).



Map 7 | Hydrology of Tomoka Marsh Aquatic Preserve.

Studies of the tidal dynamics in the Halifax River have identified a tidal node just south of the Highbridge Road bridge. At nodal points, tidal amplitude is typically near zero and there is no net flow of water in either direction north or south (EPA, 2012). Twenty-six miles south of the Highbridge node, Ponce DeLeon Inlet is the dominant source of tidal exchange through the Halifax River estuary. Twenty-two miles north of the Highbridge node, Matanzas Inlet has greater influence on tidal exchange through the AICW. Researchers at Guana Tolomato Matanzas National Estuarine Research Reserve used hydrodynamic modeling to investigate water circulation and flushing in the coastal lagoons extending from the Tolomato River, north of St. Augustine, to Ponce DeLeon Inlet. The models indicated, as other studies have concluded, that tidal exchange increases in the proximity of a waterbody to an ocean inlet. Estuarine areas distant from inlets have longer “residence times” and “flushing rates.” The study indicated that, the upper Halifax River estuary (including sections of the Halifax River and Smith Creek in the northern reach of Tomoka Marsh Aquatic Preserve) had a flushing time of 7.46 days (Sheng, Tutak, Davis, & Paramygin, 2008). In comparison, the flushing time for the lower Halifax River estuary near Ponce DeLeon Inlet was 0.90 days (EPA, 2012). The hydrodynamics of the Halifax River is also influenced by tributary inflows which can be important flushing mechanisms in estuaries that are distant from inlets. R.B. Taylor (1991) documented the effects of freshwater discharge from the Tomoka River in reducing salinity in the Halifax River, indicating significant mixing and flushing in the upper estuary. During precipitation events, tributary discharge may not be beneficial if stormwater runoff contains heavy pollutant loads.

From 2000-2013, the U.S. Geological Survey (USGS) in cooperation with the St. Johns River

Water Management District (SJRWMD) collected data from a surface water monitoring station in the Tomoka River one mile upstream from the mouth of the river at Tomoka Basin, USGS 02247598 (USGS, n.d.). The station measured gauge height (water elevation in feet) and discharge (streamflow in cubic feet/second) on the daily flood and ebb tides (also known as astronomical tides), water elevation changes during weather events (meteorological tides) and the rise in tides during the fall months. The interaction of these tidal components cause significant variation in the elevation and duration of both



high-stage and low-stage tide levels. These variations are not predicted by the calculated values of mean high water (1.07 feet) and mean tide range (0.75 feet). In shallow waterbodies like the Halifax River and Tomoka Basin with a small tide range (less than 1.0 foot), wind can have a significant influence on water level fluctuations. The effects of numerous meteorological tides have been recorded at the USGS Tomoka River station. During one notable cold front that occurred during two days in late November 2005, persistent westerly winds of 20 to 30 miles per hour gusted across Tomoka Basin and resulted in a drop in water elevation of 2.5 feet (USGS, 2005). This “wind tide” exposed large areas of sub-tidal bottom substrates of the Tomoka Basin and tributary creeks. Flooding wind tides occur when strong onshore winds from the east-northeast cause tides to rise along the western side of the Tomoka Basin. Typically, during autumn months, an increase in sea level of 0.5 to 1.0 feet in the Atlantic Ocean results in prolonged flooding of tidal wetlands at Tomoka Marsh Aquatic Preserve (NOAA, 2015c).

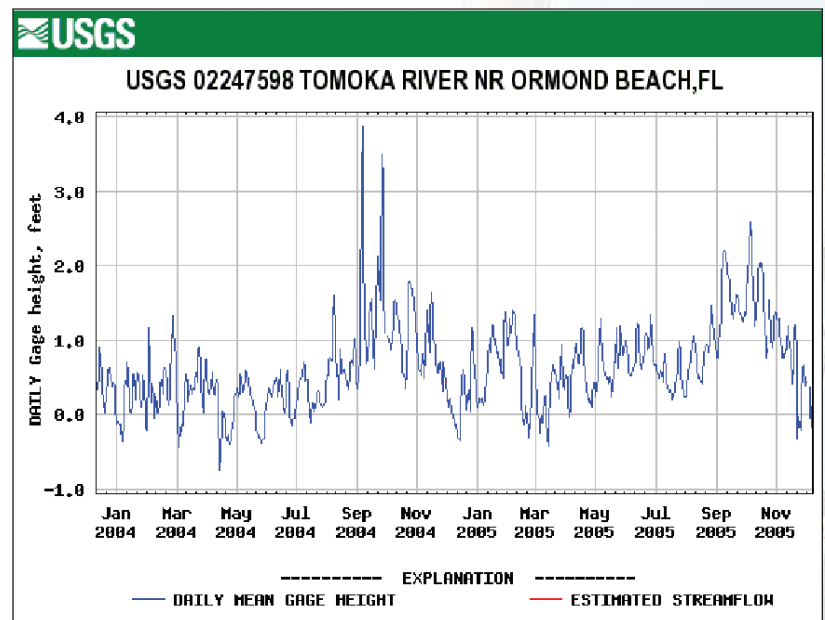
Figure 4 depicts a hydrograph of water levels at the USGS Tomoka River station during a two-year period from January 2004 to December 2005 (NOAA, 2015a). The passage of three east coast hurricanes (Charley, Frances, and Jeanne) caused peak water levels during late summer and early fall 2004. The highest daily tide elevation of 3.87 feet above mean sea level was recorded on September 6, 2004 during Hurricane Frances. Flooding along the Halifax and Tomoka rivers was caused by the combined effects of strong northeast winds, storm surge along the Atlantic coast, and runoff from 10 inches of rainfall in coastal Volusia County (Beven, 2014). The elevated tides in the fall months of 2005 reflected the influence of the seasonal rise of ocean sea level. The decline in daily tides in late fall was caused, in part, by the onset of cold fronts, including the November wind event described above.

Changes in tide levels due to wind and storm events can be directly observed and related to meteorological conditions. Annual trends in ocean sea level cannot be observed over short time durations, but require long-term records at established tide stations. Analysis of sea level records from 1925 to 1983 determined a mean sea level trend of +2.32 millimeters per year, or 0.76 feet in 100 years at the NOAA station at Sunflow Fishing Pier in Daytona Beach Shores (NOAA, 2015a). Rising sea levels, recorded at NOAA stations along the coast of Florida, can be important tools for future planning of coastal counties and municipalities.

Ten named waterbodies, each with a defined watershed, contribute to the waters of Tomoka Marsh Aquatic Preserve (Map 8). These watersheds include the Halifax River, Smith Creek, the lower Tomoka River estuary, the freshwater upper Tomoka River, Tomoka Basin, Bulow Creek, Strickland Creek, and Thompson Creek. Watersheds within the Tomoka Marsh Aquatic Preserve are specifically defined by



*Mud bottom and oyster bars at the mouth of the Tomoka River are exposed by receding tide levels.*



*Figure 4 | Surface water elevations in the lower Tomoka River, 2004 and 2005.*

the Waterbody Identification Number (WBID) system. WBID hydrological units are utilized by DEP to develop numeric water quality criteria such as Total Maximum Daily Loads (TMDL). TMDLs are developed for waterbodies or segments of waterbodies that do not meet one or more criteria listed in the state water quality standards.

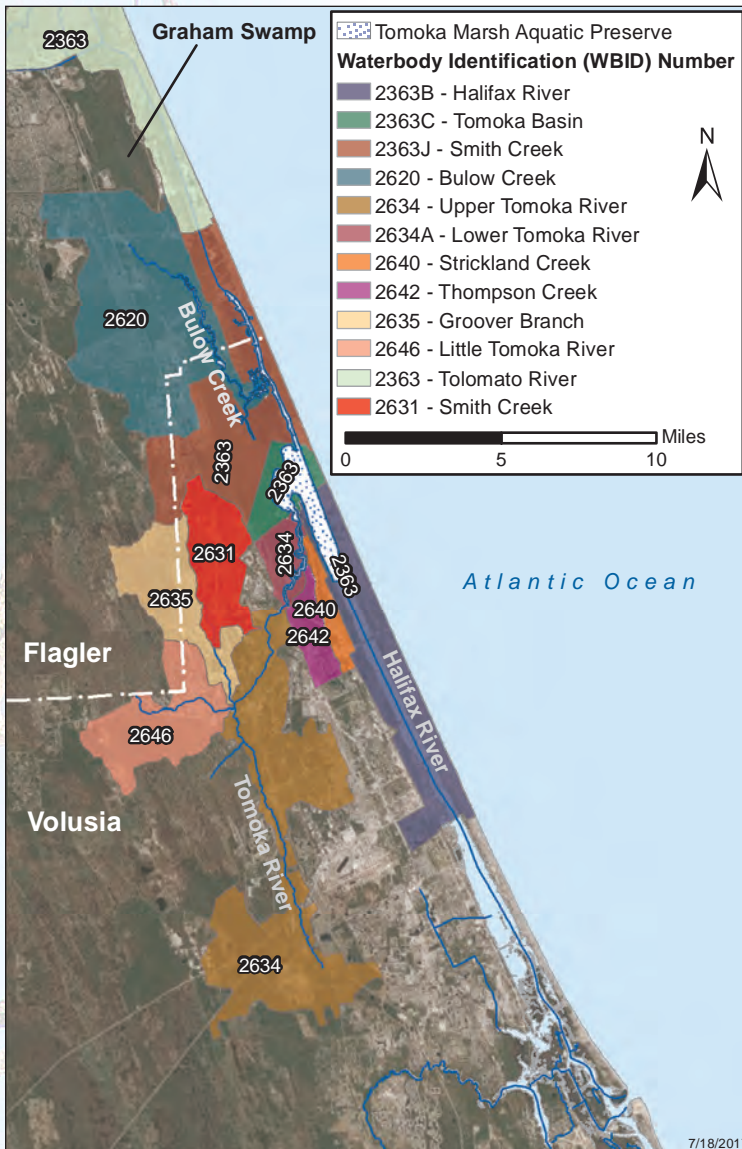
### Halifax River and Smith Creek

The Halifax River and Smith Creek are contiguous sections of the upper Halifax River estuary which extends 22 miles from its southern boundary at Beville Road in Daytona Beach to State Road (SR) 100 bridge in the City of Flagler Beach. The Halifax River drainage basin, WBID 2363B, includes residential areas and public lands on the barrier island west of Highway A1A. Land east of A1A drains to the ocean. Prior to development on the barrier island, there was minimal surface runoff as rainfall infiltrated the permeable dune sands and flowed as groundwater seepage into the Halifax River. With residential construction after World War II, the ridge and swale topography of the barrier island was leveled and sandy dune soils were replaced by impervious surfaces which drained stormwater into the estuary as surface runoff. The western boundary of the

Halifax River basin includes the residential area between South Beach Street and Ridgewood Avenue in Ormond Beach and Holly Hill which is drained by municipal storm sewers. Drainage from Daytona Beach includes commercial and light industrial zones along South Beach Street and south of International Speedway Boulevard, several dredged basins for the Halifax Harbor Marina and waterfront businesses. The Tomoka River flows to the Halifax River via the Tomoka Basin and is the largest tributary of the Halifax River estuary. The Smith Creek drainage basin, WBID 2363J, is predominantly tidal wetlands, including an 1,100-acre impoundment and saltmarshes on the west side of the AICW. The 1,100-acre impoundment was constructed by EVMCD in 1969 by building dikes around a large tract of saltmarsh between Tomoka Basin and Bulow Creek. EVMCD installed pumps to suction water from the Halifax River to flood the impoundment during the warm season to prevent saltmarsh mosquitoes from depositing eggs on the marsh surface. The impoundment operated until 1979 when pumping was discontinued and breaches were opened for natural tidal exchange with the Halifax River. Bulow Creek is the major source of freshwater inflow to the Smith Creek drainage basin.

### Tomoka River

The Tomoka River watershed is comprised of two basins, the lower Tomoka River estuary, WBID 2634a, and the freshwater basin of the upper Tomoka River, WBID 2634, that includes tributary drainage from the U.S. 1 bridge (the boundary of Tomoka Marsh Aquatic Preserve) to the headwaters of the Tomoka River southwest



Map 8 | Tomoka Marsh Aquatic Preserve watershed and drainage basins.

of Daytona Beach. The estuarine basin drains 3.3 square miles between the mouth of the river and the U.S. 1 bridge, 4.2 miles upstream. The drainage area includes state park wetlands and uplands along the west side of the Tomoka River, the Tomoka Estates subdivision on the northwest side of the U.S. 1 bridge, and the Ormond Lakes subdivision located west of Addison Blockhouse Historic State Park. In the 1960s, finger canals were dredged in the marshes at Tomoka Estates to increase the number of waterfront lots with access to the Tomoka River. The riverfront properties, without central utility services, are vulnerable to flooding and are a potential source of non-point pollution. The Ormond Lakes residential units were



constructed in the 1990s around former coquina rock quarries which were incorporated into the subdivision landscape design and stormwater retention and drainage system. The stormwater system discharges to creeks that drain into the brackish marshes of the lower Tomoka River.

### **Strickland Creek**

The two main tributaries of the lower Tomoka River, Strickland Creek and Thompson Creek, are delineated as separate drainage basins, WBID 2640 and WBID 2642, respectively. Strickland Creek was created in the late 1950s along the western edge of the Tomoka peninsula. Draglines were used to excavate a large channel, about 12 feet deep and 150 to 200 feet wide, comparable in size to some reaches of the AICW. The excavated sand and shell material was deposited as overburden on the marsh surface between the dredged channel and Thompson Creek, a natural tributary. Although artificially created, Strickland Creek is a relatively natural looking creek with several bends and runs for a length of approximately three miles. The hydrology of Strickland Creek is largely influenced by tidal flow originating from the lower Tomoka River. The Strickland Creek basin includes drainage from finger canals in the Ormond Terrace residential area built in the 1960s. The lots on the canals have navigable access to Strickland Creek and the Tomoka River, but are situated in the 100-year flood zone and vulnerable to flooding during major storms.

### **Thompson Creek, Dodson Creek, and Laurel Creek**

Thompson Creek, WBID 2642, is a natural estuarine tributary of the lower Tomoka River with its headwaters originating several miles south in Holly Hill. South of U.S. 1, tidal influence is reduced where the creek has been modified significantly to convey water from a narrow basin west of the Florida East Coast Railway in Ormond Beach and Holly Hill. The Ormond Beach Wastewater Treatment Plant on Orchard Street is situated on the west side of Thompson Creek south of U.S. 1. The facility discharges wastewater effluent under a National Pollutant Discharge Elimination System permit into the Halifax River through an outlet pipe near Melrose Avenue. In 1982, prior to the implementation of rigorous standards for the conveyance of wastewater, a break in the pipeline carried raw sewage into the plant which resulted in a large spill of untreated wastewater into Thompson Creek. A large, visible fish kill occurred in the creek, but the spread of bacterial contamination north into Strickland Creek and the residential canals in Ormond Terrace was a greater risk to public health (McLachlin & Ecker, 1982). The contaminated effluent was eventually diluted to non-harmful concentrations in the estuarine tributaries of the Tomoka River. With the modernization of the plant and safeguards for wastewater transport, a similar event has not occurred and is not anticipated.



*Top: The excavation of Strickland Creek in 1958 depicting dredge material deposited on the marsh habitat adjacent to Thompson Creek. Bottom: The west bank of Strickland Creek in 2016 with slash pines and red cedar growth established where dredged material was deposited in the 1950s.*

Laurel Creek was originally a natural tributary of Thompson Creek, and is included in the same drainage basin, WBID 2642. With the construction of U.S. 1 in the 1930s, the creek was modified to drain into Dodson Creek. Laurel Creek originates in the lowland basin east of Nova Road in the Central Park area

of Ormond Beach. The creek drains low hammocks and swamps into a network of mosquito ditches in the brackish marsh east of the intersection of Nova Road and U.S. 1. An outlet ditch flows through a double box culvert into Dodson Creek on the north side of the highway. Dodson Creek was excavated to provide fill for U.S.1 where it crossed a tidal marsh. A deep channel, cut from the east end of Dodson Creek to the Thompson Creek tributary, connects to Strickland Creek via a breach in the island located opposite the boat ramp at Sanchez Park. Although artificially created, Strickland and Dodson creeks are important manatee habitat and part of the federally designated Manatee Sanctuary discussed elsewhere in this plan.

### **Upper Tomoka River**

The Upper Tomoka River, WBID 2634, and its numerous tributaries is the largest drainage basin in the watershed of the Tomoka Marsh Aquatic Preserve. The upper Tomoka River extends 13.6 miles from the U.S. 1 bridge in Ormond Beach to the Tomoka Farms Road near the Volusia County landfill. The boundary between WBID 2634, classified as a freshwater basin, and WBID 2634A, an estuarine basin (also the southern boundary of the aquatic preserve in the Tomoka River) does not demarcate the limit of tidal influence in the Tomoka River. The boundary between freshwater and saltwater varies continuously with the interaction of tides and freshwater discharge. Analysis of water quality data from a monitoring station near SR 40, 8.8 miles from the river mouth, indicated that 30 percent of the salinity measurements between 1998 and 2011 reflected a tidal influence at the station location. The salinity values recorded at the LPGA Boulevard bridge station location, 12 miles from the river's mouth, never exceeded the 0.5 parts per thousand threshold that defines saline water conditions (Magley, 2013b).

Table 2 includes a summary of discharge data for the Tomoka River watershed reported in a FEMA flood study of Volusia County (FEMA, 2014). The discharge values, based on the "10-Percent-Annual-Chance" storm event (approximately 7.5 inches of rain in 24 hours) provide a comparison of the peak runoff from the tributaries of the freshwater and estuarine basins, WBIDs 2634 and 2634A, respectively. The predicted discharge values varied greatly and ranged from an estimated 100 cubic feet per second to more than 7,400 cubic feet per second.

Two tributaries of the upper Tomoka River - the Little Tomoka River and Groover Branch contribute 66 percent of the predicted discharge at the U.S. 1 bridge. The Little Tomoka River has two main branches - the northwest and west. The northwest branch originates in Hull Cypress Swamp and the west branch, which roughly parallels the north side of SR 40, flows through the Breakaway Trails and Hunters Ridge subdivisions. The Tomoka Settlement at the confluence of Groover Branch and the Tomoka River was the first community established along the upper Halifax River after the Civil War. In the early 20th century, the natural channel of Groover Branch was extended north to the Florida East Coast Railway junction where it functioned as a drainage canal for the National Gardens project. National Gardens was an agricultural experiment in the cultivation of flowers for northern markets. The experiment did not succeed in Florida's climate, but the drainage canal remained and was incorporated into the Ormond Crossings planned development at the intersection of the Interstate 95 National Gardens exit and U.S. 1.

The notable expansion of the area drained by the Tiger Bay Canal at the south end of the Tomoka River was previously described in the section on topography and geomorphology. The impact of the excavation of the Tiger Bay Canal in the 1940s would be manifested decades later after the extensive urban growth of coastal Volusia County. The Tiger Bay Canal was cut through Rima Ridge, the natural watershed divide, to drain the Talbot Terrace of interior Volusia County. In the 1980s, state and county water management agencies initiated assessments of future water supply and identified a significant regional aquifer in central Volusia County which was designated by the Environmental Protection Agency as a "Sole Source Aquifer" (EPA, n.d.). The large terraces of interior Volusia County, the Pamlico Terrace and Talbot Terrace, are recharge areas for this Sole Source Aquifer. The Tiger Bay Canal and other artificially created drainage systems are known to lower the water table and reduce recharge to the aquifer. The Florida Forest Service (FFS) manages Tiger Bay State Forest, which includes most of the basin drained by the canal. FFS is working with SJRWMD to restore more natural hydrological conditions to the terraces in the upper Tomoka River watershed. A weir was installed in 2004 at the outlet channel of Tiger Bay Canal (SJRWMD, 2009) and further actions have been proposed to increase recharge to the central Volusia aquifer.

### **Tomoka Basin**

Tomoka Basin, WBID 2363C, is an approximately 376 acre estuarine bay, located at the confluence of the Halifax River and Tomoka River. Within this shallow waterbody, freshwater from the Tomoka River mixes with tidal water from the Halifax River resulting in highly variable salinity levels that respond to precipitation events, wind-driven tides, storm surge and seasonal changes in water temperature.



There are numerous small creeks draining wetlands in Bulow Creek State Park, and one major man-made tributary, the Lamoureaux Canal, in the 4.3 square mile drainage area of Tomoka Basin. The Lamoureaux Canal was excavated in the 1940s to drain the flatwoods of the Pamlico Terrace between Hull Cypress Swamp, just west of U.S. 1, and the Old Dixie Highway on the sand ridge two miles west of Tomoka Basin. The primary function of the canal was to lower the seasonal high water table of flatwoods soils for timber production and cattle range. The origin of the name of the canal is uncertain, but some local residents call it the Peat Bed Canal as it drained surface water from a “peat” mining operation on the west side of Old Dixie Highway. A survey of the hydrology and geological strata of the area for the Halifax Plantation development in 1981 revealed that the “peat” was actually “hardpan,” a subsoil layer of quartz sand which is cemented and stained dark red by the accumulation of organic precipitates and iron oxides (Gomberg, 1981). The runoff at the outlet of the Lamoureaux Canal under the Old Dixie Highway flowed over a resistant layer of hardpan and dropped about five feet into a natural stream, the only known waterfall in the watershed. In the 1960s, the canal was extended easterly

<b>Tomoka River Watershed</b> <i>Tomoka River &amp; tributaries</i>	<b>DEP Waterbody</b> <i>WBID #</i>	<b>River Mile</b> <i>from mouth</i>	<b>FEMA Discharge*</b> <i>CFS</i>	<b>FEMA Basin</b> <i>sq. mi.</i>	<b>Tributary Location</b> <i>city or county</i>
Tomoka River mouth at Tomoka Basin	Boundary 2363/2634A	0.0	nd**	nd	Ormond Beach
Tomoka River at Old Dixie Highway	2634A	0.6	5,470	145.1	Ormond Beach
Strickland Creek	2640	1.1	nd	0.1	Tomoka State Park
Dodson Creek	2642	tributary to Thompson Crk.	nd	0.1	Tomoka State Park
Thompson Creek	2642	2.5	208	0.4	Ormond Beach
Laurel Creek	2642	tributary to Dodson Crk.	331	2.4	Ormond Beach
Tomoka River at U.S. 1 bridge	Boundary 2634A/2634	4.2	7,489	136.6	Ormond Beach
Bear Creek tributary	2634	4.6	nd	1.7	Ormond Beach
Misner Branch tributary	2634	6.3	562	2.7	Ormond Beach
Groover Branch tributary	2634	8.5	1,774	17.1	Ormond Beach
Little Tomoka River	2634	8.6	3,205	21.2	Ormond Beach
Tomoka River at SR 40 bridge	2634	8.8	4,521	88.1	Ormond Beach
Priest Branch tributary	2634	10.1	nd	7.1	Daytona Beach
Shooting Range Canal	2634	10.5	100.4	0.5	Daytona Beach
Tomoka River at LPGA Blvd. bridge	2634	12.0	3,520	74.7	Daytona Beach
Tiger Bay Canal	2634	14.1	nd (weir)	29.5	Tiger Bay Forest
Tomoka River at U.S. 90 bridge	2634	15.9	928	6.1	Daytona Beach
Tomoka Farms Road landfill	2634	17.8	NPDES permit	nd	Volusia County
<b>Bulow Creek Watershed</b>					
Bulow Creek at Boardman Lane bridge	2620	3.2 mi. from Smith Creek	1280	28.3	Volusia & Flagler counties
* FEMA discharge based on the “10-Percent-Annual-Chance” storm event, approximately 7.5 inches of rainfall in 24 hours.					
**nd=no data in FEMA Flood Study					

Table 2 | The predicted discharge of the Tomoka River and tributaries from the FEMA Flood Study of Volusia County (2014).

to Tomoka Basin when the bed of the stream was dredged and discharge directed into a tidal tributary. In the later decades of the 20<sup>th</sup> century, the northward expansion of suburbs from Ormond Beach resulted in the conversion of silvicultural and range lands to residential subdivisions in the western portion of the Tomoka Basin watershed.

### Bulow Creek

The drainage basin of Bulow Creek, WBID 2620, is 8.9 square miles. Tomoka Marsh Aquatic Preserve includes more than nine miles of Bulow Creek from the mouth at Smith Creek to the north boundary of the Bulow Grant in Flagler County. Although Bulow Creek is defined by DEP as a freshwater stream, the creek has an average salinity of 11.2 parts per thousand at Walter Boardman Lane bridge (Miller, 2008), 3.2 miles upstream from its mouth. At Bulow Plantation Ruins Historic State Park, six miles upstream from the mouth, there are measurable semi-diurnal tides. The Korona Canal, 4.2 miles upstream, is a major freshwater tributary to Bulow Creek. The Korona Canal was excavated in the 1950s to provide drainage in the flatwoods terrace between the Polish community of Korona on U.S. 1 in Flagler County

and the Old Kings Road in Volusia County.

The canal was cut through the Atlantic Coastal Ridge at the Old Kings Road and the channel continued down the east slope of the ridge to drain into a natural creek in the lowland basin west of Bulow Creek. In the 1960s, a land investor, B.H. Oates, Sr. acquired 4,500 acres of the old plantation lands along Bulow Creek, including portions of the Ormond Grant and McHardy Grant south of the Korona Canal and a tract of the Bulow Grant north of the canal. A property survey indicated that approximately 1,300 acres of low hammock that were below the five-foot contour could not be developed due to flooding from the canal discharge and a high water table. The surveyor devised a flood control plan that the owner provided to EVMCD which had equipment for the construction of large earth works. The plan included extending the canal through the lowland basin with seven-foot banks to contain floodwater, and then continue through an elevated upland hammock into Bulow Creek. The EVMCD reported uncertainty regarding the engineering design and its effectiveness in preventing flooding in the lowland basin, but agreed to improve drainage. A deep channel was excavated through the upland hammock into the channel of Bulow Creek (J.T. Williams, personal communication, June 11, 1981). The property was not subsequently developed, and after several changes of ownership, the state of Florida acquired the 1,990-acre eastern half of Oates' lands which was dedicated as Bulow Creek State Park in 1981. Although occasional flooding in the low hammocks was not a management concern to the Florida Park Service, the Korona Canal had a significant impact upstream, outside



*Top: Aerial view of Bulow Creek on December 26, 2000 downstream of the Korona Canal depicting a large vegetated sandbar. Photo by Volusia County. Bottom: The restored channel of Bulow Creek downstream (south) of the Korona Canal in 2004 after the sandbar was removed.*

the park boundary, where the channel cut through deep layers of sand in the Atlantic Coastal Ridge at Old Kings Road. During heavy rains, the canal discharge undercut the sand banks of the ridge and



transported large amounts of the sediment through the outlet canal into the Bulow Creek reach of the aquatic preserve. By the year 2000, the accumulated sediment deposited in Bulow Creek had formed large vegetated sandbars which obstructed flow in a 1,000-foot reach of the channel (see above photo). Restoration plans for Korona Canal and Bulow Creek were initiated by staff of the Tomoka Marsh Aquatic Preserve, EVMCD (now known as the Volusia County Mosquito Control District), and the Florida Park Service. The Korona Canal restoration project is described under wetlands restoration in the Resource Management section of this plan.

The channel of Bulow Creek north of Bulow Plantation Ruins progressively narrows with a transition from estuarine to freshwater conditions, evident in the change of floodplain vegetation from brackish marsh to forested wetlands with cabbage palms, bald cypress, and swamp hardwoods.

The headwaters of the creek receive freshwater inflow from two tributaries - the Flagler Airport ditch and the Graham Swamp branch, a natural creek. The airport ditch originates at the south end of Gore Lake and drains the east runways at Flagler County Airport. The ditch continues easterly through the Seminole Woods subdivision and past the inactive Flagler County landfill on Old Kings Road before discharging into Bulow Creek. The Graham Swamp tributary originates in the forested wetlands north of SR 100 between the AICW and Interstate 95 in the city of Palm Coast. The northern boundary of the Bulow Creek watershed, WBID 2360, is the Lehigh Grade and an associated canal that was constructed in 1953 as a railroad spur used by the Lehigh Portland Cement plant. The Lehigh Grade bisected Graham Swamp and impeded the southerly flow of drainage from the northern part of the swamp basin. The state acquired 3,170 acres of Graham Swamp in 1995. Under the management of SJRWMD, open culverts were installed under Lehigh Grade to increase the flow from Graham Swamp into the Bulow Creek headwaters (SJRWMD, 2010). In 1998, the hydrological connection of Graham Swamp and Bulow Creek was further improved with the addition of eight culverts installed under SR 100 when the roadway was widened to four lanes (SJRWMD, 1999). In 2000, the Lehigh Grade was acquired and converted to a trail and is currently managed by Flagler County as the Lehigh Greenway Rail Trail.



*Cabbage palms and swamp hardwoods replace brackish marsh vegetation with the transition from saltwater to freshwater in the upper reaches of Bulow Creek.*

### **Climate**

The weather on the east central coast of peninsular Florida reflects its geographic location in a transition zone between warm temperate and subtropical climate regions. A long, humid warm season is characteristic from May to October with daytime high temperatures often exceeding 90° F in mid-summer. The winters are mild, with an average daily high of 68° F and low of 47° F during the month of January (Florida State University, 2015a). Subfreezing weather has occurred in Daytona Beach every decade since



temperature data was first recorded by the National Weather Service in 1923 (NOAA, 2015b). Freeze events in 1983 and 1985 had a major impact on the estuaries of east central Florida causing the mortality of aquatic fauna and the die-back of mangrove trees north of Cape Canaveral (DEP, 2009a).

The average annual rainfall recorded by the National Weather Service at Daytona Beach International Airport for the years 1937 to 2011 was 49.63 inches (Magley, 2013a). Yearly rainfall is highly variable. 1953 was the wettest year on record with 79.29 inches. 1956 and 2006 were the driest years with just over 31 inches recorded in both years. Typically, about half, or approximately 25 inches, of the annual rainfall occurs during the summer months from June through September (Magley, 2013a). Most precipitation results from convection thunderstorms but tropical storms and hurricanes, which can extend into November, may drop large amounts of rainfall during short-duration storm events.

Records for daily and cumulative precipitation were set in 2009. While the total rainfall at the National Weather Service Daytona Beach International Airport station in 2009 was approximately 50 inches, during a six day period from May 17 to 22, more than 20 inches of rain fell in Daytona Beach setting new station records. The storm was caused by the convergence of a late season cold front with a powerful low pressure system over the southeast Gulf of Mexico. This resulted in heavy tropical moisture with strong easterly winds that occurred for almost a week over east central Florida (Florida State University, 2015b). The Halifax River was elevated by wind-driven tides which caused major tributary canals to backflow and resulted in flooding of stormwater drains and on-site wastewater systems in residential and commercial areas from Ormond Beach to Port Orange (Pulver, 2009). The 2009 year ended with the onset of cold weather which continued into 2010 and represented the coldest winter season since 1981. There were nine days when the daily low temperature was below 32° F (NOAA, 2010a). NOAA climate analysts attributed the extreme weather in east central Florida in 2009-2010 to a regional manifestation of a global-scale climate event represented by the co-occurrence of El Niño conditions in the Pacific Ocean with a southward extension of the Arctic Oscillation (NOAA, 2010b). In the long-term context, the cold winter of 2009-2010 was not a significant variation or reversal of an increasing annual temperature trend. 2000-2010 is listed as the warmest decade in Florida since records were first collected in 1895 (NOAA, 2015c).

The largest hurricane recorded in Volusia County was Hurricane Dora in September 1964 with Category 2 wind speeds of 96-100 mph. During August and September 2004, three hurricanes - Charley, Frances, and Jeanne - crossed central Florida. Charley passed directly over northeast Volusia County with hurricane-strength gusts of 88 mph. When Hurricane Frances crossed into the Atlantic at St. Lucie County on September 5, 2004, coastal Volusia County experienced tropical storm-force winds (39-73 mph) with 10 inches of rainfall at Daytona Beach (Beven, 2014). Stormwater runoff from the mainland combined with coastal storm surge resulted in extreme tide levels in the Halifax River and Tomoka Basin which flooded low-lying areas along Beach Street, Old Dixie Highway, and Highbridge Road (J. Isaacs, personal communication, September 9, 2004). Hurricane Jeanne had tropical storm force winds of 45 to 55 mph with 2.3 inches of rain at Daytona Beach. Sustained northeast winds during the passage of Hurricane Jeanne caused water levels in the coastal basins to rise several feet, close to the peak elevation recorded for Hurricane Frances (USGS, 2015) (see Figure 4).

### **Natural Communities**

The natural community classification system used in this plan was developed by the Florida Natural Areas Inventory (FNAI) and DEP. The community types are defined by a variety of factors, such as vegetation structure and composition, hydrology, fire regime, topography and soil type. The community types are named for the most characteristic biological or physical feature (FNAI, 2010). FNAI also assigns Global (G) and State (S) ranks to each natural community and species that FNAI tracks. These ranks reflect the status of the natural community or species worldwide (G) and in Florida (S). Lower numbers reflect a higher degree of imperilment (e.g., G1 represents the most imperiled natural communities worldwide, S1 represents the most imperiled natural communities in Florida).

The northeast Florida coast is an excellent example of a transition zone between temperate and tropical climates, exhibiting community features of each. Tomoka Marsh Aquatic Preserve includes a number of community types, but is most notably characterized by extensive salt marsh which is productive in terms of biomass and providing a transition zone between terrestrial and aquatic habitats (Map 9). The following natural community types are found within or adjacent to Tomoka Marsh Aquatic Preserve (Table 3). Descriptions were taken from the 2010 FNAI Guide to the Natural Communities of Florida. Most community types found within the aquatic preserve are considered to be in good condition, especially considering the extent of urban development adjacent to the aquatic preserve and within the watersheds.



FNAI Natural Community	Acreage	Global Rank	State Rank	Comments
Maritime Hammock	36	G3	S2	
Shell Mound	1	G2	S2	
Hydric Hammock	5	G4	S4	
Coastal Grassland	6	G3	S2	
Salt Marsh	146	G4	S4	
Blackwater Stream	97	G4	S2	
Unconsolidated Substrate	unknown	G5	S5	
Mollusk Reef	unknown	G3	S3	
Algal Bed	unknown	G3	S2	The algal beds are ubiquitous, but ephemeral and variable so locations and acreage are constantly changing.
Seagrass Bed	<1	G2	S2	
Ruderal	6			Not classified as a natural community.

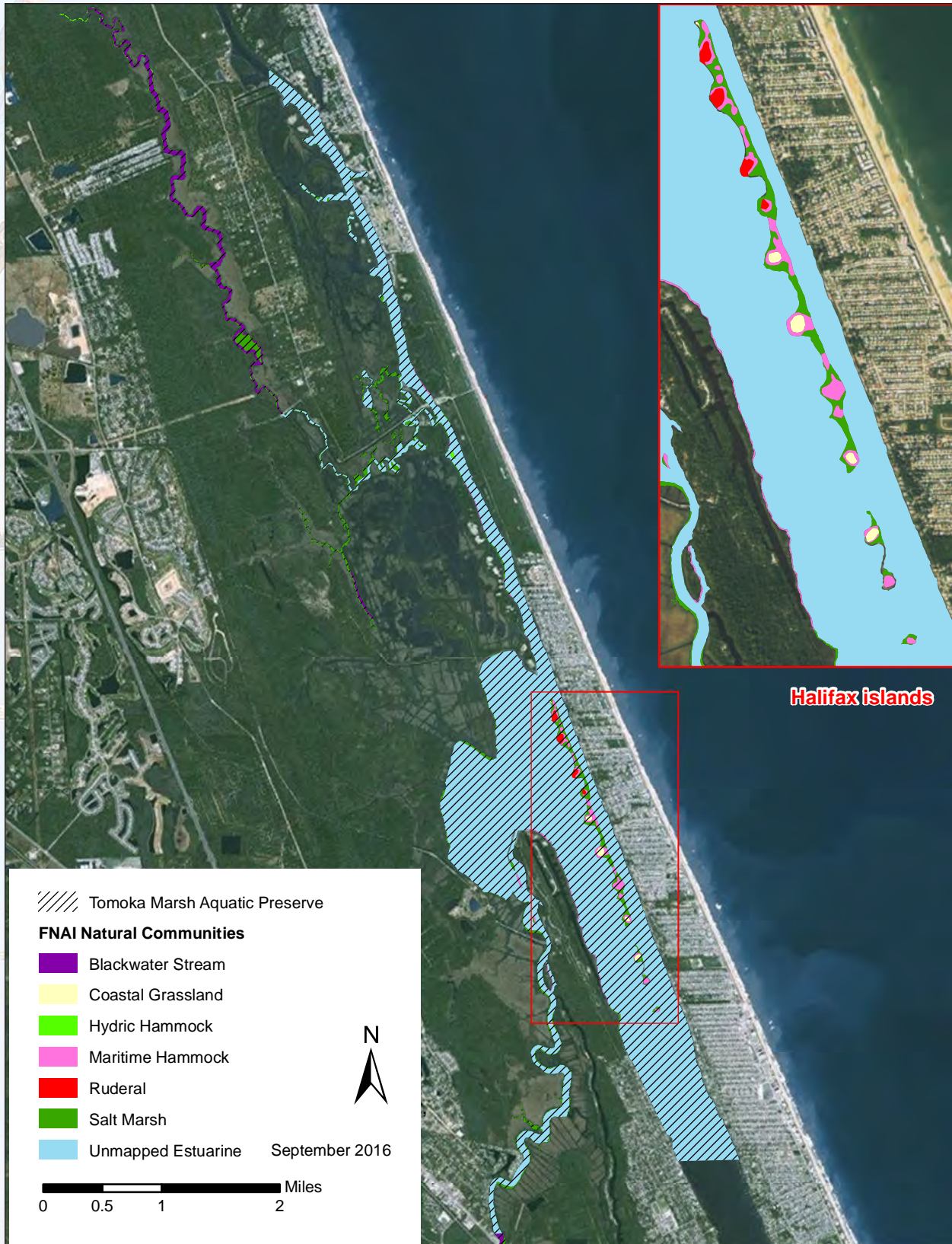
*Table 3 | Summary of Florida Natural Areas Inventory natural communities in Tomoka Marsh Aquatic Preserve.*

*Maritime Hammock* – (synonyms: coastal hammock, maritime forest, tropical hammock). Maritime hammocks are characterized as stabilized coastal dune with sand substrate; xeric-mesic; statewide but rare in Panhandle and Keys; rare or no fire; marine influence; evergreen closed canopy; live oak (*Quercus virginiana*), cabbage palm (*Sabal palmetto*), red bay (*Persea borbonia*), red cedar (*Juniperus virginiana*) in temperate maritime hammock. Maritime hammock species have become established on several islands in the Halifax River. Portions of the islands were created when the AICW was dredged in the late 1800s and submerged soils were deposited in large piles that created islands. The Halifax islands support maritime hammock species, including cabbage palm, southern red cedar, and live oak, in three areas on the northernmost islands. The understory contains saw palmetto (*Serenoa repens*), wax myrtle (*Myrica cerifera*), and bastard false indigo (*Amorpha fruticosa*). About 10 percent of the 76 acre islands have been encroached by Brazilian pepper (*Schinus terebinthifolius*) and Australian pine (*Casuarina* spp.). A hammock island is located in the tidal marshes north of Highbridge Road at Bulow Creek State Park. Maritime influences, particularly wind deposited salt, are exhibited in the low stature of the vegetation. Wind pruned live oaks are dominant in the canopy and other maritime hammock trees are also present. This maritime hammock island is considered to be in good condition. Small pockets of larger stands of maritime hammock within North Peninsula State Park (NPSP) and Tomoka State Park border Smith Creek and the Tomoka River, respectively.

*Shell Mound* – (synonyms: midden, Indian mound, tropical hammock, maritime hammock, coastal hammock). Shell mound is unusual among the biological communities because it is largely a result of the activities of Native Americans instead of natural physical factors. It is generally characterized as an elevated mound of mollusk shells and aboriginal refuse on which a hardwood, closed-canopy forest develops. Shell mound soils are composed of shells and shell fragments with an organic component derived from forest litter. Undisturbed shell mounds can support a variety of hardwood trees and shrubs which may include white stopper (*Eugenia axillaris*), live oak, cabbage palm, southern red cedar, torchwood (*Amyris elemifera*), soapberry (*Sapindus saponaria*), and snowberry (*Chiococca alba*). Shell mounds occur throughout the area with the most famous, Nocoroco, located at the point of Tomoka State Park and the southern portion of the Tomoka Basin. Others occur along Bulow Creek and the Halifax River. Aboriginal midden sites are comprised of the remains of shellfish, principally estuarine species, the eastern oyster and quahog (*Mercenaria mercenaria*). Some of the shell mounds support populations of locally rare tropical plants, including wild coffee (*Psychotria nervosa*), soapberry, and marlberry (*Ardisia escallonioides*). Other plants typically include cabbage palm, southern red cedar, live oak, Florida swamp privet (*Forestiera segregata*), coral bean (*Erythrina herbacea*), and coontie (*Zamia pumila*). An assessment of shell mounds at Bulow Creek State Park and Tomoka State Park were determined to be in good condition (DEP, 2012b). Select midden sites are discussed in the archaeological and historical resources section of this chapter. To protect the integrity of aboriginal midden sites, they are generally not depicted on management plan maps.

*Hydric Hammock* – (synonyms: wet hammock, Gulf Hammock). Hydric hammocks are strips of hammock immediately bordering salt marsh or other coastal communities. Species composition is

limited by salinity to mostly cabbage palm, live oak, and red cedar. Hydric hammock often grades into, or may be difficult to differentiate from, mesic hammock, bottomland forest, alluvial forest, swamps, and bay gall. Hydric hammock may be distinguished from mesic hammock by its species composition that is dependent on occasional flooding. Both are typically oak-dominated. However, since mesic hammock is less saturated and does not flood frequently, it supports a higher frequency of southern magnolia (*Magnolia grandiflora*) and pignut hickory (*Carya glabra*), and often has a shrub layer of saw palmetto. Pockets of hydric hammock are found along Bulow Creek along Bulow Creek State Park and along the





upper reach of Bulow Creek outside the park boundary. Upper Bulow Creek is named as an exemplary example of hydric hammock in FNAI's 2010 Natural Community Section. The hydric hammocks along Bulow Creek are in good to excellent condition.

*Coastal Grassland* – (overwash plain, deflation plain, salt flat, coastal savannah). Coastal grassland is a predominantly herbaceous community more commonly known to occupy the drier portions of the transition zone between beach dunes and the immediate coast, but also referenced to occur farther inland in transition zones between communities dominated by woody species such as coastal strand or maritime hammock. Herbaceous species found on more stable soils associated with coastal grassland include bluestem grasses (*Andropogon* spp.), camphorweed (*Heterotheca subaxillaris*) and greenbrier (*Smilax* spp.) (FNAI, 2010).

This community is characteristic of the higher, drier portions of the Halifax islands which were created when shell, sand and other submerged habitats were dredged to create the AICW more than 75 years ago. Over time, the dredged soils stabilized and characteristic plant species emerged from local seed sources. Coastal species are known to be good colonizers, especially after storm events, and the plant growth in many areas of the Halifax islands is a good example of this phenomenon. The center portions of several of the islands have recruited broomsedge bluestem (*Andropogon virginicus*) and bushy bluestem (*Andropogon glomeratus*), camphorweed, and greenbrier, all typical coastal grassland species. Several species of grasses present include lovegrass (*Eragrostis* sp.), switchgrass (*Panicum virgatum*), and fingergrass (*Eustachys petraea*) which occur in scattered patches. Pricklypear cactus (*Opuntia* sp.) is present but is sparse on several of the islands. Several gopher tortoise burrows have been observed on the islands.



Absent storm disturbance, coastal grassland communities are gradually replaced with woody species to form scrub or maritime hammock, and the fringe areas of many of the islands also contain species characteristic of maritime hammock.


Portions of the islands have been invaded by the non-native Australian pine and Brazilian pepper with control measures undertaken at various times. The cultivated lantana (*Lantana camara*) is also present, but sparse. Public use of the islands has resulted in periodic accumulation of litter, but clean-ups by staff and volunteers, and the Adopt-an-Island program address this issue.



*Salt Marsh* - (synonyms: estuarine tidal marsh, brackish marsh, coastal wetlands, coastal marshes, tidal wetlands). Salt marsh is a largely herbaceous community that occurs in the portion of the coastal zone affected by tides and seawater and protected from large waves, either by the broad, gently sloping topography of the shore, by a barrier island, or by location along a bay or estuary. The width of the intertidal zone depends on the slope of the shore and the tidal range. Salt marsh may have distinct zones of vegetation, each dominated by a single species of grass

*Top: Opuntia cactus on a Halifax island. Bottom: Christmasberry grows at the landward edge of a brackish salt marsh with black needle rush and salt grass.*





or rush. Saltmarsh cordgrass (*Spartina alterniflora*) dominates the seaward edge and borders of tidal creeks, areas most frequently inundated by the tides. Needle rush (*Juncus roemerianus*) dominates higher, less frequently flooded areas. Other characteristic species include Carolina sea lavender (*Limonium carolinianum*), wand loosestrife (*Lythrum lineare*), marsh fimbry (*Fimbristylis spadicea*), and shoreline seapurslane (*Sesuvium portulacastrum*). The landward edge of the marsh is influenced by freshwater influx from the uplands and may be colonized by a mixture of high marsh and inland species, including needle rush, sawgrass (*Cladium jamaicense*), saltmeadow cordgrass (*Spartina patens*), and sand cordgrass (*S. bakeri*), among others. A border of salt-tolerant shrubs, such as groundsel tree (*Baccharis halimifolia*), saltwater falsewillow (*Baccharis angustifolia*), marshelder (*Iva frutescens*), and christmasberry (*Lycium carolinianum*), often marks the transition to upland vegetation or low berms along the seaward marsh edge (FNAI, 2010). Black mangroves occur sparsely in the intertidal wetlands throughout the aquatic preserve, but in recent years their numbers appear to be increasing.

Tidal fluctuation is the most important ecological factor in salt marsh communities, cycling nutrients and allowing marine and estuarine fauna access to the marsh. This exchange helps to make salt marsh one of the most biologically productive natural communities in the world (DEP, 2009b; Mitsch & Gosselink, 1986). Salt marshes are also extremely important because of their storm buffering capacity and their pollutant filtering actions. The dense roots and stems hold the unstabilized soils together, reducing the impact of storm wave surge. The plants, animals, and soils filter, absorb, and neutralize many pollutants before they reach adjacent marine and estuarine communities. These factors make salt marshes an extremely valuable natural community.

Salt marsh is the most common natural community adjacent to the waters of the aquatic preserve. It occurs alongside every waterbody and around all of the Halifax islands. The occurrence of salt marsh, however, is limited in areas adjacent to residential development along the AICW. Based on the salinity regime, the wetlands of lower Tomoka River and Bulow Creek floodplains are characterized as brackish marshes, where saline tidewaters mix with freshwater runoff. The tidal marsh is comprised of interspersed areas of salt tolerant grasses-predominantly sand cordgrass, needle rush, and salt grass (*Distichlis spicata*). Succulent halophytes include perennial glasswort (*Sarcocornia ambigua*), annual glasswort (*Salicornia bigelovii*), and saltwort (*Batis maritima*). Brushy seaside oxeye (*Borrhchia frutescens*) grows in slightly elevated areas of the marshes and is characteristic of berms that border some areas along the Tomoka River.

The tidal regime of the floodplain marshes associated with the aquatic preserve are characterized by highly variable hydroperiod (the depth and duration of flooding) and poor surface drainage. Prior to ditching, surface water drained slowly to the river through meandering tidal creeks. Floodwaters are detained in potholes and shallow depressions throughout the marsh and the standing pools provide breeding sites for salt marsh mosquitoes, *Aedes sollicitans* and *A. taeniorhynchus*. A variety of vertebrates and other invertebrates also inhabit the tidal wetlands. The coffee-bean snail (*Melampus bidentatus*) is an abundant air-breathing gastropod that cannot tolerate prolonged submergence. Coffee-bean snails can be seen clustered on plant stems above water when the marsh is flooded. The Carolina marsh clam (*Polymesoda caroliniana*) is common in high salt marsh. Tidal marsh substrate is aerated by numerous crab holes. The red-jointed fiddler crab (*Uca minax*) feeds on marsh detritus; the purple marsh crab (*Sesarma reticulatum*) is omnivorous, preying on fiddlers and other crabs as well as digesting plant material, the blue crab (*Callinectes sapidus*) is also common. The rice rat (*Oryzomys palustris*) is an abundant small mammal that nests above water in marsh grasses. Colonies of the round-tailed muskrat (*Neofiber alleni*) build straw “muskrat houses” in clumps of sand cordgrass. Like muskrats, marsh rabbits (*Sylvilagus palustris*) are herbivorous, feeding on grasses and other marsh plants. A variety of snakes including the eastern diamondback rattlesnake (*Crotalus adamanteus*) that use the food resources of the marsh, but do not reside in estuarine wetlands. The river otter (*Lutra canadensis*) and American alligator (*Alligator mississippiensis*) also inhabit tidal creeks in the estuarine tidal marsh.

The tidal marshes at Bulow Creek are largely comprised of “high marsh” vegetation that consists of a mixed growth of salt grass and low succulent species, glasswort (*Sarcocornia ambigua*) and patches of saltwort. The lower reaches are dominated by brackish marsh with needle rush and sand cordgrass present as the two most common species. Farther upstream, Bulow Creek transitions to a blackwater stream. There are also wet depressions with needle rush and stands of saltmarsh cordgrass in the higher salinity marshes near the mouth of Bulow Creek. Some of the marsh tracts have been disturbed by physical alterations for mosquito control. The salt flats on the north side of Highbridge Road were ditched by draglines between 1958 and 1963 to drain potholes and shallow ponds, primary mosquito breeding habitat. The disturbed salt marshes at Bulow Creek State Park are assessed to be in poor-fair condition. The unaltered salt marshes are assessed to be in good condition (DEP, 2012b).






*An Eastern pygmy-blue butterfly feeds on minute flowers in the jointed stems of perennial glasswort.*

The management of salt marsh mosquitoes had a significant impact on the ecology and scenic quality of the tidal marshes. Impacts to wetlands related to alteration of the Tomoka marshes included changes to surface drainage, de-watering of the substrate and altered marsh topography and vegetation. Mosquito control was first implemented during the 1930s by Works Projects Administration crews. Ditches were created manually in the marshes of the Tomoka River. In the 1950s, draglines were used to excavate series of parallel cuts, or “grid ditches” in the floodplain of the lower Tomoka River and suction dredges were used to create deep channels in the marshes on the eastern side of Tomoka Point. Strickland Creek was dredged along the western side of the peninsula. In the 1960s, mosquito control agencies discontinued dragline ditching for “source reduction” and developed chemical larvicides, such as Altosid to control the development of larval mosquitoes in aquatic habitats. Since 1980, EVMCD has been using rotary ditching and larvicide treatments as primary source reduction techniques. In 1993, EVMCD first used rotary ditching at Tomoka State Park to open breaches in a low berm impounding a 22-acre tract of tidal marsh between Strickland Creek and the Tomoka River. The 22-acre marsh, like most of the tidal wetlands along the lower Tomoka River, was disturbed by hand ditching and draglines. Tomoka State Park completed a dragline ditch restoration project in December 2000. An amphibious excavator contracted by St. Johns River Water Management District was used to backfill ditches with dredged material that was deposited on the marsh surface (DEP, 2012b).

*Blackwater Stream* - (synonyms: blackwater river, blackwater creek). Characterized as perennial or intermittent/seasonal watercourse with tea-colored water and a high content of particulate and dissolved organic matter derived from drainage through swamps and marshes; generally lacking an alluvial floodplain.

The majority of the Tomoka River outside the aquatic preserve can be characterized as blackwater stream. Within the aquatic preserve, the aquatic preserve waters transition from freshwater to estuarine conditions. The physical parameters of waters immediately upstream and downstream of U.S. Highway 1 can have variable conditions depending on rainfall and tides. Upper Bulow Creek is characterized as blackwater stream while the lower reach of Bulow Creek is more estuarine. Several seepage streams, characterized as upper perennial or intermittent/seasonal watercourses with clear to lightly colored water derived from shallow groundwater seepage, drain to Bulow Creek from within Bulow Creek State Park.





Approximately two miles of the blackwater stream natural community occurs in Tomoka Marsh Aquatic Preserve along the northern reach of Bulow Creek. A change in the hydrology and vegetation of Bulow Creek is notable about two miles north of Bulow Plantation Ruins Historic State Park where the influence of discharge from Graham Swamp, and diminished tidal flow, results in a transition from a brackish stream to a freshwater stream. In this upper reach of Bulow Creek, the width of the channel narrows to less than 30 feet and the brackish marsh grasses of the lower floodplain, Sand cordgrass and needle rush are replaced by sawgrass, cattails (*Typha* spp.), and leather fern (*Acrostichum danaeifolium*) with cabbage palms and occasional bald cypress (*Taxodium distichum*). Taller trees, including bald cypress provide nesting sites for osprey (*Pandion haliaetus*).

The shallow bottom of the upper creek is visible in the tea-colored, but clear water that is characteristic of blackwater streams. Strands of southern naiad (*Najas guadalupensis*) and submerged logs can, at times, impede navigation of shallow watercraft approaching the northern boundary of the aquatic preserve in this reach of Bulow Creek. Notable flowering emergent plants along the edge of the meandering channel include the southern swamp-lily (*Crinum americanum*), pickerelweed (*Pontederia cordata*), and scarlet hibiscus (*Hibiscus coccineus*). Dominant floodplain trees include cabbage palm, bald cypress and numerous hardwoods including red maple (*Acer rubrum*) and sweetgum (*Liquidambar styraciflua*). This community is considered to be in good condition.

**Mollusk Reef** - (synonyms: oyster bar, oyster reef, oyster bed, oyster rock, oyster grounds, mussel reef, worm shell reef, Vermetid reef). Marine and estuarine mollusk reefs are faunal based natural communities typically characterized as expansive concentrations of sessile mollusks occurring in intertidal and subtidal zones to a depth of 40 feet (12.2 meters). In Florida, the most developed mollusk reefs are generally restricted to estuarine areas and are dominated by the eastern oyster. Numerous other sessile and benthic invertebrates live among, attached to, or within the collage of mollusk shells. Most common inhabitants include burrowing sponge, anemones, mussels, clams, oyster drill (*Urosalpinx cinerea*), lightning whelk (*Busycon perversum*), polychaetes, mud worms, oyster leech, barnacles, blue crab, mud crab, stone crab (*Menippe mercenaria*), pea crab (*Pinnotheres pisum*), amphipods, and sea stars. The crown conch (*Melongena corona*) is a common inhabitant throughout the aquatic preserve. Several fish also frequently occur near or feed among mollusk reefs, including cownose ray (*Rhinoptera bonasus*), menhaden (*Brevoortia tyrannus*), inshore lizardfish (*Synodus foetens*), gafftopsail catfish (*Bagre marinus*), pinfish, spotted seatrout (*Cynoscion nebulosus*), spot (*Leiostomus xanthurus*), black drum (*Pogonias cromis*), and mullet. Mollusk reefs that are exposed during low tides (e.g., oysters) are frequented by a multitude of shorebirds, wading birds, raccoons (*Procyon lotor*), and other vertebrates.

The most common kind of mollusk reef - oyster reefs - occur in water salinities from just above freshwater to just below full strength sea water, but develop most frequently in estuarine water with salinities between 15 and 30 parts per thousand. Their absence in marine water is largely attributed to the many predators, parasites, and diseases of oysters that occur in higher salinities. Prolonged exposure to low salinities (less than two parts per thousand) is also known to be responsible for massive mortality of oyster reefs. Significant increases or decreases in salinity levels through natural or unnatural alterations of freshwater inflow can be detrimental to oyster reef communities.

Mollusk reefs occupy a unique position among estuarine invertebrates and have been an important human food source since prehistoric times. The University of Central Florida and SJRWMD recently completed an oyster mapping and oyster condition assessment. Additional ground truthing at locations identified as oyster habitat may be required (R. Shelton, personal communication, August 2017). They present a dynamic community of estuarine ecology, forming refugia, nursery grounds, and feeding areas for a myriad of other estuarine organisms.

The major threats to mollusk reefs continue to be pollution and substrate degradation due, in large part, to upland development. Mollusks are filter feeders, filtering up to 100 gallons of water a day. In addition to filtering food, they also filter and accumulate toxins from polluted waters. Sources of these pollutants can be from considerably distant areas, but are often more damaging when nearby. Substrate degradation occurs when silts, sludge and dredge spoils cover and bury the mollusk reefs. Declines in oyster and other mollusk reef populations can be expected in coastal waters that are being dredged or are receiving chemicals mixed with rainwater flowing off the land, or from drainage of poorly or minimally treated residential or industrial sewage systems (FNAI, 2010).

Oyster bars are found at various locations throughout the aquatic preserve, but most commonly in the shallow waters of the Halifax River and lower Bulow Creek. Additional inspections of historically viable oyster habitat are required to determine current status of oyster beds in the aquatic preserve.





*Oyster bars at the mouth of Bulow Creek.*

Past dredging activities in the AICW appears to have disturbed oyster reefs in Smith Creek. A berm of loose oyster shells is located at the southern end of Smith Creek, along the western shoreline south of High Bridge Road. Archaeological surveys conducted at the site have not revealed any artifacts to suggest that the berm is an aboriginal shell midden (C. Dutoit, personal communication, May 11, 2016). The shells appear to have been transported from the shallow littoral edge along the AICW by boat wakes and storm waves.

*Algal Bed* - (synonyms: algal mats, periphyton mats). Marine and estuarine algal beds are floral based natural communities characterized as large populations of nondrift macro or micro algae. The dominant algal species are primarily *Enteromorpha* spp., occurring intermittently throughout the aquatic preserve. This community may occur in subtidal, intertidal, and supratidal zones on soft and hard bottom substrates. Vascular plants (e.g., seagrasses) may occur in algal beds associated with soft bottoms. Sessile animals associated with algal beds will vary based on bottom type. For algal beds associated with hard bottom substrate (lithophytic), faunal populations will be similar to populations associated with octocoral beds and sponge beds. Those associated with soft bottom substrate (psammophytic) may have similar benthic and pelagic species in addition to infauna species. Recent research has shown that algal beds provide critical habitat for juvenile spiny lobsters (*Panulirus argus*), a species of great commercial importance.

Marine and estuarine algal beds may grade into seagrass beds, salt marsh, mangrove swamp, or many of the other marine or estuarine natural communities. Algal beds appear to be ephemeral within Tomoka Marsh Aquatic Preserve. Distribution information is lacking, and research is needed to assess the condition of this natural community. Algal beds have been observed adjacent to the island located at the mouth of the Tomoka River and along the Halifax islands. A manatee was observed feeding on *Enteromorpha* spp. at the mouth of the Tomoka River and a little blue heron (*Egretta caerulea*) was observed feeding on an algal bed along the Halifax islands.

*Seagrass Bed* - (synonyms: seagrass meadows, grass beds, grass flats). Marine and estuarine seagrass beds are floral based natural communities typically characterized as expansive stands of vascular plants. This community occurs in subtidal (rarely intertidal) zones, in clear, coastal waters where wave energy is moderate. Seagrasses are not true grasses (Poaceae). The three most common species of seagrasses



in Florida are turtle grass (*Thalassia testudinum*), manatee grass (*Syringodium filiforme*), and shoal grass (*Halodule wrightii*). Widgeon grass (*Ruppia maritima*) occurs in areas of lower salinity. However, only shoal grass and widgeon grass have been observed in Tomoka Marsh Aquatic Preserve, and only in small populations.

One of the more important factors influencing seagrass communities is the amount of solar radiation reaching the leaf blades. In general, the water must be fairly clear because turbidity blocks essential light necessary for photosynthesis. The rapid growth rate of seagrass under optimum conditions rivals that of most intensive agricultural practices, without energy input from man (FNAI, 2010).

Seagrass beds are extremely vulnerable to human impacts. Many have been destroyed through dredging and filling activities or have been damaged by sewage outfalls and industrial wastes. In these instances, the seagrasses are either physically destroyed or succumb as a result of decreased solar radiation resulting from increased water turbidity (FNAI, 2010).



*Top: Crown conchs in a sea lettuce bed along the east bank of one of the Halifax islands. Bottom: Little blue heron feeding on an algal bed along the east bank of one of the Halifax islands.*

In 2005, shoal grass was observed in a cove along the northwestern reach of one of the Halifax islands. The species was not observed during repeated surveys in subsequent years. Widgeon grass was observed by the park biologist in Bulow Creek in 2012 (C. Dutoit, personal communication, December 4, 2015). Additional surveys are needed to determine the presence and extent of these grasses within the aquatic preserve. It is not known if seagrasses were ever an important feature in the aquatic preserve. If they were present, past dredging activities, persistent resuspension of unconsolidated particles, and other factors may have contributed to the decline of seagrass beds and may inhibit recolonization of seagrasses.

#### *Estuarine Unconsolidated Substrate*

– (synonyms: sand bottom, shell bottom, sand bar, mud flat, tidal flat, soft bottom). Unconsolidated sediments comprise a significant portion of the submerged shallow bottom waterways of Tomoka Marsh Aquatic Preserve. This substrate type occurs in the 376 acre Tomoka Basin, in the wide estuarine waters of the Halifax River west of the Halifax Islands, along the Halifax River and Smith Creek, along the lower reach of Bulow Creek, and adjacent to the channel in the Tomoka River. A bottom profile for a proposed Florida Power and Light utility corridor across the Tomoka Basin and Halifax River (Avirom & Associates, 2007) found that the bottom substrates were uniformly fine-grained muddy sediment. There were two small oyster reefs, but no vascular plant beds in the 34-acre survey

area aside from a small bed of shoal grass near the Halifax islands described above. No hard-bottom mineral substrate was identified in the survey transect.

The dredging of the AICW introduced sediments from sub-surface layers into the Halifax River lagoon. Fine-sand substrate on sand bars and along portions of the shoreline of the Halifax Islands are now important habitat for birds in the aquatic preserve. A variety of terns, including the least tern (*Sternula antillarum*),



gulls, and shorebirds use the sand bars for resting sites and for access to food resources. The seasonal appearance of white pelicans (*Pelecanus erythrorhynchos*) is notable to passing boaters as well as bird watchers during the winter months. The sandy shorelines along the western side of the Halifax islands are an important habitat-substrate type for nesting diamondback terrapin (*Malaclemys terrapin*).

The soft bottom substrate in Tomoka Marsh Aquatic Preserve is in good condition and provides habitat for benthic organisms. SJRWMD provided a summary of benthic macroinvertebrate data from selected fresh water and estuarine water bodies within SJRWMD. Two sites in Tomoka Marsh Aquatic Preserve were included in the sampling regime (SJRWMD, 2000). The report provides species lists for organisms identified at sampling stations located at the Tomoka River bridge on Old Dixie Highway and at Bulow Creek at Walter Boardman Lane (Low Bridge). A cluster analysis of the aggregate data for three parameters: organism density (number per meter<sup>2</sup>), total number of taxa, and the Shannon-Weaver Diversity Index, was used to group sites with similar attributes. The results of the analysis indicate significant habitat differences between the aquatic preserves estuarine system's shallow saltwater lagoons, the small tributary Bulow Creek and the large freshwater tributary, the Tomoka River. The macroinvertebrate data for the station at Bulow Creek was characterized as "average" in terms of the number of taxa and density of organisms (990 organisms/meter<sup>2</sup>). The Shannon-Weaver Index had a moderate value (2.30) between low diversity sites and high diversity sites. The data for the lower Tomoka River at the Old Dixie Highway were unique and the station was identified as a separate cluster from the other 147 sample sites in the District. The extremely high density of benthic macroinvertebrates (38,990 organisms/meter<sup>2</sup>) of this separate cluster was largely due to the abundance of a crustacean species, the tanaid, *Halmyrapseudes bahamensis*. The Shannon-Weaver Index was low (0.81) due to the single-species dominance and the report suggested that this could be attributed to several factors, including a large amount of particulate organic matter as a food resource, a seasonal growth pulse in *H. bahamensis*, and a broad tolerance to environmental variability conferring dominance over habitat sensitive species (SJRWMD, 2000).

Benthic macroinvertebrates are an important component of the estuarine food chain (FNAI, 2010) and this is evident in the Tomoka Marsh estuary system. When the bottom substrate is exposed during low tides, large groups of fiddler crabs descend from the saltmarsh to feed. The red-jointed fiddler is common in the muddy substrates of the aquatic preserve. The Atlantic sand fiddler (*Uca pugilator*), is adapted for sorting organic matter from the sandy substrates (Smithsonian Marine Station at Fort Pierce, 2016) and this species is found along the Halifax islands and Tomoka Point. Crabs and other crustaceans and mollusks provide forage for bottom-feeding finfish, including red drum (*Sciaenops ocellatus*), black drum, spot, sheepshead (*Archosargus probatocephalus*), and southern flounder (*Paralichthys lethostigma*), all of which were documented the 1990s fisheries survey.



Top: Red-jointed fiddler crabs feed on mud substrates along tidal creeks at low tide. Bottom: The clapper rail (*Rallus longirostris*) has long toes for walking on soft sediments to forage for fiddler crabs and other invertebrates.

## Native Species

The natural communities described within the previous section provide habitat for a wide range of animals including birds, mammals, reptiles, insects, fish, and shellfish. More than 175 bird species have been observed within the aquatic preserve during surveys conducted by aquatic preserve staff since 1990. Some of the birds observed utilizing the habitats found throughout the aquatic preserve include 16 species of wading birds, 27 species of warblers, 17 species of sandpipers, 14 species of gulls, terns and skimmers, 12 species of ducks and geese, seven species of rails and coots, and numerous other avian species.

Tomoka Marsh Aquatic Preserve is an important nursery area for fish, shrimp, and crab caught commercially and recreationally both in the aquatic preserve and in the Atlantic Ocean. More than 100 species of fish were identified within the aquatic preserve during a five year juvenile fisheries assessment conducted by FWC's Florida Marine Fisheries Institute (now FWRI) in partnership with aquatic preserve staff and volunteers. Species inhabiting the aquatic preserve include snook (*Centropomus undecimalis*), sheepshead (*Archosargus probatocephalus*), two species of snapper, 10 species of drum, seven species of flounder, five species of pompano, 10 species of gobies, striped (*Mugil cephalus*) and white mullet (*M. curema*), and several other popular sport fish. Four species of shrimp and three species of crab also inhabit the aquatic preserve, including the commercially important and recreationally popular blue crab (*Callinectes sapidus*).

For a complete list of the native species found in the aquatic preserve, see Appendix B.

## Listed Species

Listed species are those listed by the USFWS, Florida Fish and Wildlife Conservation Commission (FWC) or the Florida Department of Agriculture and Consumer Services as endangered, threatened or of special concern. All management actions addressed in this plan will be in compliance with the recovery plans for these species. Several plant and animal species inhabiting the Tomoka Marsh Aquatic Preserve have been listed as endangered or threatened (Appendix B).

### Florida Manatee:

One of the most recognizable of the listed species inhabiting Tomoka Marsh Aquatic Preserve is the Florida manatee. The Florida manatee is federally listed as threatened by USFWS. The Florida Manatee Sanctuary Act of 1989 designated the Tomoka River and tributaries Strickland Creek, Thompson Creek and Dodson Creek as protected habitat. In 2003, the USFWS established the Halifax and Tomoka Rivers Manatee Refuge (50 Code of Federal Regulations Part 17) under the Endangered Species Act of 1973.

The manatee is a large grey aquatic mammal that commonly reaches a body length of nine to ten feet and a weight of 1,000 pounds. Manatees can, however, grow to more than 13 feet and weigh up to 3,500 pounds (FWC, n.d.-c). Manatees inhabit waters of the aquatic preserve, especially the Tomoka River, during the spring and summer months. Manatees are present generally from late March through October, although Florida Park Service (FPS) biologists reported observations in December and February. DEP aerial monitoring surveys (December 1985 through January 1987, and March 1991 through July 1993) and shoreline surveys conducted by staff at Tomoka State Park documented manatees feeding, resting, and mating in the Tomoka River (DEP, 2012b). When conducting resource management activities on the water, aquatic preserve staff have observed manatees engaged in similar behaviors at various locations throughout the aquatic preserve.

Numerous neonatal and calf mortalities have been recorded from the Tomoka River area, leading to the area being recognized as a calving and nursing habitat. In the early 1980s in a tributary of the Tomoka River, the first birth of a free-ranging manatee was witnessed and documented. As recently as September 2015, a 3-week-old 66 pound orphaned manatee calf was rescued from a residential area on the Tomoka River. The calf was taken to SeaWorld for care and is expected to be released when it reaches 600 pounds. In early May 2016, an injured female manatee and her calf were rescued from the Tomoka River and taken to SeaWorld for care. The still-nursing calf weighted approximately 97 pounds and was 4 feet and 5 inches (Pulver, 2016). Female manatees seek out quiet areas as birthing places so it is critical that the Tomoka River and its tributaries remain as undisturbed as possible.

Other human-related manatee mortality is attributed to habitat destruction, entanglement in flood gates or canal locks, and deaths caused by from monofilament line, litter, vandalism, culverts, and other man-made structures. Manatee mortality attributed to natural causes include cold water temperature, red tide, disease and calving difficulties (Save the Manatee Club, 2015b).



The Manatee Sanctuary Act and the federal refuge rule authorize the regulation of watercraft use for protection of manatee, as boat collisions account for about 80 percent of human-caused mortality in manatee. Boat speed regulations and zones established for the Tomoka and Halifax rivers are depicted in Map 10.

In the Tomoka River, two idle speed zones existed prior to the sanctuary designation and were established primarily due to their locations at launch sites. One idle speed zone extends south from the “point” at Tomoka State Park to the mouth of Strickland Creek and another is located along the reach of the Tomoka River from the U.S. 1 bridge downstream to the extent of the Tomoka Estates residential area.

#### **Wood Stork:**

The wood stork (*Mycteria americana*), federally designated as threatened, is a large, long-legged wading bird that nests in mixed hardwood swamps, sloughs, mangroves and cypress domes/strands in Florida. A major threat to wood storks is the drainage of cypress strands which prevents wood storks from nesting and promotes predation from raccoons (FWC, n.d.-d). While nesting is not known to be prevalent in the aquatic preserve, wood storks have been documented feeding in Smith Creek, the Tomoka Basin, the Tomoka River and its tributaries, and in nearby drainage ditches. Wood storks have a specialized feeding technique called tactolocation or groping. They typically wade through six to 20 inch deep water with their beak immersed and partially open. The mandibles snap shut when prey, usually a small fish, is encountered. Successful feeding is dependent on heavy concentrations of small fish, which are typical of an isolated wetland with an intermittent hydrologic connection. Wood stork nesting is believed to be triggered by increased concentrations of small fish.



#### **Least Tern:**

State designated as threatened, least terns are often observed in the vicinity of the Halifax islands, either resting along the shoreline or flying about. Least terns nest in open island habitat which is present in some areas of the Halifax islands, but the terns have not been observed nesting on the islands. Raccoons and other predators may affect ground nesters on the islands.

#### **Piping Plover:**

Federally designated as threatened, the piping plover (*Charadrius melodus*) has a white belly, pale grayish upperparts, bright yellow-orange legs, and a small bi-colored bill. The diet of the piping plover primarily consists of insects, crustaceans, and marine worms. Piping plovers inhabit sandy beaches, sand flats, and mud flats along coastal areas. The main threat to piping plovers is habitat loss (FWC, n.d.-b). Piping plovers have been observed in the aquatic preserve during summer bird surveys.



*Top: A SeaWorld rescue boat with a capture net encircles an injured female manatee and her calf in Strickland Creek, June 7, 2005.*

*Bottom: A female manatee with her left flipper lacerated by entanglement in a crab pot line was transported with her calf to SeaWorld and rehabilitated, June 7, 2005.*



### Gopher Tortoise:

State designated as threatened, individual gopher tortoises (*Gopherus polyphemus*) have been observed on occasion on the Halifax islands. Several tortoise burrows are present, but the status of gopher tortoise populations on the islands is uncertain.

### Atlantic Salt Marsh Snake:

The presence of the federally-threatened Atlantic salt marsh snake (*Nerodia clarkia taeniata*) in the aquatic preserve has not been confirmed. FPS reported that surveys conducted at the Tomoka River and Bulow Creek did not confirm evidence of the salt marsh snake. The record for this species in the Tomoka Basin is based on specimens collected by E.D. Cope in 1895 (DEP, 2012b).

Other threatened species that are observed in the aquatic preserve include tricolored heron (*E. tricolor*), little blue heron, reddish egret (*Egretta rufescens*), and roseate spoonbill (*Platalea ajaia*).

### Invasive Non-native and/or Problem Species

Invasive non-native species are those wild or feral plants or animals that are not native to Florida, but were introduced as a result of human-related activities. They typically have fewer natural predators and may harbor diseases or parasites that significantly affect non-resistant native species. All invasive non-native species are a threat to the integrity of Tomoka Marsh Aquatic Preserve's natural communities and are in direct conflict with the aquatic preserve mission to encourage sustainable conservation of natural biodiversity.



Map 10 | Tomoka and Halifax rivers state and federal boat speed regulations in the Tomoka River Manatee Sanctuary and the Halifax and Tomoka Rivers Manatee Refuge.



Aquatic preserve staff cooperate with partners in the FWC Invasive Plant Management Section for the removal of invasive and problem species within the aquatic preserve. Aquatic preserve staff typically assist FWC staff with invasive plant surveys throughout the aquatic preserve. After the surveys are completed, FWC staff create a work plan for the removal of the invasives documented in the aquatic preserve and the species are treated by an FWC contractor. Most invasive species in the Upper Bulow Creek reach of the aquatic preserve are under maintenance condition with relatively low acreages (one to five acres) of invasive or nuisance species. The submerged species treated most often in Bulow Creek include common water-hyacinth (*Eichhornia crassipes*), hydrilla (*Hydrilla verticillata*), torpedo grass (*Panicum repens*), water-lettuce (*Pistia stratiotes*), wild taro (*Colocasia esculenta*), and Brazilian pepper.

Brazilian pepper is a significant problem in many areas throughout Florida and this species is present in varying acreages in and around the aquatic preserve, including state park units. FPS management plans address control and eradication of Brazilian pepper. Invasive removal efforts are carried out by FPS staff and volunteers.

Invasive species were treated in the early 1990s on the Halifax islands as mitigation for rotary ditching operations conducted to control larval mosquitos. A 2014 survey by aquatic preserve and FWC staff estimated approximately eleven acres of Brazilian pepper and four acres of Australian pine on the islands. Lantana are also present, but sparse. A small patch of life plant (*Kalanchoe pinnata*) is present on one island. Volunteers have removed a portion of it and although small, it is persistent. Aquatic preserve staff continue to investigate potential funding sources for invasive control on upland areas of the Halifax islands.

The brown anole (*Anolis sagrei*) is a small diurnal lizard native to several Caribbean islands (primarily Cuba and the Bahamas). The range of the brown anole has expanded northward throughout most of Florida and it now occurs as far north as South Carolina. The range expansion is attributed to both northward movement from original introductions in the Florida Keys and independent introductions throughout peninsular Florida (Warner, 2014). Rapid colonization by the brown anole is attributed to the species high reproductive rate and the broad physiological tolerances to environmental extremes exhibited by the eggs and embryos. Information gathered from studies of the brown anole on several of the Halifax islands indicate food sources for the lizards include terrestrial invertebrates such as roaches, spiders, and crickets that occupy the forested interior of the islands and marine-based invertebrates such as sea roaches and amphipods that are found in the sandy/grassy perimeter of the islands (Warner, Delaney, & Cates, 2014). Anecdotal and some experimental evidence suggests that reduced numbers of the native green anole may be attributed to the



*Wood storks and snowy egrets are frequently observed in the aquatic preserve.*

brown anole, especially in human-altered habitats. Adult male brown anoles are also known to prey upon smaller green anoles (FWC, n.d.-a).

Problem species are defined as native species that cause specific management problems or concerns. In 2013, five acres of cattail (*Typha* spp.) along Bulow Creek was treated to manage the expansion of this species into salt marsh habitats. While saltwater influx generally keeps the cattail population low, it can occasionally expand and compete with more beneficial salt marsh vegetation.

Raccoons are suspected of significant predation upon the nests of diamondback terrapins on the Halifax islands. Aquatic preserve staff, in partnership with the East Coast Diamondback Terrapin Group, are investigating methods and funding sources to control raccoon predation on the islands.

### Archaeological and Historical Resources

The Florida Division of Historical Resources (DHR) maintains an inventory of the cultural resources of the state in its Florida Master Site File (MSF) system. The historical background of Tomoka Marsh Aquatic Preserve provides a summary of human occupation along the waterways of the aquatic preserve for the past 7,000 years, up to the 20th century. It should be noted that archaeological sites and historical resources are protected (Chapter 267, Florida Statutes) and are not to be disturbed unless prior permission is granted from the Department of State's Division of Historical Resources. A complete list of the numerous cultural and historic sites associated with the history of the Tomoka Marsh Aquatic Preserve are included in Appendix B.5, but ten are summarized below. These sites were referenced from MSF Archaeological Site Forms and MSF sites identified in the Tomoka Basin State Parks Unit Management Plan (DEP, 2012b). The sites meet the following criteria:

- 1) Significant artifacts or other historical remains have been located in submerged substrates that are associated with adjacent upland sites listed in the MSF.
- 2) Historic landings, docks, or other sites that were the focus for commercial or recreational activity on the waterways in the aquatic preserve.
- 3) Historic bridges or river crossings that in addition to their transportation function, served as plantation settlements, roadside parks, and public recreation.
- 4) Homesteads on islands in the aquatic preserve.

Sites that meet these criteria include:

**Tomoka Stone (VO2571).** The Tomoka Stone site is located on the western shoreline of the Halifax River. The site contains a coquina midden which has been cemented by calcite, forming hardened shell deposits that are submerged at high tides. This coquina "stone" is distinct from coquina rock, a geological formation, by the presence of human cultural remains, including pottery sherds and vertebrate skeletal remains. The fiber-tempered pottery in the midden is characteristic of the Orange period, 2000 B.C. - 500 B.C. The most abundant vertebrate fauna identified at the Tomoka Stone site were juvenile fish, including croaker, pinfish, mullet, and catfish (Russo & Ste. Claire, 1992). These species provided a sustainable resource for millennia, and they remain abundant in the Halifax River estuary today.

**Nocoroco (VO0082).** Nocoroco was a large Timucuan village on Tomoka Basin that was described by the Spanish explorer Alvaro Mexia in 1605. The present archaeological site in Tomoka State Park was listed on the National Register in 1973 and is comprised of shell midden with pottery sherds and other artifacts dating from the St. Johns cultural period, 500 B.C. to 1565 A.D. In 1960, a dragline operator recovered a small wood carving submerged in mud which had preserved a unique cultural artifact of the Nocoroco people. The stylized figure, nine inches tall, appeared to be a woman carrying a child on her back (see below). The radiocarbon date of the Brazilwood carving was 1480 A.D., shortly before the discovery of the New World by Columbus in 1492 A.D. The Tomoka carving was described by DHR as "one of the few wooden effigies that survive in Florida from the prehistoric era" (DEP, 2012b).

**Mt. Oswald Plantation Settlement (VO4310).** In 1764, Richard Oswald, a Scotsman, received a 20,000 acre grant in east Florida from the British Crown. The first settlement was named Mt. Oswald and was situated on Tomoka point, at the abandoned village site of Nocoroco. Oswald hired an overseer and purchased slaves to clear 300 acres for the cultivation of indigo, cotton, and corn. The Mt. Oswald settlement was profitable from the lucrative trade in indigo dye, but was abandoned in 1782 during the revolution of the 13 British colonies to the north. In 1783, when the Treaty of Paris was drafted, Richard Oswald served as the British delegate along with the American delegates Benjamin Franklin and John Jay. Richard Oswald died the following year at the age of 80. Archaeological investigations at the Mt. Oswald site have identified domestic artifacts, such as delFTWARE ceramics, that are characteristic of the British period (1763-1783). The most significant discovery, however, resulted from shoreline erosion in the last decade which has exposed ancient human skeletal remains at the Mt. Oswald/Nocoroco



site. The results of forensic analysis indicated that the remains were several hundred years old and represented individuals of African ancestry (Dupras & Schultz, 2010). DHR determined that these findings were evidence of a historic cemetery that was likely associated with a slave community. Tomoka State Park management, in cooperation with Tomoka Marsh Aquatic Preserve, has implemented preservation measures to reduce shoreline erosion at the site.

**Oswald's Ferry Settlement (VO7127).** The Ferry Settlement, located at the Tomoka River crossing of the King's Road, has been known to historians since the publication of "Loyalists in East Florida, 1774 to 1785" by W. H. Siebert (1929). Siebert's collection of records on Richard Oswald's 20,000-acre land grant include personal testimonials about the Ferry Settlement, which describe an overseer's house, slave quarters, rice fields, and a ferry house. The King's Road was located between what is now U.S. 1 and the upstream Florida East Coast railroad bridge. A linear remnant of the King's Road causeway is barely visible in the marsh today. The settlement site was not added to the state MSF until 1998 when archaeologists identified British period artifacts which were submitted to DHR as physical evidence of Oswald's Ferry Settlement.

**Lee Landing (VO2588).** Located on the shoreline of a colonial land grant on Tomoka Basin, Lee Landing was occupied by a succession of planters that included John Moultrie from 1767 to 1783, John Bunch from 1804 to 1825, and the Thomas Dummett family from 1825 to 1829. The predominantly underwater site is comprised of a layer of bricks laying on the muddy bottom at an indentation in the shoreline. Lee Landing was submitted to the MSF in 1989 as a historic boat landing under the assumption that the bricks were placed to stabilize the soft substrate at the landing. An alternative interpretation was proposed by archaeologist T. Payne (1999) who found evidence of an old brick kiln in the vicinity of the site. Payne observed that the shoreline was actively eroding from exposure to storm surge waves and reasoned that the landward edge of the historic shoreline extended farther out into the basin. Payne surmised that the submerged brick pile resulted when kiln bricks stacked near the shoreline dropped into the water as the bank eroded.

**Bulow Plantation (FL0007).** This American Territorial period plantation site (1821-1836) was listed on the National Register in 1970. Bulow Plantation Ruins Historic State Park preserves 150 acres of the plantation including the ruins of the sugar mill works, the Bulow mansion, and slave quarters. There are



*Carved wood figure found in the Tomoka Basin – front and back views. Photo by C. DuToit.*



three boat slips and coquina remains of the Bulow Creek bridge abutment near the park's boat ramp. A bridge over Bulow Creek was mentioned in the memoirs of Lt. W.W. Smith (1836). In his memoir, Smith wrote that at the start of the Seminole War in 1836, a soldier with the Florida militia was posted as a lookout on the Bulow Creek bridge. He further described tall rows of sugarcane located to the west of the bridge that bordered the plantation entrance road from "The Kings Road" (now Old Kings Road) to the Bulow Creek bridge. Smith further wrote that to the east of the bridge [across the causeway in the marsh], cotton fields covered the sand ridge that separated Bulow Creek from "Haulover Creek." Haulover Creek was later renamed "Smith Creek." Haulover Creek was identified in an 1850 survey of the Bulow land grant prepared by A.M. Randolph. Remnants of the old causeway tracks are still visible in the marsh today.

**Mound Grove (VO0245).** The Mound Grove site is situated at the tip of the peninsula between Smith Creek and Bulow Creek. Mound Grove has a large aboriginal shell midden component that dates

back to the St. Johns II cultural period (500 B.C.-1565 A.D.) and also includes an American 19th century historic site. L.B. Knox and G.F. Beed established a citrus plantation on the site in 1879. Their *Mound Grove* brand fruit was carried by the steamship "Belle of Bulow" and other boats from the packing house to another landing in Ormond known as the "orange dock" where it was shipped by railroad to northern markets (McLachlin, 1976). The packing house was painted yellow and (see below) was an area landmark that remained in operation until 1967. The packing house was destroyed by fire in 1971 (Grabe, 1971).

**Tomoka River Bridge at U.S. 1 (1932-2000) (VO7101).** The U.S. 1 bridge, which is the southern boundary of the Tomoka River reach of Tomoka Marsh Aquatic Preserve, was added to the MSF in 1998, prior to its reconstruction in 2000. The original bridge was built in 1932 for what was then a new roadway through Ormond Beach. The road was an extension of the federal coastal highway system and was designated as SR 5 and U.S. 1. Built to what was then the standard specifications of the State Road Department, the 1932 bridge was 297 feet in length and had nine spans each 33 feet apart, and slotted concrete railings bordering the travel lanes (see below). Due to its similarity to other 1930s-era bridges, some of which still remain in use, the U.S. 1 bridge was not considered for listing on the National Register of Historic Places. U.S. 1 was the gateway for automobile tourism in the greater Daytona Beach area from the 1930s to the 1960s before Interstate 95 was constructed through Volusia County.



*Top: Oil painting of the Mound Grove packing house by M.S. Thornburn, painted around 1980 from a photograph. Photo of painting by C. DuToit, courtesy of the Butts family. Bottom: View from Cobb's Corner looking north to the former site of the Mound Grove packing house, 2005. Photo by C. DuToit.*

**Tomoka River Bridge at Old Dixie Highway (1964-2011) (VO9392).** This bridge was the first of the concrete and steel bridges built to cross the Tomoka River at Old Dixie Highway. The original wood bridge and the first bridge to cross the Tomoka River, was built with the construction of Old Dixie Highway in 1918 and refurbished in 1938 with new wood pilings and wood deck. In 1918, Ernest



Mills, a Canadian, acquired five acres on the northeast side of the bridge. Shortly after the land was acquired, Mills opened Sunset Park, one of the early roadside parks for motorists traveling along the east coast of Florida. In 1950, the Mills parcel was acquired by the Florida Park Service as a core addition to Tomoka State Park. In 1964, the old wooden bridge was replaced with a bridge that incorporated steel girders and a center span that could be removed for vessels requiring more than 14 feet of clearance above low water. In 2011, after nearly 50 years of service, the 1964 bridge had significant deterioration from salt water damage and it was reconstructed. Due to its age, the bridge is now eligible for MSF listing as an Historic Bridge. The Tomoka River bridge, part of the Ormond Scenic Trail, continues to be heavily used for fishing and crabbing, and provides an outstanding overlook of the river for cyclists and motorists traveling in the Tomoka area.

**Keeney House Site (VO9230).** The Keeney House site contains the remains of a homestead which dates to the mid-20th century. The large frame house was built on a small island on the Tomoka River just south of the Old Dixie Highway bridge. A 1945 family photograph of the Keeney homestead depicts a wooden bridge that provided access from the Old Dixie Highway and a dock along the riverfront where the family boat was moored. The date and cause of the destruction of the house is not presently known, only that it occurred sometime after it was photographed in July 1945. Today, the remains of the foundation and the coquina rock fireplace are secluded in a growth of red cedar trees on the Tomoka River island.

#### **Other Associated Resources**

The 34-mile Ormond Scenic Loop and Trail was designated in 2007 as part of the Florida Scenic Highway program (Ormond Scenic Loop & Trail, n.d.). Enjoyed by motorists and cyclists, the trail provides numerous views of the aquatic preserve. The trail crosses the aquatic preserve at the Tomoka River just northwest of the entrance to Tomoka State Park, again on Highbridge Road on the Halifax River, and parallels the aquatic preserve along the entire length of John Anderson Drive.

Tomoka Marsh Aquatic Preserve provides extraordinary views of open water combined with active birdlife along the Halifax River. The scenic views of the Tomoka River include extensive salt marsh habitat and associated wildlife that has delighted residents and visitors for more than a hundred years. The aquatic preserve's scenic attributes, easily accessed in numerous local parks, offer needed respite from nearby urban areas.

Observation areas along the Great Florida Birding trail associated with the aquatic preserve can be found at Bulow Creek State Park, Tomoka State Park, and NPSP. Visitors are likely to observe gulls and terns, ducks and the common loon (*Gavia immer*), bald eagle (*Haliaeetus leucocephalus*), swallow-tailed kite (*Elanoides forficatus*), numerous shorebirds, and many other species depending on time of year. For more information, see the Tomoka Marsh Aquatic Preserve species list in Appendix B.3 and visit [floridabirdingtrail.com](http://floridabirdingtrail.com).



*Top: The Tomoka River bridge, 1956, from the south approach of U.S. 1. Photo from Florida Memory website in the Florida Archives. Bottom: The Tomoka River bridge on the Old Dixie Highway, April 16, 2009. Photo by C. DuToit.*



### 3.4 / Values

The Tomoka River, Halifax River, Bulow Creek, and Tomoka Basin are resources of historic, environmental, and economic significance. These waterways and associated habitats are of irreplaceable value to the quality of life and well-being of the people of the State of Florida. In addition to the aquatic preserve designation, all waters within the aquatic preserve are designated Outstanding Florida Waters. The Tomoka River is a designated State Canoe Trail. Portions of the Halifax River, Smith Creek, Bulow Creek, and the Tomoka River are federally designated as a Manatee Refuge. In 1989, Chapter 370, F.S. was amended to include the Tomoka River and its tributaries Strickland Creek, Thompson Creek, and Dodson Creek under the Manatee Sanctuary Act. Manatee Protection Zones with motorboat speed regulations intended to provide protection to the endangered Florida manatee are in place within the Tomoka River Manatee Sanctuary.



Top: The Keeney house on the Tomoka River, July 1945. Photo courtesy of Tomoka State Park, provided to the park by the Keeney family.  
Bottom: The chimney remains of the Keeney house, 2006. Photo by C. DuToit.

#### Natural Value

The combination of diverse vegetation and variety of habitats present in this region provide ideal conditions for high biodiversity and species richness. There are a number of special interest marine animal species that in some way rely on the waters within the aquatic preserve. The aquatic preserve includes a federally designated Manatee Refuge. The aquatic preserve and surrounding waters are considered a summer sanctuary or warm water refuge for the Florida manatee. In addition to marine species, the area provides habitat and critical food sources for a wide variety of threatened species including the wood stork, least tern, reddish egret, roseate spoonbill, among other wading birds and rare species. Extensive salt marsh associated with the aquatic preserve provides habitat for the threatened Atlantic salt marsh snake. The abundant trees, marshes, wildlife, and the aquatic realm provide interesting and ever-changing scenic vistas throughout the aquatic preserve for all to enjoy.

#### Economic Value

Tomoka Marsh Aquatic Preserve is of economic importance to Florida both commercially and recreationally. The aquatic preserve provides a substantial and direct contribution to the economy with jobs, sales tax, and other revenue generated by a variety of outdoor recreation activities. Recreationally this area draws tourists to the waters for fishing, motor boating, canoeing, and kayaking. Popular sport fish include sea trout (*Cynoscion* spp.), redfish (*Sciaenops ocellatus*), and flounder (*Paralichthys*

*lethostigma*). The Tomoka and Halifax rivers support an important commercial crab fishery. The shellfish industry of this region includes the harvest of blue crab and shrimp (*Farfantepenaeus* spp.). The serene vistas surrounding the aquatic preserve and adjacent marshes entice visitors to explore the many opportunities for wildlife viewing, nature study, environmental education, and photography – activities which support the economy in many ways.



## Scientific Value

Tomoka Marsh Aquatic Preserve has a diverse assemblage of natural and cultural resources. This has drawn numerous scientific endeavors to be conducted throughout the aquatic preserve, both by aquatic preserve staff, other local and state agency staff, a number of universities, as well as private entities. Studies and surveys include two multi-year juvenile fisheries assessments, wading bird and shorebird surveys, brown anole studies on the Halifax islands, diamondback terrapin surveys, botanical surveys, shoreline surveys, Atlantic salt marsh snake surveys, long-term water quality assessments, sediment analysis, and saltmarsh and shoreline restoration. The aquatic preserve encourages outside investigations because they result in benefits to the aquatic preserve such as high quality research, a broad range of expertise, interdisciplinary approaches, broader participation and a wide range of funding sources that may otherwise be unavailable through FCO. Information gained from scientific endeavors within the aquatic preserve and throughout the watershed provides valuable data that can be used to make more informed resource management decisions and is often incorporated in or used to support the aquatic preserve's Ecosystem Science, Education and Outreach, and Resource Management programs.

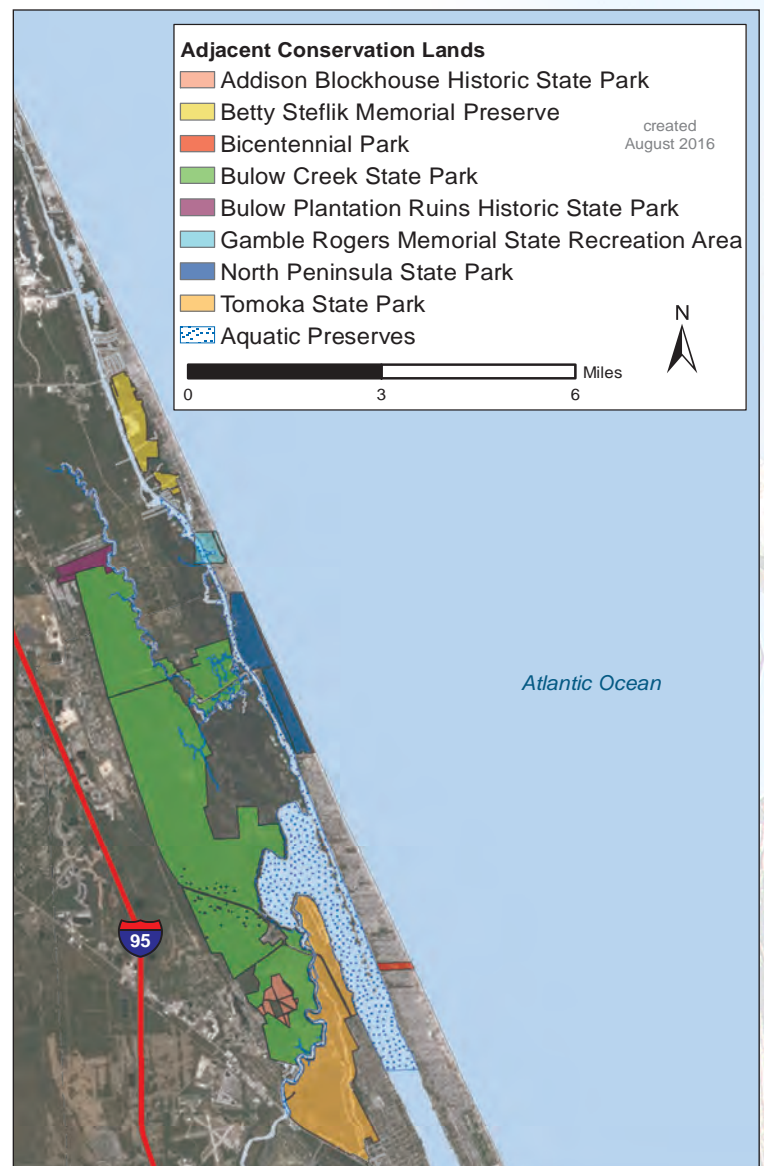
## Social and Cultural Value

The aquatic preserve and surrounding area contain multiple significant prehistoric and historic cultural resources that date back to Paleo-Indian times through European contact. Shell mounds and middens along the Tomoka River associated with the village of Nocoroco contain evidence of native occupation dating back 7,000 years. The aquatic preserve served as a travel corridor and provided important life sustaining resources for thousands of years and it continues to serve modern populations with abundant fisheries, opportunities for boating, canoeing, kayaking, wildlife observation, photography, nature study, and other nature based activities.

The unique characteristics of the Tomoka Marsh Aquatic Preserve contribute to a sense of place that defines this east central Florida region. For more than forty years, active citizen groups and individuals have supported the acquisition of 8,259 acres of public lands adjacent to the aquatic preserve for the protection of water quality within the aquatic preserve and to maintain the diverse ecosystems that surround the aquatic preserve.

### 3.5 / Citizen Support Organization

The Aquatic Preserve Alliance of Central Florida, Inc. (the Alliance) serves as the Citizen Support Organization for the Wekiva River and Tomoka Marsh aquatic preserves. The Alliance was established in 2014 by educators, scientists, and friends of Florida's natural environment with a stated mission to promote and support charitable, educational and scientific activities that directly and indirectly benefit the Wekiva River and Tomoka Marsh aquatic preserves' ecosystems. The Alliance is dedicated to raising awareness and educating the public about the Wekiva River and Tomoka Marsh aquatic preserves' ecosystems. The Alliance is registered as a Florida not-for profit corporation and serves as a means to accept donations of funds or



Map 11 | State and local managed areas bordering the Tomoka Marsh Aquatic Preserve.

equipment from individuals, corporations, or community organizations desiring to contribute to the restoration or management of the aquatic preserves.

The Alliance's short-term goals include filing for nonprofit 501(c)(3) status, growing its membership, supporting aquatic preserve volunteers' resource management, education and outreach activities, and fundraising to support aquatic preserve activities. Long-term goals include assisting the Wekiva River and Tomoka Marsh aquatic preserves in achieving management plan goals, in particular, establishing a Central Florida Freshwater Research Station with an education component at a direct river access location to better serve the needs of basin researchers and the public and promote a sense of place for central Florida aquatic preserve programs.



*Top: Residents and visitors can enjoy the aquatic preserve at Volusia County's public fishing pier at Bicentennial Park on the Halifax River.  
Bottom: An aquatic preserve information panel is located at the access walkway to the public pier at Bicentennial Park on the Halifax River.*

### **3.6 / Adjacent Public Lands and Designated Resources**

Approximately 8,260 acres adjacent to the aquatic preserve are managed by state and local agencies.

Tomoka State Park, Bulow Creek State Park, Bulow Plantation Ruins Historic State Park, and Addison Blockhouse Historic State Park are managed by the Florida Park Service as one unit referred to as Tomoka Basin Parks, and comprising 7,340 acres (Map 11). Tomoka State Park borders the Tomoka River and the southwestern reach of the aquatic preserve along the Halifax River. Bulow Plantation Ruins Historic State Park and Bulow Creek State Park border portions of the upper and lower reaches of Bulow Creek, respectively. The Addison Blockhouse Historic State Park is located within marshlands of the Tomoka River and can be accessed from the Tomoka River reach of the aquatic preserve via a hiking trail that traverses through the marsh (DEP, 2012b).

Other lands managed by the Florida Park Service include the 522-acre NPSP that borders a portion of the east and west banks of the Smith Creek/Halifax River reach of the aquatic preserve just north of Highbridge Park (county park) (DEP, 2006b) and 134-acre Gamble Rogers Memorial State Recreation Area at Flagler Beach (Gamble Rogers) that borders a portion of the northern reach of the aquatic preserve along Smith Creek (Halifax River) in Flagler County (DEP, 2006a). NPSP and Gamble Rogers stretch from the Atlantic Ocean to Smith Creek and provide a variety of

recreational activities including scenic views of the aquatic preserve (DEP, 2006a; 2006b).

Tomoka State Park, Bulow Creek State Park, and Gamble Rogers have motor boat and canoe/kayak launches that provide access to the aquatic preserve.

Michael Crotty Bicentennial Park is a 40-acre park managed by Volusia County. Located on the barrier island, the park stretches from the Atlantic Ocean to the Halifax River. The western section of Michael Crotty Bicentennial Park borders a small reach of the Halifax River in the vicinity of the Halifax islands. The park has a large public fishing pier that provides scenic vistas of the aquatic preserve. An aquatic preserve



information panel marks the entrance to the public fishing pier at Michael Crotty Bicentennial Park. A canoe/kayak launch provides access to the aquatic preserve and the Halifax islands (Volusia County, n.d.).

Highbridge Park is a six-acre park managed by Volusia County that provides a public boat launch, picnic area, fishing dock and restrooms. The park is located on the southeast corner of Highbridge Road on the Halifax River in the northern reach of the aquatic preserve. Highbridge Park also borders NPSP (Volusia County, n.d.).

Betty Steflik Memorial Preserve is a 217-acre park managed by Flagler County which is just north of the northernmost reach of the aquatic preserve on Smith Creek. The preserve provides a public boat launch, fishing dock, picnic area, nature trails with a boardwalk, and restrooms (Flagler County, n.d.).

All the parks mentioned above provide a buffer to the aquatic preserve as well as areas where the beauty of the aquatic preserve can be observed and appreciated. In addition to boating, fishing, canoeing and kayaking, other popular activities adjacent to the aquatic preserve include picnicking, bird watching, photography, nature study and general enjoyment of the scenic river panoramas.

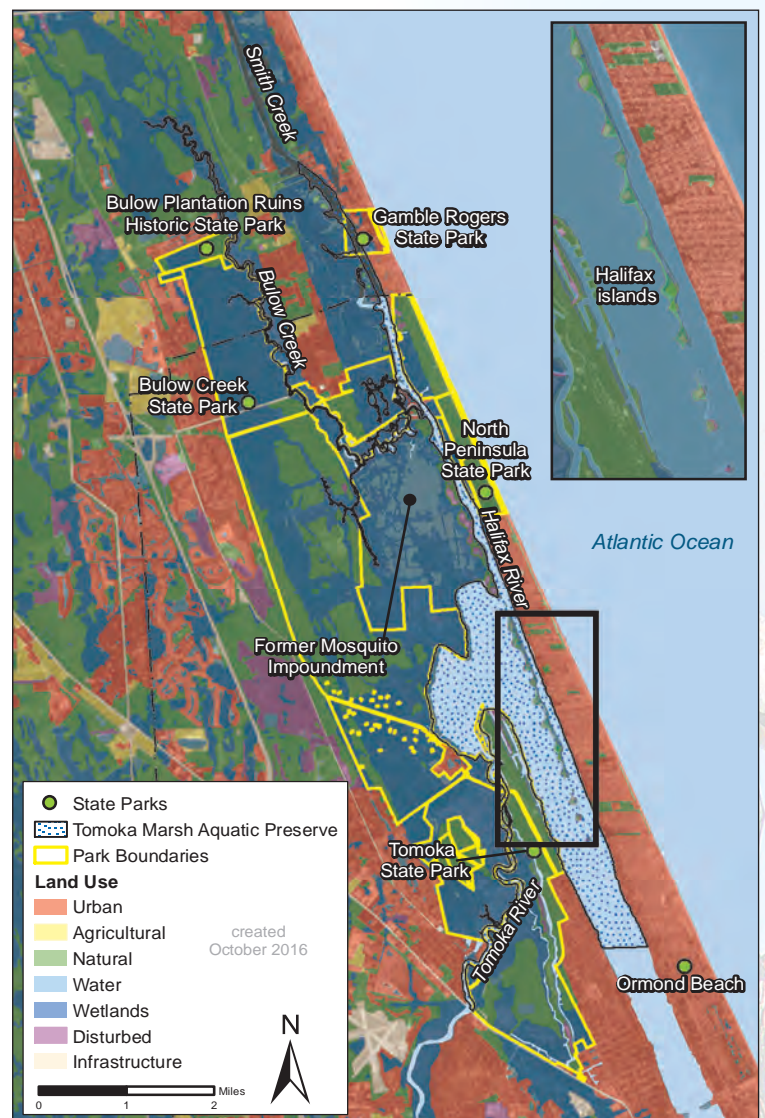
### 3.7 / Surrounding Land Use

Water quality, water quantity, and habitats within the aquatic preserve are directly affected by land use in the respective watersheds. Human activities over the past 100 years have shaped the aquatic preserve of today. Some areas of the aquatic preserve have been affected by loss of shoreline habitat, erosion, wastewater discharges, stormwater, and a myriad of other anthropogenic events.

The majority of developed areas adjacent to the aquatic preserve are located on the barrier island along the east bank of the Halifax River (called Smith Creek in Flagler County) from the southern reach of the aquatic preserve in Ormond Beach north into Flagler County. Two large parks, NPSP and Gamble Rogers, separate some of the development on the barrier island. Many multi-family residential units border Smith Creek in Flagler County. The western bank of the Halifax River / Smith Creek, across from the barrier island, is relatively undeveloped and includes extensive marshlands associated with public land, and the former 1,000-acre mosquito impoundment near NPSP. Further south, the Halifax River surrounds 75 acres of undeveloped islands (which are part of the aquatic preserve) and borders the forested eastern boundary of Tomoka State Park. The farthest southwestern reach of the aquatic preserve along the Halifax River borders residential units located south of Tomoka State Park. The majority of lands along Bulow Creek are undeveloped as part of Bulow Creek State Park and Bulow Plantation Ruins Historic State Park. The majority of lands adjacent to the Tomoka River are included as part of Tomoka State Park.

Impacts to the aquatic preserve from surrounding land use on the barrier island include stormwater runoff and septic tank leachate. Impacts from inland development that affect the waters of the aquatic preserve include stormwater runoff and wastewater discharges. Faunal impacts include avian and terrapin mortality caused by vehicles traveling near the aquatic preserve. However, steps have been taken over the years to restore and further protect the resources of the aquatic preserve.

Land use adjacent to the aquatic preserve is depicted in Map 12.



Map 12 / Land use near Tomoka Marsh Aquatic Preserve.







*Great blue heron on the Tomoka River.*

*Part Two*

## Management Programs and Issues

*Chapter Four*

### The Florida Coastal Office's Management Programs and Issues

The work performed by the Florida Coastal Office is divided into components called management programs. In this management plan all site operational activities are explained within the following four management programs: Ecosystem Science, Resource Management, Education and Outreach, and Public Use.

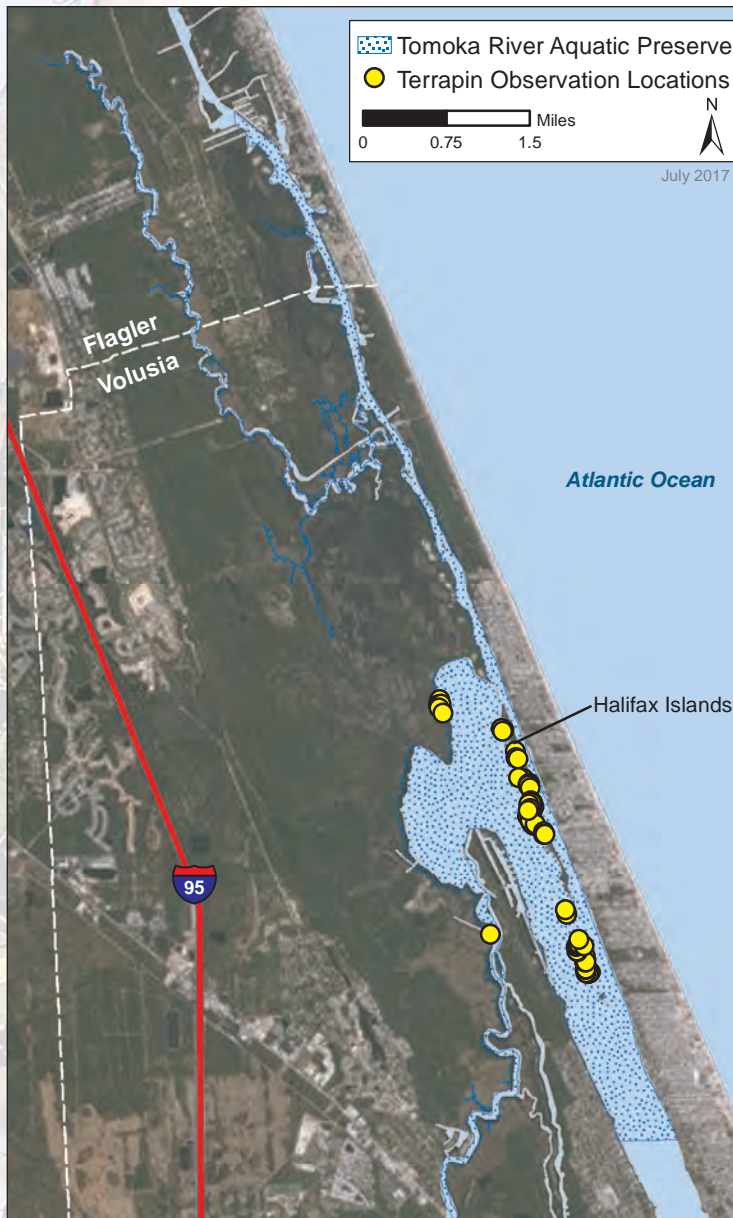
The hallmark of Florida's Aquatic Preserve Program is that each site's natural resource management efforts are in direct response to, and designed for unique local and regional issues. When issues are addressed by an aquatic preserve it allows for an integrated approach by the staff using principles of the Ecosystem Science, Resource Management, Education and Outreach, and Public Use Programs. This complete treatment of issues provides a mechanism through which the goals, objectives and strategies associated with an issue have a greater chance of being met. For instance, an aquatic preserve may address declines in water clarity by monitoring levels of turbidity and chlorophyll (Ecosystem Science - research), planting eroded shorelines with marsh vegetation (Resource Management - habitat restoration), creating a display or program on preventing water quality degradation (Education and Outreach), and offering training to municipal officials on retrofitting stormwater facilities to increase levels of treatment (Education and Outreach).

Issue-based management is a means through which any number of partners may become involved with an aquatic preserve in addressing an issue. Because most aquatic preserves typically have limited staff, partnering is a necessity, and by bringing issues into a broad public consciousness partners who wish to be involved are able to do so. Involving partners in issue-based management ensures that a particular issue receives attention from angles that the aquatic preserve may not normally address.

This section will explore issues that impact the management of Tomoka Marsh Aquatic Preserve directly, or are of significant local or regional importance that the aquatic preserve's participation in them may prove beneficial. While an issue may be the same from preserve to preserve, the goals, objectives, and

strategies employed to address the issue will likely vary depending on the ecological and socioeconomic conditions present within and around a particular aquatic preserve's boundary. In this management plan, Tomoka Marsh Aquatic Preserve will characterize each of its issues and delineate the unique goals, objectives, and strategies that will set the framework for meeting the challenges presented by the issues.

Each issue will have associated goals, objectives, and strategies. Goals are broad statements of what the organization plans to do and/or enable in the future. They should address identified needs and advance the mission of the organization. Objectives are a specific statement of expected results that contribute to the associated goal, and strategies are the general means by which the associated objectives will be met. Appendix D contains a summary table of all the goals, objectives and strategies associated with each issue.



Map 13 | Locations of diamondback terrapins observed in the aquatic preserve in 2014.

#### 4.1 / The Ecosystem Science Management Program

The Ecosystem Science Management Program supports science-based management by providing resource mapping, modeling, monitoring, research, and scientific oversight. The primary focus of this program is to support an integrated approach (research, education, and stewardship) for adaptive management of each site's unique natural and cultural resources. FCO ensures that, when applicable, consistent techniques are used across sites to strengthen the state of Florida's ability to assess the relative condition of coastal resources. This enables decision-makers to more effectively prioritize restoration and resource protection goals. In addition, by using the scientific method to create baseline conditions of aquatic habitats, the Ecosystem Science Management Program allows for objective analyses of the changes occurring in the state's natural and cultural resources.

Scientific research in Tomoka Marsh Aquatic Preserve has been conducted by a variety of sources. Through the collective efforts of federal, state, and local agencies, institutions, non-profit organizations, and individuals many topics have been researched and investigated through a range of time periods. Entities include the United States Geological Survey (USGS), Florida Department of Environmental Protection (DEP), Florida Fish and Wildlife Conservation Commission (FWC), St. Johns River Water Management District (SJRWMD), Bethune Cookman University, Auburn University, and Volusia County.

##### 4.1.1 / Background of Ecosystem Science at Tomoka Marsh Aquatic Preserve

The Tomoka Marsh Aquatic Preserve was designated as an aquatic preserve in 1969 for the purpose of maintaining the biological resources of the estuarine system. Management strategies were approved in 1992 with the adoption of the management plan (Florida Department of Natural Resources, 1992). A large portion of historical ecosystem science activities that occurred within the aquatic preserve were conducted by staff and various other state and federal agencies. The following section outlines some of the historical mapping, modeling, monitoring, and research that has been completed within Tomoka Marsh Aquatic Preserve.



## Mapping and Modeling

To effectively manage resources within Tomoka Marsh Aquatic Preserve, consistent mapping and modeling of vital resources must be conducted. This allows for the identification of impacted areas within the aquatic preserve where increased research, monitoring, and management focus is necessary. Some significant mapping projects in the Tomoka Marsh Aquatic Preserve include:

- Surveys of manatee habitat in Volusia County (Tomoka River) were flown twice a month from December 1985 to January 1987. Aerial distribution surveys were used by marine mammal biologists from FWC and other agencies to determine the seasonal distribution of manatees.
- In 1987, the Florida Department of Natural Resources (now DEP) Marine Resource Laboratory, in conjunction with a Fishery Habitat Loss Study, analyzed LANDSAT imagery, aerial photography, and performed ground truthing to compile a Resource Protection Area Map. The map identified and classified resources within the aquatic preserve that required protection by the management program (Florida Department of Natural Resources, 1992).
- Quarterly or bi-annual invasive, non-native submerged and emergent vegetative mapping in Bulow Creek and removal efforts have been underway from 1990 through the present, through a partnership between the aquatic preserve and FWC Invasive Plant Management Section (IPMS).
- In 2012, DEP Central District prepared geographic information system-based aerial maps depicting all docks located in Tomoka Marsh Aquatic Preserve as part of a statewide assessment of all docks present in northeast Florida aquatic preserves. Aquatic preserve staff conducted ground truthing for approximately 80 percent of the mapped sites.
- In 2012, onsite sewage treatment and disposal systems on the barrier island and in the Tomoka River Watershed were mapped as part of the Halifax River nutrient Total Maximum Daily Load (TMDL) report assessment.
- In 2014, as part of the Northern Coastal Basin Initiative, SJRWMD staff initiated oyster habitat mapping in areas around the aquatic preserve. This project is ongoing.
- In 2014, the East Coast Diamondback Terrapin Group, a partnership with the Florida Park Service (FPS), Tomoka Marsh Aquatic Preserve, and volunteers logged sightings and mapped locations of individual diamondback terrapins on the Halifax islands, and on lands surrounding the Tomoka Basin and the state parks (Map 13).

## Monitoring and Research

Aquatic preserve staff and a variety of contributors have aided in the compilation of historical data associated with the waterbodies included in Tomoka Marsh Aquatic Preserve. Both monitoring and research efforts provide pertinent information related to the aquatic preserve, as well as support for appropriate management requirements within Tomoka Marsh Aquatic Preserve. Some significant efforts included:



*Top: Bird Spit, the northernmost of the Halifax islands, provides a resting place for numerous birds and is located where the Tomoka Basin meets the Halifax River. Bottom: Red drum captured in a seine net during the 2003 fisheries survey.*



- Since 1997, SJRWMD has conducted bi-monthly sampling for a variety of physical and chemical parameters at Bulow Creek, and the Tomoka and Halifax rivers. Data is available online (SJRWMD, 2016).



- From 1993 – 1996, the aquatic preserve partnered with Florida Marine Resource Institute (now Fish and Wildlife Research Institute) by providing staff and volunteers to conduct a juvenile fisheries assessment of the Tomoka and Halifax rivers. Samples were collected at fixed stations two days per month to provide baseline information on the status of fisheries in the aquatic preserve.

- From 1994 – 1996, aquatic preserve staff conducted monthly bird surveys in all reaches of the aquatic preserve. A check list brochure was produced in partnership with FPS and Volusia Audubon. The checklist is updated periodically.

- In 2003, the NCB Surface Water Improvement and Management (SWIM) Plan prepared by SJRWMD included the Halifax River Basin. The plan focused on five primary initiatives: water quality, watershed master planning, stormwater retrofit and master plan implementation, compliance and rules enforcement, and resource assessment, protection, and restoration (Haydt & Frazel, Inc., 2003).

- From 2001 – 2006, USGS built on a previous fisheries survey and conducted an additional fisheries survey throughout the Northern Coastal Basin. Samples were collected monthly to establish baseline fish occurrence and seasonal variation. Station locations were determined by stratified random sampling methods and included areas within Tomoka Marsh Aquatic Preserve. Aquatic preserve staff participated in the survey.
- In 2012, studies on nutrition analysis and sleep-site choice in the brown anole lizard were conducted on two of the Halifax islands by D.A Warner & D.M. Delaney. Department of Biology, University of Alabama at Birmingham, Alabama. More than 200 lizards were captured and removed after the study (D. Shelley, personal communication, May 11, 2016).



*Top: Behavior patterns of brown anoles were studied in 2009 on islands in the Halifax and Tomoka rivers. Bottom: Close up of brown anole on an island in the Halifax River.*

- In 2012, H. J. Cho of Bethune Cookman University conducted a pilot restoration study that included hand collection of reproductive shoots of shoal grass from Bulow Creek. The study aimed to garner

information needed to produce readily available shoal grass seeds and seedlings for field transplanting, and to field-test the survival of laboratory-grown shoal grass seedlings (D. Shelley, personal communication, May 11, 2016).



#### 4.1.2 / Current Status of Ecosystem Science at Tomoka Marsh Aquatic Preserve

##### Water Quality

Research and monitoring are essential parts of resource and ecosystems management. Data collected from various monitoring programs provide staff with important information that is used to make resource management decisions. Monitoring efforts allow for the creation of baseline data for future comparison. Baseline data can also provide insight to short and long term variations in environmental conditions. Historically, efforts included conducting research and monitoring activities relevant to understanding the ecological processes of Tomoka Marsh Aquatic Preserve. These efforts give rise to management strategies that maintain the intent of the Florida Aquatic Preserves rule, the preservation of aquatic preserves in essentially natural or existing condition so that the aquatic preserves aesthetic, biological, and scientific values may endure for the enjoyment of future generations (Chapter 18-20, Florida Administrative Code). Current monitoring and research programs are designed and executed based on current and potential future impacts to the resources within Tomoka Marsh Aquatic Preserve.

Major management issues within Tomoka Marsh Aquatic Preserve relate to water quality assessment and improvement, health of submerged resources and salt marsh communities, and land use changes and development. Florida's rapid growth increases public use and development pressures within the aquatic preserve. Effective ecosystem management, public outreach and education, monitoring and research, and interagency cooperation are essential pieces of the puzzle needed to maintain and protect the resources associated with the aquatic preserve. Programs associated with the Current Ecosystem Science Programs are discussed in the following section.

##### Water Quality: Nutrient Total Maximum Daily Load

Section 303(d) of the federal Clean Water Act requires states to submit to the U.S. Environmental Protection Agency a list of surface waters that do not meet applicable water quality standards (impaired waters) and establish a TMDL for each pollutant causing the impairment of listed waters on a schedule. DEP has developed such lists, commonly referred to as 303(d) lists, since 1992. The list of impaired waters in each basin, referred to as the Verified List, is also required by the Florida Watershed Restoration Act (Subsection 403.067[4], Florida Statutes), and the state's 303(d) list is amended annually to include basin updates.

In 1995, in response to general water quality concerns and waterbodies within their jurisdiction identified on the 303(d) list, SJRWMD initiated the Northern Coastal Basin (NCB) project. The NCB includes coastal lagoons and rivers from Ponte Vedra in St. Johns County to Ponce de Leon Inlet in Volusia County. An initial NCB Reconnaissance Report was produced and used as a resource guide in development of the NCB SWIM Plan. The purpose of the NCB SWIM Plan was to set forth a proactive course of action that identified the projects that addressed both estuarine water quality and habitat protection, and the effort needed to accomplish them, consistent with the levels and trends of available funding (Haydt & Frazel, Inc., 2003).



Map 14 | Halifax River (WBID 2363B).



In 2003, SJRWMD approved a SWIM plan for the NCB. The SWIM program provides funding for water quality sampling and analysis for the Tomoka and Halifax rivers, and Bulow Creek. Water quality conditions in Bulow Creek were included in subsequent water quality reports for the NCB (Winkler & Ceric, 2004).

Data from the NCB sampling stations was incorporated into the 2005 Water Quality Status Report for the Upper East Coast Basin, a comprehensive watershed assessment prepared by DEP for the TDML program required under the federal Clean Water Act.

A TMDL represents the maximum amount of a given pollutant that a water body can assimilate and still meet water quality standards, including its applicable water quality criteria and its designated uses. TMDLs are developed for water bodies that are verified as not meeting their water quality standards and provide important water quality goals that are intended to guide restoration activities.

### Bulow Creek

Bulow Creek is designated Class III waters for “recreation, propagation and maintenance of a healthy, well-balanced population of fish and wildlife.” The Water Quality Status Report mentioned above indicated that dissolved oxygen values and iron content in the upstream freshwater segment of Bulow Creek exceeded the threshold values of these parameters for Class III waters. Due to these surface water conditions, Bulow Creek was added to the statewide list of “impaired waters” which requires the development of TDMLs as the initial step in the restoration of the waterway. Bulow Creek was later delisted for the iron impairment, with the iron attributed to natural conditions. Bulow Creek is included as part of the Upper East Coast Basin, Group 5 assessment process. In the Group 5, Cycle 2 assessment for February 2012, dissolved oxygen, nutrients (chlorophyll-a [chl<sub>a</sub>]), and mercury (in fish tissue) remained on the verified list. The freshwater and marine dissolved oxygen criteria have changed since the Cycle 2 assessment was completed. There have also been rule changes in the assessment methodology and interpretation of the narrative nutrient criteria. Cycle 3 assessments of the Group 5 basins will occur in two years (the verified period ends in June 30, 2017). Additional water quality information will be collected as part of the assessment process. Based on a statewide mercury TMDL that was adopted, mercury (in fish tissue) will be delisted in Cycle 3. A preliminary assessment of existing data suggests that based on the new dissolved oxygen saturation criterion, dissolved oxygen would not be impaired. Since the chlorophyll criterion considers exceedances over three year periods, it is unclear at this time whether Bulow Creek would remain on the verified list when the Cycle 3 assessment is conducted in 2017 (W. Magley, personal communication, December 18, 2015).



Map 15 | Wastewater facilities in close proximity to Tomoka Marsh Aquatic Preserve.

SJRWMD has collected water quality samples from Bulow Creek at the Walter Boardman bridge every other month for more than 15 years as part of the ambient monitoring program. Parameters analyzed from sampling include water temperature, secchi disc transparency, sample collection depth, color, specific conductance, dissolved oxygen analysis by probe, pH, total alkalinity, total non-filterable residue, total nitrogen (TN), total phosphorus (TP), total organic carbon, total calcium, total magnesium, total sodium, total potassium, total sulfate, trichromatic uncorrected chl<sub>a</sub>, hardness, total filterable residue, and lab turbidity (SJRWMD, 2016).



SJRWMD analysis reports that Bulow Creek has a typical temperature range with conductivity less than that typically found in other estuaries. Major ion concentrations are elevated resulting in very hard water. The median dissolved oxygen concentration is low for an estuary. The water has good buffering capacity, with a neutral pH. Total organic carbon concentrations are elevated compared to other estuarine sites, and may contribute to the elevated color and correspondingly low Secchi depth at the collection site. Total suspended solids and nutrients concentrations are typical for estuarine waters, while turbidity and chlorophyll concentrations are elevated. The creek has fair water quality at the collection site, according to the trophic state index (SJRWMD, 2016).

### Halifax River

As described in Watershed section in Chapter 3, the Halifax River is a 23-mile-long tidal estuary with its major ocean connection situated at Ponce de Leon Inlet to the south. A tidal node located to the east of the lower reach of Bulow Creek separates the Halifax River and Matanzas River Estuary systems. For TMDL assessment purposes, the main stem of the Halifax River was divided into two assessment polygons (Waterbody Identification [WBID] 2363B [Map 14] and WBID 2363A). The division between the two polygons is near the location of the tidal node. A TMDL nutrient report was prepared for the Halifax River, WBID 2363B. About two miles of the Halifax River reach of the aquatic preserve is included in WBID 2363B (Magley, 2013a).

WBID 2363B was verified as impaired for nutrients based on chl<sub>a</sub> and was included on the Verified List of impaired waters for the Upper East Coast Basin that was adopted by Secretarial Order on February 7, 2012. Based on the median total nitrogen/total phosphorus ratio of 6.73, total nitrogen was identified as the limiting nutrient. The TMDL report established the allowable loadings to the Halifax River that would restore the waterbody so that it meets its applicable water quality criterion for nutrients (Magley, 2013a).

WBID 2363B was verified as impaired for nutrients based on data in the DEP's Impaired Waters Rule database. The chl<sub>a</sub> data for the verified period was January 1, 2004, through June 30, 2011. The Impaired Waters Rule listing threshold for nutrients in estuaries is based on an annual average chl<sub>a</sub> concentration. Annual average chl<sub>a</sub> in 2010 exceeded the threshold of 11 micrograms per liter (µg/L) (Magley, 2013a).

Sources contributing to impairment status that are located within close proximity to the aquatic preserve include discharges from a wastewater treatment facility (WWTF), municipal separate storm sewer systems and septic systems. The nutrient TMDL report for the Halifax River (WBID 2363B) provided information on three wastewater treatment facilities located in close proximity to the aquatic preserve (Map 15). The following WWTFs were identified as point sources in the final nutrient TMDL report for the Halifax River (Magley, 2013a):

The Ormond Beach WWTF (FL0020532) is in Ormond Beach and has a permitted annual average discharge of 6.0 million gallons per day (MGD), with discharge to the Halifax River and reuse. The permitted annual average TN concentration is 6 mg/L, with a maximum discharge of 150 pounds per day (lbs/day). The permitted annual average TP concentration is 1 milligram per liter (mg/L) with a maximum discharge of 50



Map 16 | Onsite sewage treatment and disposal systems in the Halifax River watershed (WBID 2363B), 2012.



lbs/day. Based on discharge monitoring reports over the January 1997 to April 2012 period, discharges (181 values) ranged between 0.22 and 6.41 MGD, with a median discharge of 2.16 MGD (mean of 2.31 MGD). TN concentrations (181 values) over this period ranged between 0.32 and 4.97 mg/L, with a median concentration of 2.19 mg/L (mean of 2.29 mg/L). The corresponding TN daily loads ranged between 3.48 and 160.5 lbs/day, with a median of 41.0 lbs/day (mean of 44.0 lbs/day). TP concentrations over the same period (181 values) ranged between 0.07 and 1.72 mg/L, with a median concentration of 0.35 mg/L (mean of 0.40 mg/L). The corresponding TP daily loads ranged between 0.64 and 51.28 lbs/day, with a median of 5.60 lbs/day (mean of 7.49 lbs/day).

The Holly Hill WWTF (FL0027677) is located in Holly Hill and has a permitted annual average discharge of 2.4 MGD, with discharge to the Halifax River. The permitted annual average TN concentration is 3 mg/L, with a maximum single sample discharge of 60 lbs/day. The permitted annual average TP concentration is 1 mg/L, with a maximum single sample discharge of 20 lbs/day. Based on discharge monitoring reports over the January 1997



Map 17 | Historical sampling sites in the Halifax River watershed (WBID 2363B).

to April 2012 period, discharges (184 values) ranged between 0.08 and 3.88 MGD, with a median discharge of 1.38 MGD (mean of 1.51 MGD). TN concentrations (182 values) over this period ranged between 1.12 and 25.0 mg/L, with a median concentration of 2.33 mg/L (mean of 2.61 mg/L). The corresponding TN maximum single sample daily loads ranged between 1.63 and 267.0 lbs/day, with a median of 26.70 lbs/day (mean of 33.20 lbs/day). TP concentrations over the same period (181 values) ranged between 0.0 and 1.14 mg/L, with a median concentration of 0.26 mg/L (mean of 0.30 mg/L). The corresponding TP maximum single sample daily loads ranged between 0.0 and 14.70 lbs/day, with a median of 3.15 lbs/day (mean of 3.75 lbs/day).

Although the Daytona Beach/Bethune Point WWTF (FL0025984) discharges to the lower portion of the Halifax River (WBID 2363A), the outfall is located near the boundary with WBID 2363B and is north of the tidal node. The permitted annual average discharge is 20 MGD with annual average limits for TN and TP of 3 and 1 mg/L, respectively. Maximum single-sample TN and TP loads are 570 and 190 lbs/day, respectively. Based on discharge monitoring reports over the January 1997 to April 2012 period, discharges (183 values) ranged between 1.6 and 18.3 MGD, with a median discharge of 7 MGD (mean of 7.34 MGD). TN concentrations (156 values) over the period from May 1998 to April 2012 ranged between 1.30 and 7.7 mg/L, with a median concentration of 2.65 mg/L (mean of 3.14 mg/L). The corresponding TN monthly average loads ranged between 873.8 and 20,466.9 lbs, with a median of 4,738.2 lbs (mean of 5,815.6 lbs). TP concentrations over the same period (164 values) ranged between 0.1 and 2.157 mg/L, with a median concentration of 0.66 mg/L (mean of 0.74 mg/L). The corresponding TP monthly average loads ranged between 7.43 and 5,222.5 lbs, with a median of 1,052.9 lbs (mean of 1,349.4 lbs).

Note: the “tide node” referenced for the Holly Hill WWTF is the second and southern tidal node discussed in the Watershed section.

Nutrient loadings to the Halifax River are also generated from nonpoint sources in the watershed. These potential sources include loadings from surface runoff, ground water inflow, and onsite sewage treatment and disposal systems. Approximately 1,030 onsite sewage treatment and disposal systems are located in the subject watershed (Magley, 2013a). The majority of these systems are located on the section of barrier island that borders the aquatic preserve (Map 16).



Data used in the determination of the TMDL was collected from 78 sampling stations in the Halifax River, 18 of which are located within Tomoka Marsh Aquatic Preserve (Map 17). The TMDL for the Halifax River was expressed in terms of a percent reduction in TN to meet the nutrient criterion. Total nitrogen reductions of nine percent are required from nonpoint sources. Any future wastewater discharge permits issued in the watershed will also be required to contain appropriate discharge limitations on nitrogen and phosphorus that will comply with the TMDL. The TMDL requires that certain permitted stormwater outfalls would be responsible for a nine percent reduction in TN loads.

A Basin Management Action Plan (BMAP) is the primary mechanism through which TMDLs are implemented in Florida. DEP determines if a BMAP is needed for a particular TMDL. The BMAP is a restoration plan typically developed by DEP and basin stakeholders that formalizes the activities that will reduce the pollutant loads and achieve the TMDL. Stakeholders in a Halifax River BMAP typically would include representative from state and local governments, utilities, marinas and other local businesses, and interested citizens. The BMAP represents a formal commitment for various responsible parties who will take corrective actions to meet the TMDL.

The Volusia County Health Department has identified a number of areas with potential onsite sewage treatment and disposal system problems. These include the barrier island Ormond by the Sea, neighborhoods around Ormond Beach along the Tomoka River, and in other watersheds. In recognition of these impacts, DEP, SJRWMD, and local governmental, scientific, educational, and citizen organizations are working to develop strategies for protecting and restoring water quality and quantity in the Upper East Coast Basin.

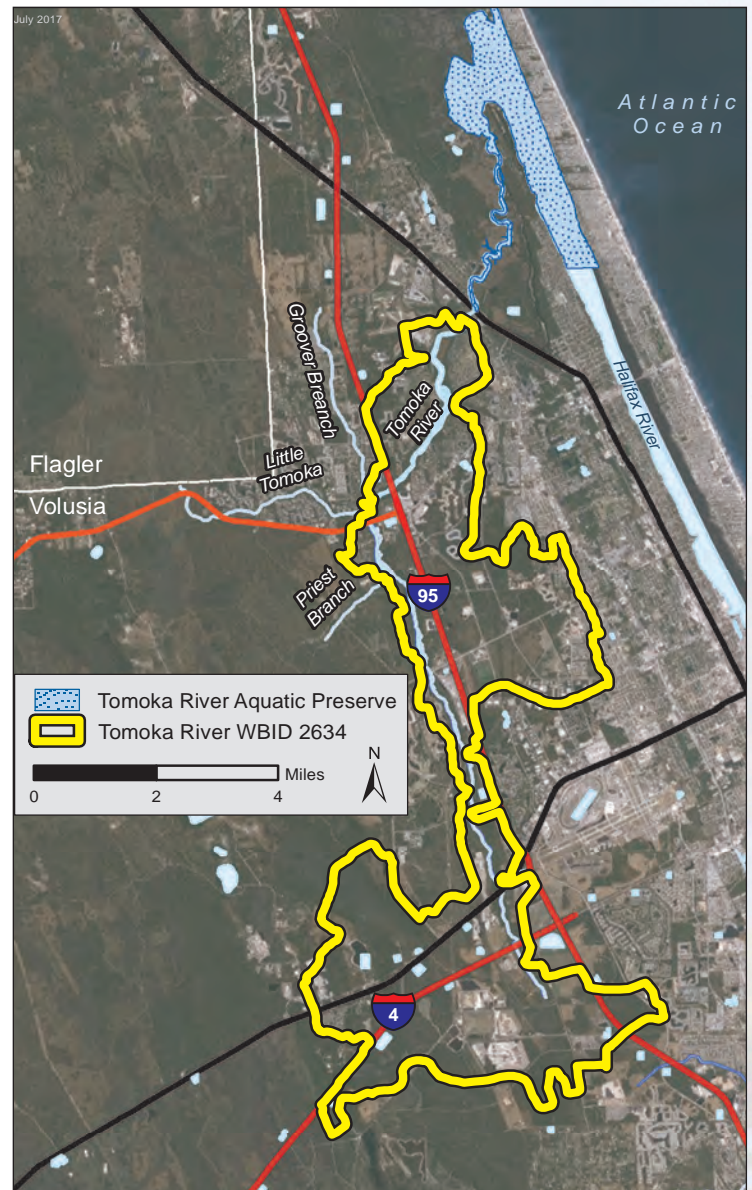
### Tomoka River

Only the lower three mile reach of the 17 mile Tomoka River is within the aquatic preserve boundary, but waters from the upper reach are inextricably linked to the lower reach. The segment of the Tomoka River immediately upstream of the aquatic preserve boundary was verified as impaired for nutrients based on chla and was included on the Verified List of impaired waters for the Upper East Coast Basin that was adopted by Secretarial Order on February 7, 2012.

For assessment purposes, the Tomoka River was divided into a fresh water and a marine segment. The TMDL addressed the fresh water portion of the Tomoka River. The fresh water segment of the Tomoka River is approximately 13.6 miles long, with a watershed area of approximately 30 square miles (Map 18). This watershed is discussed further in the Watershed section.

DEP used the Impaired Waters Rule to assess water quality impairments in the Tomoka River watershed (WBID 2634) and has verified that the fresh water waterbody segment was impaired for nutrients. The Impaired Waters Rule listing threshold for nutrients in estuaries was based on exceeding the historic minimum chla annual average of 3  $\mu\text{g/L}$  by more than 50 percent in at least two consecutive years (2008 – 2010). The corrected chla data was used for the verification period, January 1, 2004, through June 30, 2011.

As the nutrient impairment listing was based on exceeding an annual average chla concentration of 5  $\mu\text{g/L}$  for two consecutive years, a target annual average corrected chla concentration of 4.5  $\mu\text{g/L}$  was considered as an appropriate protective target and used to develop nutrient reductions.



Map 18 / Tomoka River (WBID 2634)

Other indices, such as the stream condition index can be used to assess biological health of aquatic systems. Over the period September 1992 to May 2012, twenty-four stream condition index assessments were conducted in this WBID. The stream condition index uses 10 metrics to evaluate the biological health of the macroinvertebrate community. All twenty-four assessments have concluded that the biological community is healthy with good or excellent ratings.

Implementation of strategies developed through the TMDL and BMAP are anticipated to result in restoration of the waterway and relate to the freshwater/estuarine interface located immediately downstream within the aquatic preserve.

## **Ecosystem Science Issue**

### **Issue One: Water Quality (WQ)**

As previously discussed, water quality is one of the primary issues of importance for the Tomoka Marsh Aquatic Preserve. Without adequate safeguards, historical land uses or changes in land use often lead to degradation of water quality through increased nutrients. Waterbodies within the aquatic preserve have experienced changes in water quality that have negatively impacted the natural habitats and wildlife as well as decreased public enjoyment of the water. A healthy water body contains a balanced amount of nutrients and normal fluctuations in salinity and temperature. It also maintains sufficient oxygen, which is a basic requirement for nearly all aquatic biota, and little suspended sediment, so that living aquatic resources can breathe or receive adequate sunlight for growth.

**WQ Goal 1:** Protect areas with good water quality and, where necessary, improve water quality to maximize utility for natural resource and public needs.

**WQ Objective 1.1:** Continue to coordinate and collaborate with the various entities that collect water quality data within the aquatic preserve to inform managers and the general public about water quality conditions. Coordinate with other divisions within DEP, SJRWMD, and other entities to locate and review all available data.

**WQ Integrated Strategy 1.1.1:** Continue to retrieve and collate water quality data from various agencies involved in collection within the basins. Utilize water quality data and summary reports to better understand water quality conditions and how these conditions may be effecting the natural resources within the aquatic preserve. Inform stakeholders about water quality trends.

**WQ Integrated Strategy 1.1.2:** Continue to keep updated on ongoing research and regulations related to existing TMDLs.

**WQ Integrated Strategy 1.1.3:** Continue to coordinate through the BMAP process to support and promote strategies identified that will result in water quality improvements.

**WQ Performance Measure:** A data base of existing water quality is maintained and utilized to promote improvements in water quality conditions where needed.

**WQ Objective 1.2:** Investigate existing or potential use of benthic data and a benthic habitat quality index that includes species diversity, physical parameters, and analysis of contaminants of benthic sediments. Such an index, if applied intensively and long-term within the aquatic preserve, will be a useful tool in tracking degradation as well as recovery of submerged resources.

**WQ Integrated Strategy 1.2.1:** Investigate the availability, suitability, and adequacy of existing data and their usefulness in assessing benthic habitat health.

**WQ Integrated Strategy 1.2.2:** Acquire additional data sets from agencies and universities and evaluate their suitability for determining habitat change and health.

**WQ Integrated Strategy 1.2.3:** Investigate existing or potential use of a benthic habitat quality index that includes species diversity, physical parameters, and analysis of contaminants of benthic sediments.

**WQ Performance Measure:** Make an informed definitive decision on whether to proceed with the use of a specific benthic habitat index, and create a white paper on the decision.

**WQ Objective 1.3:** Encourage effective wastewater treatment systems in the aquatic preserve watershed. Review the adequacy of setbacks and other requirements for these systems on land adjacent to the aquatic preserve. Whenever possible, connection to city sewer systems or advanced wastewater treatment on-site will be encouraged.

**WQ Integrated Strategy 1.3.1:** Review existing geographic information systems (GIS)-based maps on the abundance and distribution of septic systems in the Tomoka Marsh Aquatic Preserve watersheds.



**WQ Integrated Strategy 1.3.2:** Coordinate with state and local stakeholders to resolve issues related to onsite sewage treatment and disposal systems in areas immediately adjacent to the aquatic preserve.

**WQ Integrated Strategy 1.3.3:** Encourage local health agencies to review and consider new state-of-the-art wastewater treatment ideas or connection to central wastewater systems and reuse. Collaborate with local city and county staff to minimize the effect of onsite sewage treatment and disposal systems and other domestic discharges within the watershed.

**WQ Performance Measure:** The number of onsite sewage treatment and disposal systems within aquatic preserve watersheds and adjacent to the aquatic preserve are reduced.

**WQ Performance Measure:** Reuse of wastewater through graywater systems is increased.

**WQ Objective 1.4:** Encourage ecologically sound pet sanitation methods on public use waterfront areas.

**WQ Integrated Strategy 1.4.1:** Conduct a review of resources for proper pet sanitation at aquatic preserve access points (launches, waterfront parks, etc.).

**WQ Integrated Strategy 1.4.2:** Encourage managers of aquatic preserve access points to provide pet waste pickup stations.

**WQ Integrated Strategy 1.4.3:** Encourage management entities to monitor pet cleanup stations.

**WQ Integrated Strategy 1.4.4:** Encourage placement of informational signs detailing water quality impacts of pet waste at access points.

**WQ Performance Measure:** An up-to-date report of the status of pet sanitation around the aquatic preserve is created and made available.

**WQ Performance Measure:** Pet sanitation methods at waterfront parks are improved where needed.

**WQ Objective 1.5:** Evaluate and, where feasible, support the improvement and effectiveness of stormwater treatment techniques, regulations, and enforcement currently in place.

**WQ Integrated Strategy 1.5.1:** Review and evaluate the effectiveness of local and regional stormwater efforts and plans in the aquatic preserve watersheds.

**WQ Integrated Strategy 1.5.2:** Identify, prioritize and, when feasible, support the implementation of the most effective stormwater treatment measures in both new and retrofit projects (public and private) to meet existing requirements and/or provide innovative treatment approaches for nutrient removal.

**WQ Performance Measure:** Information on Best Management Practices for stormwater management are included in formal presentations.

#### **4.2 / The Resource Management Program**

The Resource Management Program addresses how FCO manages Tomoka Marsh Aquatic Preserve and its resources. The primary concept of Tomoka Marsh Aquatic Preserve Resource Management projects and activities are guided by FCO's mission statement: "Conserving and restoring Florida's coastal and aquatic resources for the benefit of people and the environment." FCO's sites accomplish resource management by physically conducting management activities on the resources for which they have direct management responsibility, and by influencing the activities of others within and adjacent to their managed areas and within their watersheds. Watershed and adjacent area management activities, and the resultant changes in environmental conditions, affect the condition and management of the resources within their boundaries.

FCO works to ensure that the most effective and efficient techniques used in management activities are used consistently within our sites, throughout our program and, when possible, throughout the state. The strongly integrated Ecosystem Science, Education and Outreach, and Public Use Management Programs, provide guidance and support to the Resource Management Program. These programs work together to provide direction to the various agencies that manage adjacent properties, our partners, and our stakeholders. Tomoka Marsh Aquatic Preserve also collaborates with these groups by reviewing various protected area management plans. The sound science provided by the Ecosystem Science Management Program is critical in the development of effective management projects and decisions. The nature and condition of natural and cultural resources within Tomoka Marsh Aquatic Preserve are diverse. This section explains the history and current status of our Resource Management efforts. Implementation of the goals, objectives, and strategies outlined in this section are on dependent on adequate funding.

#### 4.2.1 / Background of Resource Management at Tomoka Marsh Aquatic Preserve

Due to limited personnel, aquatic preserve staff have focused on several key resource management areas including water quality, fisheries assessments, non-native invasive plant control, and wildlife monitoring and protection programs. Programs have been developed and conducted in house and in coordination with other agencies, research entities, and local private organizations to support resource management activities. Specific projects have included fisheries surveys, bird surveys, a single family dock survey, restoration projects, review and commenting on proposed environmental regulatory permits, review of TDMLs, land acquisition projects and adjacent state land management reviews. Staff have also provided technical support to other land managers and regulatory authorities on a variety of projects, have assisted with field assessments, and have notified the appropriate authorities of violations and illegal activities within the aquatic preserve. Communication with local, state, and federal agencies, as well as private organizations, is an important aspect in protecting and managing the resources within Tomoka Marsh Aquatic Preserve.

#### Fisheries Assessments

Sampling stations within Tomoka Marsh Aquatic Preserve were included in the four year fisheries assessment conducted from January 1993 to December 1996 because aquatic preserve staff committed to participating in the field work and obtaining volunteers to assist with the fieldwork component - two days per month. Without this partnership, the fisheries assessment in the aquatic preserve would not have taken place. DEP's Florida Marine Research Institute's Marine Fisheries-Independent Monitoring program criteria was followed to sample ichthyofauna and selected invertebrates associated with the Halifax and lower Tomoka rivers. Eight fixed stations were sampled monthly using gear types selected for juvenile and sub-adult age classes. A total of 351,977 individuals representing 116 taxa and 40 families was collected. More animals were caught in seines from littoral habitats ( $n=261,775$ ) than in trawls in open water habitats ( $n=90$ ). At 37.4 percent, anchovies (*Anchoa* spp.) were the numerically dominant taxa collected by seine, followed by spot, and silversides (*Menidia* spp.) - 12.1 percent and 13.9 percent, respectively. Atlantic croaker (33.2 percent) was the numerically dominant taxa collected in trawls, followed by pink and brown shrimp, and anchovies (*Anchoa* spp.) - 17.6 percent and 13.9 percent, respectively. Statistical indices used to evaluate faunal composition among four trawl and four seine stations, indicated moderate to high similarity between the stations. Ten species of drum were documented in the aquatic preserve including the popular red drum,

croaker, spot, and spotted sea trout. Species composition was robust and included ten species of gobies, seven species of flounder, three species of sole, three species of shrimp, and two species of blue crab (*Callinectes sapidus* and *C. similis*). Five species in the sunfish family were collected, including largemouth bass (*Micropterus salmoides*). Sunfish, including bass, were collected from the Tomoka River



Top: An amphibious excavator with a 60 foot backhoe extension, excavated dredge material along the banks of a perimeter ditch around Rosetta Island. Bottom: Close up view of an amphibious excavator excavating dredge material at Rosetta Island.



at the southern reach of the aquatic preserve near the freshwater interface. More than 200 derelict crab traps were caught during trawl sampling, and removed from the aquatic preserve.

Aquatic preserve staff also assisted with sampling during the 2001–2006 fisheries survey conducted by USGS. Station locations were determined by stratified random sampling methods and included areas within Tomoka Marsh Aquatic Preserve and throughout the NCB. Staff primarily participated at stations within the aquatic preserve, but assisted with other areas as needed.

### **Marsh Restoration**

The 2003 Northern Coastal Basin Surface Water Improvement and Management Plan prepared by SJRWMD identified the need for salt marsh restoration at a variety of locations throughout the NCB, including areas associated with the aquatic preserve. Extensive alternative to salt marsh communities from drag line ditching for mosquito control, mentioned elsewhere in this plan, established the need for restoration. Over the past 15 years, several significant marsh restoration projects have been completed in areas adjacent to the aquatic preserve.

These include projects marsh restoration at Rozetta Island at Bulow Creek, completed in 2007 by SJRWMD in cooperation with the FPS. The Rozetta Island project restored the natural open vista across the high marsh with annual glasswort, saltwort, and brushy seaside oxeye.

Extensive restoration to marshes adjacent to the Halifax River at North Peninsula State Park and at Gamble Rogers State Recreation Area at Flagler Beach were also completed over the past 10 years. The NCB program continues to restore degraded marshes along the Halifax River. Aquatic preserve staff reviewed and commented on various marsh restoration proposals, conducted site inspection for on-going and completed projects, and partnered with various agencies during the Bulow Creek restoration at Korona Canal.

Additional restoration projects completed within or adjacent to the aquatic preserve included backfilling of dragline ditches in the marshes of the Tomoka River between 2000 and 2007 (Map 19), and along Tomoka Basin in 2011. In 2012, a berm was breached along Cedar Creek, a tributary of Bulow Creek, which improved the connection between the two creeks (Map 20). Additional projects have been identified and will be conducted as funding becomes available (Map 21).

### **Bird Surveys**

Bird surveys were conducted in all reaches of the aquatic preserve over a two year period from August 1995 to March 1998. Surveys were conducted monthly over a two-day period, typically during the last week of month. Surveys were conducted along the Tomoka River, Strickland Creek, Thompson Creek, Dodson Creek, the Halifax River, Smith Creek, Bulow Creek, and within the 1,100 acre mosquito impoundment. A 14 foot shallow draft skiff allowed birders to travel through the extensive backwaters adjacent to main water courses. The boat was equipped with an airboat seat that was elevated about 8 feet above the deck that



*Top: A backfilled section of the perimeter ditch after excavation.  
Bottom: Salt marsh with saltwort, glasswort, and brushy seaside oxeye after restoration.*



allowed for observation over marsh habitat. A surveyor experienced in identifying species by sound was contracted to assist with the surveys to more efficiently identify individual species. Bird surveys continue quarterly for several years, then yearly, and are now conducted as time and staffing allow. These surveys have identified close to 200 species in the aquatic preserve, including herons, egrets, ducks, hawks, shorebirds, gulls and terns, and warblers. A check list of Tomoka Basin birds was created in partnership with FPS and West Volusia Audubon.



Map 19 | Tomoka Marsh Basin dragline ditch restoration (Tract G/H)



Map 20 | Cedar Creek dragline ditch restoration (Tract J)

## Manatee

The Tomoka River is recognized as one of the most important manatee use areas in Volusia County. Manatees along the Atlantic coast of Florida use the Halifax and Tomoka rivers extensively during seasonal migrations. Aerial survey, satellite telemetry, and mortality data have documented manatee use of the Halifax River in every month of the year, and documented manatee use of the Tomoka River in every month except February (Save the Manatee Club, 2015a). The Tomoka River is documented as an important manatee calving area (Florida Department of Natural Resources, 1992). All waters of the aquatic preserve have designated speed zones to regulate boat traffic.

In 1989, as part of the Florida Manatee Sanctuary Act, Volusia County was identified as one of thirteen counties in Florida that were listed as key to manatee survival. Each of the key counties were required to develop a Manatee Protection Plan. Volusia County completed a Manatee Protection Plan that included a marina siting element, and educational and outreach components. The Boating Activity Study, completed in 1996 and updated in 2000, is the foundation for the policies outlined within the Volusia County Manatee Protection Plan. The goal of the Manatee Protection Plan is to ensure long-range protection of manatee and their habitat through a number of objectives that include reducing the number of boat related mortalities, achieving and maintaining an optimal sustainable manatee population, promoting boating safety, and developing and implementing education programs within Volusia County (Volusia County, 2002). Volusia County has conducted manatee conservation efforts through education, outreach, habitat enhancement, scientific research, and interagency coordination.

Some of the projects and coordination efforts undertaken by Volusia County include manatee education and outreach

correlated to the educational curriculum to skill sets outlined in the Florida Sunshine State Standards, representation at community festivals and events, manatee identification curriculum, Manatee Watch program training by manatee specialists, collaborations with the USGS Sirenia Project, county liaison for DEP's Clean Marina Program, intergovernmental coordination, coordination with law enforcement, the Volusia County Marine Mammal Stranding program, estuarine restoration projects, and several other activities that benefit manatee or manatee habitat.





*In winter, both brown pelicans (year-round residents) and white pelicans (winter residents) may be observed resting on sand bars.*

#### 4.2.2 | Current Status of Resource Management at Tomoka Marsh Aquatic Preserve

##### Management Strategic Approach

Due to limited program resources, aquatic preserve staff work with a variety of different stakeholders to protect and restore Tomoka Marsh Aquatic Preserve resources. Staff often partner with other land managers, agencies, researchers, and private entities to accomplish resource management goals. Tomoka Marsh Aquatic Preserve strives to be as effective as possible and shares resources such as staff time, vessels, and equipment to accomplish common goals. Management of the aquatic preserve primarily takes on a proactive and preventative approach. The present status of the Tomoka Marsh Aquatic Preserve resource management programs, accompanied by future needs, are detailed in the following sections.

##### Invasive Non-Native Removal and Treatment

Invasive non-native species have negative effects on the natural communities in which they invade by threatening the structure and function of diverse native aquatic ecosystems. FWC IPMS is the lead agency responsible for permitting, coordinating, and funding statewide programs designed to control invasive aquatic non-native plants on public conservation lands and waterways.



*Map 21 | Highbridge Marsh dragline ditch restoration (Tract K)*



Like many areas throughout Florida the proliferation of non-native or nuisance plant species has been a long standing issue within Tomoka Marsh Aquatic Preserve. A cooperative effort between IPMS and aquatic preserve staff has been in place since 1990 and includes surveys to identify invasive non-native vegetation on Bulow Creek, the Tomoka River, and the Halifax islands. Invasive control activities have focused primarily on Bulow Creek. The amount of acreage requiring control generally ranged from one to five acres. Depending on regrowth conditions, invasive species currently managed in Tomoka Marsh Aquatic Preserve by an FWC herbicide contractor include water hyacinth, water lettuce, hydrilla, and torpedo grass. Nuisance cattails have encroached into saw grass and cordgrass marsh habitats on occasion and stands have been reduced when determined necessary.

A 2014 survey on the Halifax islands identified 11 acres of Brazilian pepper and four acres of Australian pine at various locations around the islands. Removal of these invasive non-native species is desirable. In June 2016, three acres of Australian pine were cut down and stump-treated with funds from the aquatic preserve budget. Additional funding was identified for 2017 and aquatic preserve staff continue to seek alternate funding for removal of these non-natives. A small patch of life plant, a hardy succulent typically sold as a house plant, is established on one of the islands. Staff and volunteers are working toward eradicating this non-native from the island.



*Used fishing line should be disposed of properly.*

preserve volunteers focused primarily on monitoring for terrapin on the Halifax islands. Aquatic preserve volunteers were DEP Canoe/Kayak certified and used DEP canoes, kayaks, global positioning systems (GPS), and other equipment to conduct the surveys. Volunteers provided daily report logs on their activities and have documented locations of terrapin sightings on aerial maps. An aquatic preserve intern from Bethune Cookman University participated in the survey. The aquatic preserve purchased terrapin radio transmitters for the intern's research project.

### **Permitting, Enforcement, and Mitigation**

Aquatic preserve staff provide technical support to many local entities including: DEP Central and Northeast regulatory districts, SJRWMD, FPS managed areas, FWC IPMS, and Volusia County. Aquatic preserve staff often assist these agencies with permit application reviews and comments, mitigation planning, and public interest project opportunities. Staff meets with the environmental regulatory permitting staff during coordination meetings and on an as needed basis for field site inspections. DEP provides materials and training to regulatory staff which ensures consistent permitting and application of the Aquatic Preserve Rule, Chapter 18-20, Florida Administrative Code. Aquatic preserve staff will continue assisting the regulatory agencies and stakeholders to ensure impacts to the aquatic preserve are kept to a minimum to protect the resource.

### **Wildlife Monitoring and Research**

**Bird Surveys** - Staff continue to conduct bird surveys as staff and time allows. Repeating the monthly surveys on a regular basis for a one year period would allow for a comparison of data to determine if any change in species presence or absence has occurred.

**Diamondback Terrapin** - During 2014 and 2015, staff partnered with the East Coast Diamondback Terrapin Group. Partners include representative from the FPS, Bethune Cookman University, other agency staff, county government, and volunteers. The group met before the active terrapin season to coordinate monitoring efforts. Aquatic



**Brown Anole** - Studies on nutrition analysis and sleep-site choice in the brown anole lizard were conducted on two of the Halifax islands during summer months in 2012. More than 200 non-native individuals captured during the study were removed from the study site.

### **Marine Debris**

Aquatic preserve staff and volunteers conduct clean-ups throughout the aquatic preserve. Staff participate in planned events and also remove debris as it is encountered during regular resource management activities. Volunteers conduct clean-ups on the Halifax islands as part of the diamondback terrapin monitoring program and other resource management activities. In recent years, an increase in recreation activity has been documented on the Halifax islands along with an increase of litter on the islands.

**Halifax Island Assessment and Management** - Aquatic preserve staff are currently participating in an "All Island Assessment" for islands managed by FCO. The assessment aims to identify current status and uses of islands within FCO managed areas. Aquatic preserve staff also coordinate with other entities such as the Northeast Florida Estuarine Restoration Team (NERT), working on assessments, restoration projects or management planning for ecosystems and islands within Tomoka Marsh Aquatic Preserve.

### **Resource Management Issue**

#### **Issue Two: Wildlife and Habitat (WH)**

As stated above, invasive non-native species have negative effects on the natural communities in which they invade by threatening the structure and function of diverse native aquatic ecosystems. Many invasive species do not have natural predators present in the areas they invade which contributes to monocultures or explosive population growth. Expansion of some nuisance species (cattail) present in the aquatic preserve may be attributed to nutrient enrichment or other environmental factors.

**WH Goal 1:** Improve habitat in Tomoka Marsh Aquatic Preserve for species diversity.

**WH Objective 1.1:** Understand aquatic vegetation dynamic including interactions between native and non-native species. Eradicate or control non-native and nuisance plants.

**WH Integrated Strategy 1.1.1:** Continue coordination with FWC IPMS on surveys of non-native and nuisance plant species on Bulow Creek.

**WH Integrated Strategy 1.1.2:** Continue coordination with FWC IPMS and other partners for funding and strategies to eradicate or control non-native species throughout the aquatic preserve.

**WH Integrated Strategy 1.1.3:** Investigate partnerships and funding options for eradicating or controlling non-native species on the Halifax islands.

**WH Integrated Strategy 1.1.4:** Solicit for and work with volunteers to assist with controlling life plant on the Halifax islands.

**WH Performance Measure:** The amount and acreage of non-native and nuisance plant and animal species and nuisance vegetation within all areas of the aquatic preserve is reduced.

**WH Goal 2:** Improve habitat for wildlife populations in Tomoka Marsh Aquatic Preserve.

**WH Objective 2.1:** Monitor and assess wildlife populations located within Tomoka Marsh Aquatic Preserve.

**WH Integrated Strategy 2.1.1:** Continue partnership with the East Coast Diamondback Terrapin Group.

**WH Integrated Strategy 2.1.2:** Solicit volunteers to assist with diamondback terrapin monitoring.

**WH Integrated Strategy 2.1.3:** Increase public awareness through various educational outlets (literature, attend public meetings, etc.) about the presence of diamondback terrapin and their habitat within Tomoka Marsh Aquatic Preserve.

**WH Integrated Strategy 2.1.4:** Continue to recruit and support interns from Bethune Cookman University (and other universities) interested in studying diamondback terrapin on the Halifax islands.

**WH Integrated Strategy 2.1.5:** Coordinate with FWC and other entities to maximize optimum habitat for diamondback terrapin on the Halifax islands, especially if opportunities exist during or after exotic species control.

**Performance Measure:** Seasonal diamondback terrapin activity is tracked and recorded each year.

**WH Objective 2.2:** Improve understanding of bird populations (migratory and year-round residents) that use the aquatic preserve.

**WH Integrated Strategy 2.2.1:** Reinstate quarterly contracted bird survey as funding becomes available.

**WH Integrated Strategy 2.2.2:** Consult with statisticians and ornithologists for appropriate analysis of bird survey data to assess population trends.

**WH Performance Measure:** Regular reports will be given on bird population trends in the aquatic preserve.

**WH Objective 2.3:** Improve awareness and understanding of manatee populations that inhabit the aquatic preserve.

**WH Integrated Strategy 2.3.1:** Coordinate with Volusia and Flagler counties for manatee related educational events.

**WH Integrated Strategy 2.3.2:** Place signage at all access points to the aquatic preserve that advises boaters they are entering the aquatic preserve and manatee habitat.

**WH Performance Measure:** Signs that advise boaters that they are entering the aquatic preserve boundaries and manatee habitat are located at all access points.

**WH Objective 2.4:** Improve degraded or altered salt marsh habitat by partnering with entities that are conducting salt marsh community restoration.

**WH Integrated Strategy 2.4.1:** Coordinate with the NCB and other initiatives for salt marsh community restoration within the aquatic preserve.

**WH Integrated Strategy 2.4.2:** Encourage salt marsh restoration projects within the aquatic preserve.

**WH Performance Measure:** Partnerships are established that result in the restoration of altered salt marsh habitat throughout the aquatic preserve each year.

**WH Objective 2.5:** Evaluate oyster habitat at appropriate locations throughout the aquatic preserve.

**WH Integrated Strategy 2.5.1:** Encourage research and mapping of oyster habitat within the aquatic preserve.

**WH Integrated Strategy 2.5.2:** Encourage the restoration of oyster beds, if needed, within the aquatic preserve.

**WH Performance Measure:** Research and mapping of oyster habitat is conducted within the aquatic preserve. Restoration of oyster beds, if needed, is conducted.

**WH Objective 2.6:** Reassess the status of fisheries within the aquatic preserve.

**WH Integrated Strategy 2.6.1:** Coordinate with FWC's Division of Marine Fisheries Management or other entities who conduct fisheries assessments.

**WH Integrated Strategy 2.6.2:** Encourage and support fisheries surveys within the aquatic preserve.

**WH Performance Measure:** An updated fisheries assessment is conducted within the aquatic preserve.

**WH Objective 2.7:** Assess habitats on islands within the aquatic preserve.

**WH Integrated Strategy 2.7.1:** Continue to participate in FCO's All Island Assessment.

**WH Integrated Strategy 2.7.2:** Coordinate with other entities conducting island assessments to share information and minimize duplication of efforts.

**WH Performance Measure:** Current status and uses of the Halifax islands are assessed. Management strategies for various islands are developed.

**WH Objective 2.8:** Support and encourage the development of Imperiled Fish and Wildlife Species Management Strategies that addresses imperiled fish and wildlife species.

**WH Integrated Strategy 2.8.1:** In cooperation with FWC, develop management prescriptions, as staffing and funding allow, for imperiled fish and wildlife species occurring within the aquatic preserve and their associated habitats.

**WH Integrated Strategy 2.8.2:** In cooperation with FWC, include the development of appropriate imperiled fish and wildlife species survey and monitoring protocols in management prescriptions based on site-specific occurrences, population data, and sustainability potential.

**WH Performance Measure:** Site-specific management prescriptions for imperiled fish and wildlife species, and their habitats are developed.



**WH Goal 3:** Reduce the amount of debris in the aquatic preserve.

**WH Objective 3.1:** Control debris at the sources.

**WH Integrated Strategy 3.1.1:** Ensure that access points to the aquatic preserve (boat launches, fishing piers, etc.) have monofilament line depositories and trash receptacles with secure lids.

**WH Integrated Strategy 3.1.2:** Encourage managers of local parks, launch sites, marinas, and other facilities to erect informational signage that promotes “Leave No Trace” and “Pack it in, Pack it Out” No Trace stewardship.

**WH Performance Measure:** Debris is reduced throughout the aquatic preserve by increased stewardship, and at access points by being retained in secure receptacles.

#### **4.3 / The Education and Outreach Management Program**

The Education and Outreach Management Program components are essential management tools used to increase public awareness and promote informed stewardship by local communities. Education programs include on and off-site education and training activities. These activities include: field studies for students and teachers; the development and distribution of media; the distribution of information at local events; the recruitment and management of volunteers; and, training workshops for local citizens and decision-makers. The design and implementation of education programs incorporates the strategic targeting of select audiences. These audiences include all ages and walks of life; however, each represents key stakeholders and decision-makers. These efforts by the Education and Outreach Management Program allow the aquatic preserve to build and maintain relationships and convey knowledge to the community; invaluable components to successful management.

##### **4.3.1 / Background of Education and Outreach at Tomoka Marsh Aquatic Preserve**

The Education and Outreach Management Program for the aquatic preserve has included presentations on topics such as the aquatic preserve program, watersheds, non-native invasive plant control, fisheries research, resource management activities, and other aquatic related issues. Programs have been presented at workshops and symposiums and to a variety of audiences including community groups, schools, citizen support groups, garden clubs, master gardeners, and numerous agency committees. Education and outreach activities have included river clean-ups, and participation at festivals at Tomoka State Park, seafood festivals in Daytona Beach and Ormond Beach, and other similar outdoor venues.

Other projects have included field trips for various agency and stakeholder committees, the design and production of aquatic preserve brochures, posters showcasing research and management in the Tomoka Basin, as well as educational articles for various public outlets. A narrative slide show “Clean Water - Who Needs It?” has also been produced, and presented to high school and college classes as well as adult audiences.

##### **4.3.2 / Current Status of Education and Outreach at Tomoka Marsh Aquatic Preserve**

Aquatic preserve staff regularly participate in and often take an active leadership role in volunteer events throughout the area. A volunteer database and distribution list is maintained to document the amount of assistance the community provides in management of the aquatic preserve. Volunteer events include river clean-ups, assistance with bird and terrapin surveys, non-native invasive plant removal, and participation at festivals. With limited staffing, participation in educational events is directed toward target audiences.

#### **Education and Outreach Issue**

##### **Issue Three: Public Involvement (PI)**

Public outreach and involvement is crucial to the success of all Tomoka Marsh Aquatic Preserve programs. Many issues associated with degradation in the aquatic preserve can be resolved through education, outreach, an increased knowledge of specific topics, implementation of personal stewardship, and the willingness of individuals to change behavior. The aquatic preserve designation and the protections it provides are not widely understood by the general public. Aquatic preserve staff will assist the citizen support group, the Aquatic Preserve Alliance of Central Florida, to recruit and maintain involvement by members that fully understand the importance of the aquatic preserve.

**PI Goal 1:** Increase public involvement, awareness, and knowledge of Tomoka Marsh Aquatic Preserve.

**PI Objective 1.1:** Improve public understanding of aquatic preserve submerged resources.

**PI Integrated Strategy 1.1.1:** Disseminate information to the general public and volunteers through various media materials.

**PI Integrated Strategy 1.1.2:** Support other agencies' and organizations' submerged resources education efforts.

**PI Integrated Strategy 1.1.3:** Ensure that, whenever possible, public access points to the aquatic preserve include signage on the threats and prevention of debris, including promoting "Leave No Trace" and "Pack it in, Pack it Out" ethics.

**PI Integrated Strategy 1.1.4:** Provide information about the aquatic preserve to canoe and kayak vendors for dissemination to the public.

**PI Performance Measure:** Staff participates in one outreach event each year to educate the public, promote the aquatic preserve and provide printed materials as requested.

**PI Performance Measure:** Staff will offer presentations to community groups and organizations, as requested.

**PI Objective 1.2:** Improve public understanding of direct and indirect threats to aquatic preserve water quality.

**PI Integrated Strategy 1.2.1:** Disseminate information to volunteers and the general public through various media materials.

**PI Integrated Strategy 1.2.2:** Conduct PowerPoint presentations for homeowner groups to inform local residents on how they can reduce their impacts to the aquatic preserve.

**PI Integrated Strategy 1.2.3:** Support strategies that will improve water quality, such as those identified in Basin Management Action Plans, and other agencies' and organizations' water quality education efforts.

**PI Performance Measure:** Information is posted in print and digital form (website, twitter, etc.).

**PI Performance Measure:** Informational PowerPoint presentations are given to community groups and organizations.

**PI Performance Measure:** Informational posters are placed in kiosks at various locations within the aquatic preserve watershed.

**PI Objective 1.3:** Remove debris in the aquatic preserve. Continue coordination with individuals, local groups, and vendors to remove litter from the aquatic preserve.

**PI Integrated Strategy 1.3.1:** Recruit volunteers to help with clean-up events conducted by aquatic preserve and other organizations.

**PI Integrated Strategy 1.3.2:** Continue work with local vendors, non-government organizations, other government staff, and volunteers to achieve a minimum of two clean-ups per year of all accessible shorelines and to establish a maintenance schedule.

**PI Integrated Strategy 1.3.3:** Continue to promote the Adopt-an-Island program on the Halifax islands by coordinating with individuals, local groups, and vendors.

**PI Performance Measure:** Debris is cleaned from shorelines along the aquatic preserve at least twice a year.

**PI Performance Measure:** The amount of litter is decreased in the aquatic preserve.

**PI Integrated Strategy 1.3.4:** Prior to any cleanup activities, provide information and protocols to volunteers that address protection of archaeological and cultural resources.

**PI Objective 1.4:** Improve public understanding of archaeological and cultural resources associated with the aquatic preserve.

**PI Integrated Strategy 1.4.1:** Coordinate with Division of Historical Resources, Bureau of Archaeological Research's Underwater Archaeology and Public Lands programs for publications and information for public outreach and education programs specific to archaeological and cultural resources.

**PI Integrated Strategy 1.4.2:** Include information about archaeological and cultural resources in existing education and outreach programs presented by aquatic preserve staff.

**PI Integrated Strategy 1.4.3:** Continue to encourage and support volunteers who conduct historical reenactment programs related to the aquatic preserve.

**PI Performance Measure:** Public understanding of archaeological and cultural resources associated with the aquatic preserve is improved.





*Historic Postcard of a tour boat on the Tomoka River 1906.*

#### **4.4 / The Public Use Management Program**

The Public Use Management Program addresses the delivery and management of public use opportunities at the preserve. The components of this program focus on providing the public recreational opportunities within the site's boundaries which are compatible with resource management objectives. The goal for public access management in FCO managed areas is to "promote and manage public use of our preserves and reserves that supports the research, education, and stewardship mission of the FCO."

While access by the general public has always been a priority, the conservation of FCO's sites is the primary management concern for the FCO. It is essential for staff to analyze existing public uses and define management strategies that balance these activities where compatible in a manner that protects natural, cultural, and aesthetic resources. This requires gathering existing information on use, needs, and opportunities, as well as a thorough consideration of the existing and potential impacts to critical upland, wetland, and submerged habitats. This includes the coordination of visitor program planning with social science research. One of FCO's critical management challenges during the next 10 years is balancing anticipated increases in public use with the need to ensure preservation of site resources. This section explains the history and current status of our Public Use efforts.

##### **4.4.1 / Background of Public Use at Tomoka Marsh Aquatic Preserve**

The diverse landscapes in Tomoka Marsh Aquatic Preserve have provided substantial ecological significance and scenic beauty to residents and visitors for more than a hundred years. Access points at state and local parks introduce hundreds of thousands of visitors per year to the aquatic preserve's shorelines and waterways where they can experience a variety of activities. The aquatic preserve draws nature-based tourism from across the state of Florida, as well as nationally and internationally. Recreational crabbing within the aquatic preserve has been popular for more than 50 years. Popular areas include the Old Dixie Highway bridge over the Tomoka River and the Walter Boardman bridge at Bulow Creek. Other recreational uses within Tomoka Marsh Aquatic Preserve include line and net fishing, motor boating, canoeing, kayaking, birding, water skiing, nature study, and picnicking and camping on the Halifax islands. Commercial activities include crabbing and shrimping. The Atlantic Intracoastal Waterway within the Halifax River and Smith Creek is used for recreation and commercial boating activities.



#### 4.4.2 / Current Status of Public Use at Tomoka Marsh Aquatic Preserve

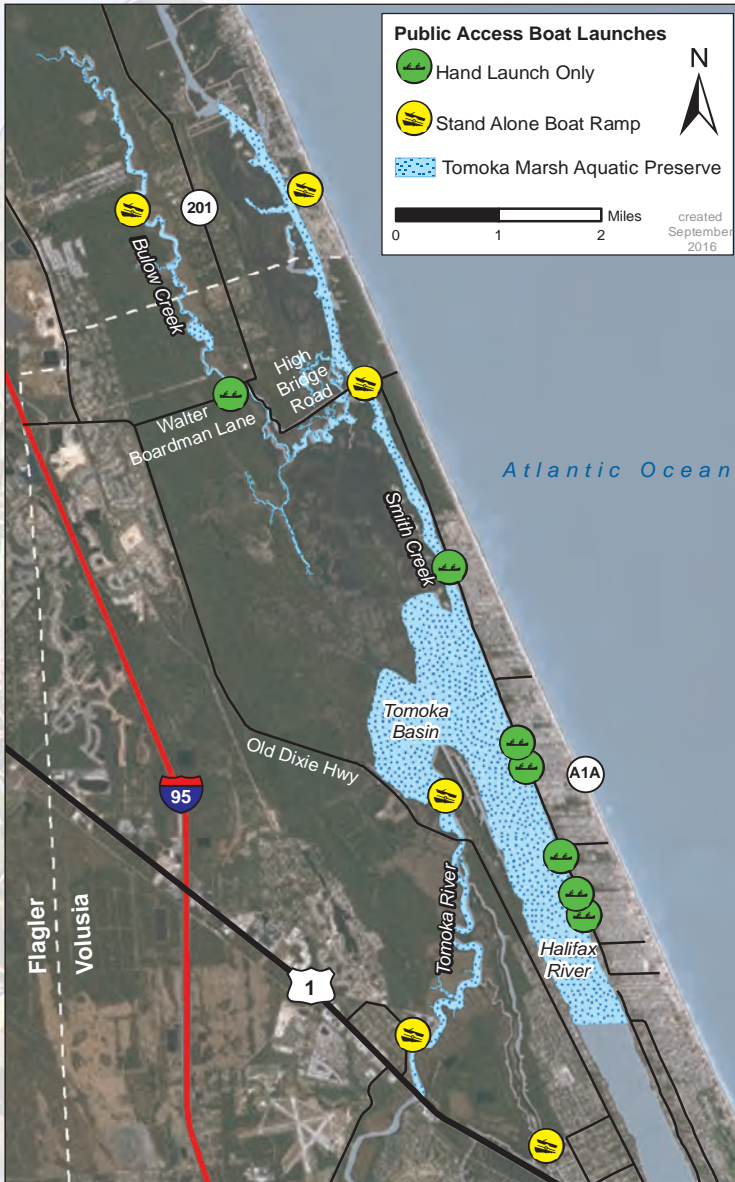
All of the activities mentioned above are still ongoing within the aquatic preserve, but as the general population has increased, visitation to the aquatic preserve has increased as well. An Ormond Beach ordinance prohibits personal watercraft use in the Tomoka River. A rise in personal watercraft use appears to be occurring along the Halifax River. Day use and camping on the Halifax islands has become more popular in recent years leading to greater amounts of litter and damage created by individuals cutting trees for firewood.

Tomoka Marsh Aquatic Preserve staff encourages sustainable use of the natural resources while working to minimize adverse impacts to the aquatic preserve from user groups. Public support and participation

are extremely important to protecting the natural resources within the aquatic preserve. For a natural resource protection or conservation program to be successful it requires user group buy-in to the principles and goals of the program. Once user groups understand how the cumulative effects of their activities affect the aquatic preserve resources and competing user groups, they are more likely to practice personal stewardship and become advocates for protecting those resources.

Public access to Tomoka Marsh Aquatic Preserve is provided via amenities in public parks and on county right-of-ways (Map 22). Access for motor boats, canoes, and kayaks are located at Tomoka State Park, Bulow Creek State Park, Highbridge Park, and Gamble Rogers Memorial State Recreation Area at Flagler Beach. Canoe and kayak launches are located at North Peninsula State Park, Michael Crotty Bicentennial Park, and several locations along John Anderson Drive. Fishing docks are located on county right-of-way along John Anderson Drive at Seabridge Riverfront Park, San Jose Fishing Dock, Briggs Drive Fishing Dock, and Roberta Drive Fishing Dock.

The entities responsible for public access to Tomoka Marsh Aquatic Preserve (state parks, Volusia County, and private vendors) are and have been supportive of educational opportunities. They continue to offer space for signs, posters, and other educational material pertaining to the aquatic preserve and its resources. Tomoka Marsh Aquatic Preserve staff will continue to work to increase awareness about local and regional issues including: manatee habitat and use, water quality and quantity, the importance of a healthy native aquatic plant community, effective control of non-native invasive plants and animals, and the importance of practicing sustainable recreational activities.



Map 22 | Public access at Tomoka Marsh Aquatic Preserve.

### Public Use Issue

#### Issue Four: Public Use (PU)

One of the key factors in protecting the resources of the aquatic preserve for current and future use is maintaining partnerships with user groups, agencies, commercial vendors, individuals, and stakeholders who have an interest in Tomoka Marsh Aquatic Preserve. The processes of maintaining and expanding existing partnerships, and developing new partnerships provides many opportunities to promote stewardship, enlighten audiences, deflect potential conflicts, and encourage sustainable recreation and commercial activities.

**PU Goal 1:** Maintain a safe and natural environment for Tomoka Marsh Aquatic Preserve wildlife, habitats, and user groups.



**PU Objective 1.1:** Identify human use conflicts with natural resources.

**PU Integrated Strategy 1.1.1:** Continue to work with regulatory agencies, law enforcement, and other resource management entities to identify and address uses in Tomoka Marsh Aquatic Preserve that are potentially illegal, unsafe for the public, and/or are harmful to natural resources.

**PU Integrated Strategy 1.1.2:** Partner with other agencies to develop and distribute information identifying potential use conflicts and methods of prevention.

**PU Integrated Strategy 1.1.3:** Provide and encourage opportunities for volunteers to promote river stewardship.

**PU Integrated Strategy 1.1.4:** Continue to promote the use of bycatch reduction devices and encourage sustainable recreational and commercial crabbing.

**PU Performance Measure:** Maintain relationships with regulatory agencies, law enforcement, and other entities to understand, prevent, and deter any potential threats to the resources.

**PU Goal 2:** Promote low-impact, sustainable recreational opportunities.

**PU Objective 2.1:** Expand current partnerships with launch site managers, private businesses and concessionaires who operate on the river systems to encourage activities that are protective of the rivers' natural resources.

**PU Integrated Strategy 2.1.1:** Provide information on "Pack it in, Pack it out" and "Leave No Trace" as needed to help concessionaires educate their customers about proper and sustainable use of the river systems and encourage personal stewardship.

**PU Integrated Strategy 2.1.2:** Work with launch site managers, private business and concessionaires to improve operational practices that address shoreline protection, wake control, litter, and other resource management challenges.

**PU Integrated Strategy 2.1.3:** Assist vendors, including boat rental locations, canoe and kayak liveries, and launch site managers with conveying information about conservation and resource protection to their customers and visitors to the aquatic preserve.

**PU Performance Measure:** Promotion of stewardship is increased at vendor locations and at public launch sites throughout the aquatic preserve through education materials provided by Tomoka Marsh Aquatic Preserve.

**PU Performance Measure:** Litter is decreased in the aquatic preserve.

**PU Performance Measure:** Incidents of damage to natural resources are decreased.

**PU Objective 2.2:** Offer ecotourism programs.

**PU Integrated Strategy 2.2.1:** Provide ecotourism programs to specifically targeted groups, such as classes or clubs, to better educate them about the aquatic preserve's resources and how they can help protect them.

**PU Performance Measure:** Each year, education staff provide two ecotourism programs to target audiences.

**PU Objective 2.3:** Assess the condition of recorded cultural and historical resources within the aquatic preserve.

**PU Integrated Strategy 2.3.1:** Independently or in partnership with professional archaeologists and/or Division of Historical Resources, Bureau of Archaeological Research staff, inspect at least two known archaeological and cultural sites associated with the aquatic preserve per year, and report findings to the Master Site File or as appropriate.

**PU Performance Measure:** Archaeological and cultural sites are visited, and site files updated annually.

**PU Objective 2.4:** Promote protection of cultural and historical resources located within or adjacent to the aquatic preserve.

**PU Integrated Strategy 2.4.1:** Develop and present education programs to the public and interested parties related to specific cultural or historical resources located within the aquatic preserve.

**PU Integrated Strategy 2.4.2:** Support existing or solicit and train new volunteers to present programs on specific cultural or historical resources located within the aquatic preserve.

**PU Performance Measure:** Protection of archaeological and cultural sites is enhanced by stakeholders.







*Driftwood near the Halifax islands.*

### *Part Three*

## **Additional Plans**

### *Chapter Five*

## **Administrative Plan**

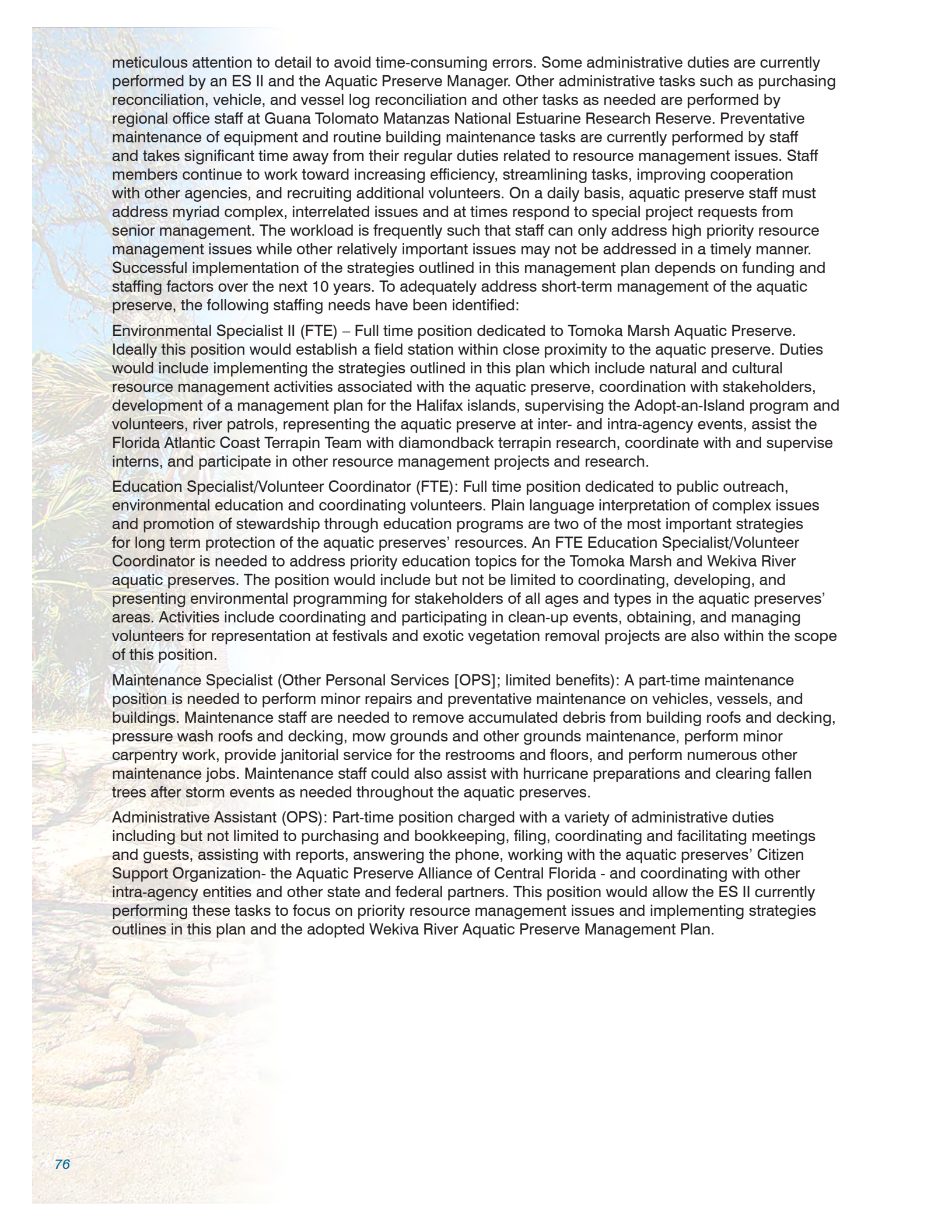
The Tomoka Marsh Aquatic Preserve consists of approximately 3,000 acres including more than 4.5 miles of the Tomoka River, 10 miles of the Halifax River, eight miles of Bulow Creek, and the 376 acre Tomoka Basin. The aquatic preserve covers sections of two central Florida counties: Flagler and Volusia. Portions of these counties range in character from rural to highly developed, especially along the coastline.

The program is currently implemented by the aquatic preserve manager and one full time equivalent (FTE) position (Environmental Specialist (ES) II). Daily and monthly administrative tasks such as purchasing, budget reconciliation, and scheduled reports are typically performed by an ES II who also conducts resource management activities. The small staffing level requires that both team members perform a variety of tasks to ensure priority resource management and administrative tasks are addressed. In addition, the aquatic preserve manager and ES II have resource management responsibilities for the Wekiva River Aquatic Preserve, which includes the designated reach of the St. Johns River, in Lake, Orange, Seminole, and Volusia counties. The aquatic preserve manager supervises a "Wekiva Wild and Scenic River Ambassador" position. The activities conducted by the River Ambassador are limited to the Wekiva River Basin.

### **Projected Staffing Needs**

Over the past ten years, the challenges confronting the health and well-being of the aquatic preserve and surrounding ecosystems have increased. Adequate staff is an important component to addressing and managing the complex resource issues associated with the aquatic preserve. In recent years, administrative tasks have become more complex, often require specific training, and often require





meticulous attention to detail to avoid time-consuming errors. Some administrative duties are currently performed by an ES II and the Aquatic Preserve Manager. Other administrative tasks such as purchasing reconciliation, vehicle, and vessel log reconciliation and other tasks as needed are performed by regional office staff at Guana Tolomato Matanzas National Estuarine Research Reserve. Preventative maintenance of equipment and routine building maintenance tasks are currently performed by staff and takes significant time away from their regular duties related to resource management issues. Staff members continue to work toward increasing efficiency, streamlining tasks, improving cooperation with other agencies, and recruiting additional volunteers. On a daily basis, aquatic preserve staff must address myriad complex, interrelated issues and at times respond to special project requests from senior management. The workload is frequently such that staff can only address high priority resource management issues while other relatively important issues may not be addressed in a timely manner. Successful implementation of the strategies outlined in this management plan depends on funding and staffing factors over the next 10 years. To adequately address short-term management of the aquatic preserve, the following staffing needs have been identified:

**Environmental Specialist II (FTE) – Full time position dedicated to Tomoka Marsh Aquatic Preserve.** Ideally this position would establish a field station within close proximity to the aquatic preserve. Duties would include implementing the strategies outlined in this plan which include natural and cultural resource management activities associated with the aquatic preserve, coordination with stakeholders, development of a management plan for the Halifax islands, supervising the Adopt-an-Island program and volunteers, river patrols, representing the aquatic preserve at inter- and intra-agency events, assist the Florida Atlantic Coast Terrapin Team with diamondback terrapin research, coordinate with and supervise interns, and participate in other resource management projects and research.

**Education Specialist/Volunteer Coordinator (FTE):** Full time position dedicated to public outreach, environmental education and coordinating volunteers. Plain language interpretation of complex issues and promotion of stewardship through education programs are two of the most important strategies for long term protection of the aquatic preserves' resources. An FTE Education Specialist/Volunteer Coordinator is needed to address priority education topics for the Tomoka Marsh and Wekiva River aquatic preserves. The position would include but not be limited to coordinating, developing, and presenting environmental programming for stakeholders of all ages and types in the aquatic preserves' areas. Activities include coordinating and participating in clean-up events, obtaining, and managing volunteers for representation at festivals and exotic vegetation removal projects are also within the scope of this position.

**Maintenance Specialist (Other Personal Services [OPS]; limited benefits):** A part-time maintenance position is needed to perform minor repairs and preventative maintenance on vehicles, vessels, and buildings. Maintenance staff are needed to remove accumulated debris from building roofs and decking, pressure wash roofs and decking, mow grounds and other grounds maintenance, perform minor carpentry work, provide janitorial service for the restrooms and floors, and perform numerous other maintenance jobs. Maintenance staff could also assist with hurricane preparations and clearing fallen trees after storm events as needed throughout the aquatic preserves.

**Administrative Assistant (OPS):** Part-time position charged with a variety of administrative duties including but not limited to purchasing and bookkeeping, filing, coordinating and facilitating meetings and guests, assisting with reports, answering the phone, working with the aquatic preserves' Citizen Support Organization- the Aquatic Preserve Alliance of Central Florida - and coordinating with other intra-agency entities and other state and federal partners. This position would allow the ES II currently performing these tasks to focus on priority resource management issues and implementing strategies outlines in this plan and the adopted Wekiva River Aquatic Preserve Management Plan.





*Tomoka Marsh Aquatic Preserve office.*

## Chapter Six

# Facilities Plan

### Buildings

The offices for the Wekiva River and Tomoka Marsh aquatic preserves are located within Lower Wekiva River Preserve State Park. Preserve state park lands are managed by the Florida Park Service's Wekiva Basin State Parks. Office components include a 2006 1,440 square foot modular office building and a 1974 1,344 square foot converted doublewide mobile home. Both buildings are included on the aquatic preserve property inventory. Boat storage facilities include an open seven-bay pole barn (used for boat and trailer storage). A 10 foot by 14 foot prefabricated enclosed storage shed purchased in 2012 is used for equipment storage and also on the aquatic preserve property inventory.

The 2006 building has office space for the aquatic preserve manager and two Full Time Equivalent (FTE) employees, a central meeting area, copier room, computer service closet, and an Americans with Disabilities Act (ADA) compliant restroom. Outdoor space includes an ADA ramp, a wrap-around boardwalk, and a walkway connecting to the covered porch of the 1974 building. The 1974 building currently provides office space for the grant-funded Other Personal Services (OPS) Wekiva Wild and Scenic River Ambassador. The building also houses a library and reference/educational/display/presentation materials, a computer service area, and provides storage for documents that must be kept on a records retention schedule.

Maintenance for both buildings and the boat storage pole barn includes pressure washing of roofs (approximately 4,500 square feet of roofing) and decks (approximately 1,800 square feet) in addition to regular maintenance. Repairs to the 2006 office completed during fiscal year (FY) 2015-2016, included sealing roof vent leaks, releveling the building, and repair of water-damaged wood around all entrance doors. The 1974 building has exceeded its life expectancy and should be replaced. To improve working conditions until a replacement building is procured, the 1974 building is in need of new air conditioning ductwork. Two wall units were purchased in lieu of new ductwork. The building also requires repairs



to some areas of the walls and plywood flooring, and also requires new floor covering throughout. Repairs to the seven-bay boat storage area were completed in 2012 and included new metal roofing and replacement of rotted rafters. In addition, solar lighting for the boat storage area was installed the same year. Repairs to the non-functioning boat yard water lines are planned as soon as funding is available.

Major repairs to the facilities are performed by outside contractors. Minor but necessary repairs and maintenance that could often avert the need for major repairs require a knowledgeable and skilled maintenance person. Janitorial services have been performed by aquatic preserve staff since the budget cuts of FY 2008-2009. In order to free up time for FTE staff to focus on additional priority resource management projects and properly maintain buildings, part-time maintenance personnel are needed to perform more frequent preventative maintenance of buildings such as clearing leaf debris off decks and roofs, periodic pressure washing of roofs and decks, mowing of grounds and other grounds maintenance, minor carpentry work, and assisting with preventative maintenance of vehicles and vessels. The Wekiva River office and other East Coast aquatic preserve offices would benefit from a circuit maintenance team or periodic assignment of maintenance personnel from other locations to offices that do not have maintenance personnel.

Due to the nature of the aquatic preserve's mission to protect Florida's coastal and aquatic resources, and to better serve the needs of both Tomoka Marsh Aquatic Preserve and Wekiva and Middle St. Johns basin researchers and the public, relocation of the aquatic preserve facilities to a direct river access site within the next 10 years is under consideration. Due to the distance from the office and travel time needed to reach Tomoka and Halifax river field sites, a field station within closer proximity to Tomoka Marsh Aquatic Preserve is also desired. Staff continue to explore appropriate options.

A Central Florida Freshwater Research Station with an education component is envisioned for a direct river access location within the boundary of the Wekiva River Aquatic Preserve. The concept was included in the Wekiva River Aquatic Preserve Management Plan that was adopted October 2015:

Due to the nature of the aquatic preserve's mission to protect Florida's coastal and aquatic resources, relocation of its facilities to a direct river access site within the next 10 years is under consideration. Staff continue discussion with local property owners at several locations. To better serve the needs of basin researchers and the public, a Freshwater Research Center with an education component is envisioned for a direct river access location.

Most research centers in Florida focus on coastal issues and saltwater fisheries. The Florida Department of Environmental Protection's (DEP) Florida Coastal Office has significant experience administrating and supporting research centers, such as the National Estuarine Research Reserves (NERR), so guidance and models are readily available. A concerted funding effort between all partners will be necessary to achieve the goal of Freshwater Research Center. For any new buildings, an effort should be made to utilize green construction components, including highly energy- and water-efficient components and green roofs. The existing 2006 building, ADA ramp and decking can be dismantled and relocated. (DEP, 2015)

A Central Florida Freshwater Research Station managed by the aquatic preserve is intended to be on a smaller scale than the NERRs in Florida. Staff will continue to reach out to various partners to achieve the goal of a Freshwater Research Station. A more central location between the two aquatic preserves would reduce travel time for resource management activities conducted at Tomoka Marsh Aquatic Preserve.

### **Vehicles**

- 2005 Chevrolet four wheel drive hybrid three quarter cab pick-up (114,870 miles, as of June 2017)
  - used for, travel to presentations, boat towing, transporting equipment and volunteers and as support for the Wild and Scenic River Ambassador program and river activities;
  - acquired new.
- 2008 Ford four wheel drive crew cab pick-up (76,337 miles, as of June 2017)
  - used for long-distance boat-towing, equipment hauling, travel to meetings and workshops, and to transport volunteers;
  - acquired new.

### **Vessels**

- 1995 21' SeaArk
  - 2001 50 horsepower four-stroke Mercury motor;
  - used for navigating within two aquatic preserves, volunteer transport for resource management activities, and hauling equipment;
  - boat and trailer are in good condition; motor will need replacing within three years.



- 2007 16' Alumacraft with a 2008 20 horsepower four-stroke Yamaha motor;
  - used for shallow-water navigation, resource management activities and is the primary boat for Wild and Scenic River Ambassador activities
  - boat, motor, and trailer are in good condition.
- 2012 17'8" Carolina skiff with 2012 60 horsepower Mercury four-stroke motor;
  - used for navigating within two aquatic preserves, volunteer transport and for resource management activities; and hauling equipment;
  - boat, motor, and trailer are in good condition.
- Four 17' canoes and trailer;
  - acquired in 2012 for use by the Wild and Scenic River Ambassador through Friends of the Wekiva River and the Wild and Scenic River Program;
  - canoes donated used (estimated at 14 years old);
  - six-slot canoe/kayak trailer purchased new in 2012.
- Four kayaks
  - one acquired in June 2013 for use by the Wild and Scenic River Ambassador through Friends of the Wekiva River and the Wild and Scenic River Program;
  - three acquired in May 2014 for use by the Wild and Scenic River and aquatic preserve programs, volunteers, and ecotourism.
- 1990 Carolina skiff with 1999 30 horsepower four-stroke Mercury motor;
  - skiff and motor need to be surplused;
  - trailer is in fair condition.

The office is surrounded by large oak trees and would benefit from several vehicle bays to protect vehicles from tree limbs. Over the past few years, several dead trees and overhanging limbs within close proximity to buildings, parking areas and boat storage have been cut down or trimmed. Each year, or as the need arises, staff assess if additional dead trees or limbs require trimming or removal. Staff coordinates with the Florida Park Service for this activity and may also contract with a private vendor.

Aquatic preserve staff updates the Hurricane/Catastrophic Event Plan annually. Upon the occasion of a catastrophic event, all facilities, vehicles, and vessels are secured, removed, or attended to according to the plan.

### **Future Needs**

**Land Acquisition** – As stated above, a suitable direct river access location to house the aquatic preserve office and boat storage complex and to provide for a site and building for a Central Florida Freshwater Research Station is desired. A location with closer proximity to Tomoka Marsh Aquatic Preserve is also desired. If a position specific to Tomoka Marsh Aquatic Preserve is provided, low cost and no cost options with the Florida Park Service and other partners could also be investigated. Due to its closer proximity, acquisition of a site along the northern section of the St. Johns River reach of the Wekiva River Aquatic Preserve would benefit resource management activities at Tomoka Marsh Aquatic Preserve by decreasing travel time to Tomoka launches, allowing for quicker response time by staff for site specific Tomoka issues, and allowing staff to spend additional time on-site addressing resource management topics.

**Office Building** – The 1974 converted double wide should be replaced with a building that will provide space for research and education programs and activities. If the aquatic preserve office complex is relocated to a direct river access location in the Wekiva Basin, the site may be within the Wekiva River's designated Riparian Habitat Protection Zone. A two-story structure will minimize the structure's footprint and the required stormwater retention. Several local vendors provide two-story modular structures. A location on the St. Johns River would not be within the Riparian Habitat Protection Zone.

Acquire three covered bays to protect state vehicles from tree limbs and excessive heat. This will be coordinated with the Florida Park Service for necessary approvals.

### **Vehicles**

- Within the next two years, the 2005 Chevrolet four wheel drive hybrid three quarter cab pick-up should be replaced with a F250 crew cab or equivalent. A heavier duty vehicle is required to haul the aquatic preserve's boats due to the weight of four-stroke engines. Crew cab is needed to transport equipment, staff, and volunteers.

- Within the next five to seven years, the 2008 four wheel drive crew cab pick-up should be replaced with a F250 crew cab or equivalent. A heavier duty vehicle is required to haul the aquatic preserve's boats due to the weight of four-stroke engines. Crew cab is needed to transport equipment, staff, and volunteers.

#### **Vessels**

- Replacement of motorized vessels are not needed at this time.
- Eight kayaks for ecotourism programs should be acquired.

#### **Trailers**

- Acquire two trailers capable of carrying six kayaks each.



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## Legal Documents

### A.1 / Aquatic Preserve Resolution

WHEREAS, the State of Florida, by virtue of its sovereignty, is the owner of the beds of all navigable waters, salt and fresh, lying within its territory, with certain minor exceptions, and is also the owner of certain other lands derived from various sources; and

WHEREAS, title to these sovereignty and certain other lands has been vested by the Florida Legislature in the State of Florida Board of Trustees of the Internal Improvement Trust Fund, to be held, protected and managed for the long range benefit of the people of Florida; and

WHEREAS, the State of Florida Board of Trustees of the Internal Improvement Trust Fund, as a part of its overall management program for Florida's state-owned lands, does desire to insure the perpetual protection, preservation and public enjoyment of certain specific areas of exceptional quality and value by setting aside forever these certain areas as aquatic preserves or sanctuaries; and

WHEREAS, the ad hoc Florida Inter-Agency Advisory Committee on Submerged Land Management has selected through careful study and deliberation a number of specific areas of state-owned land having exceptional biological, aesthetic and scientific value, and has recommended to the State of Florida Board of Trustees of the Internal Improvement Trust Fund that these selected areas be officially recognized and established as the initial elements of a statewide system of aquatic preserves for Florida;

NOW, THEREFORE, BE IT RESOLVED by the State of Florida Board of Trustees of the Internal Improvement Trust Fund:

THAT it does hereby establish a statewide system of aquatic preserves as a means of protecting and preserving in perpetuity certain specially selected areas of state-owned land: and

THAT specifically described, individual areas of state-owned land may from time to time be established as aquatic preserves and included in the statewide system of aquatic preserves by separate resolution of the State of Florida Board of Trustees of the Internal Improvement Trust Fund; and

THAT the statewide system of aquatic preserves and all individual aquatic preserves established thereunder shall be administered and managed, either by the said State of Florida Board of Trustees of the Internal Improvement Trust Fund or its designee as may be specifically provided for in the establishing resolution for each individual aquatic preserve, in accordance with the following management policies and criteria:

- (1) An aquatic preserve is intended to set aside an exceptional area of state-owned land and its associated waters for preservation essentially in their natural or existing condition by reasonable regulation of all human activity which might have an effect on the area.
- (2) An aquatic preserve shall include only lands or water bottoms owned by the State of Florida, and such private lands or water bottoms as may be specifically authorized for inclusion by appropriate instrument from the owner. Any included lands or water bottoms to which a private ownership claim might subsequently be proved shall upon adjudication of private ownership be automatically excluded from the preserve, although such exclusion shall not preclude the State from attempting to negotiate an arrangement with the owner by which such lands or water bottoms might be again included within the preserve.
- (3) No alteration of physical conditions within an aquatic preserve shall be permitted except: (a) minimum dredging and spoiling for authorized public navigation projects, or (b) other approved activity designed to enhance the quality or utility of the preserve itself. It is inherent in the concept of the aquatic preserve that, other than as contemplated above, there be: no dredging and filling to create land, no drilling of oil wells or excavation for shell or minerals, and no erection of structures on stilts or otherwise unless associated with authorized activity, within the confines of a preserve - to the extent these activities can be lawfully prevented.
- (4) Specifically, there shall be no bulkhead lines set within an aquatic preserve. When the boundary of a preserve is intended to be the line of mean high water along a particular shoreline, any bulkhead line subsequently set for that shoreline will also be at the line of mean high water.
- (5) All human activity within an aquatic preserve shall be subject to reasonable rules and regulations promulgated and enforced by the State of Florida Board of Trustees of the Internal Improvement Trust Fund and/or any other specifically designated managing agency. Such rules and regulations shall not interfere unduly with lawful and traditional public uses of the area, such as fishing (both sport and commercial), hunting, boating, swimming and the like.
- (6) Neither the establishment nor the management of an aquatic preserve shall infringe upon the lawful and traditional riparian rights of private property owners adjacent to a preserve. In furtherance of these



rights, reasonable improvement for ingress and egress, mosquito control, shore protection and similar purposes may be permitted by the State of Florida Board of Trustees of the Internal Improvement Trust Fund and other jurisdictional agencies, after review and formal concurrence by any specifically designated managing agency for the preserve in question.

(7) Other uses of an aquatic preserve, or human activity within a preserve, although not originally contemplated, may be permitted by the State of Florida Board of Trustees of the Internal Improvement Trust Fund and other jurisdictional agencies, but only after a formal finding of compatibility made by the said Trustees on the advice of any specifically designated managing agency for the preserve in question.

IN TESTIMONY WHEREOF, the Trustees for and on behalf of the State of Florida Board of Trustees of the Internal Improvement Trust Fund have hereunto subscribed their names and have caused the official seal of said State of Florida Board of Trustees of the Internal Improvement Trust Fund to be hereunto affixed, in the City of Tallahassee, Florida, on this the 24th day of November A. D. 1969.

CLAUDE R. KIRK, JR, Governor

TOM ADAMS, Secretary of State

EARL FAIRCLOTH, Attorney General

FRED O. DICKINSON, JR., Comptroller

BROWARD WILLIAMS, Treasurer

FLOYD T. CHRISTIAN, Commissioner of Education

DOYLE CONNER, Commissioner of Agriculture

As and Constituting the State of Florida Board of Trustees of the Internal Improvement Trust Fund

### ***A.2 / Florida Statutes***

All the statutes can be found according to number at [www.leg.state.fl.us/Statutes](http://www.leg.state.fl.us/Statutes)

Florida Statutes, Chapter 253: State Lands

Florida Statutes, Chapter 258: State Parks and Preserves  
Part II (Aquatic Preserves)

Florida Statutes, Chapter 267 (Historical Resources)

Florida Statutes, Chapter 370: Saltwater Fisheries

Florida Statutes, Chapter 372: Wildlife

Florida Statutes, Chapter 403: Environmental Control  
(Statute authorizing the Florida Department of Environmental Protection (DEP) to create Outstanding Florida Waters is at 403.061(27))

Florida Statutes, Chapter 597: Aquaculture

### ***A.3 / Florida Administrative Codes***

All rules can be found according to number at [www.flrules.org/Default.asp](http://www.flrules.org/Default.asp)

Florida Administrative Code, Chapter 18-20: Florida Aquatic Preserves  
[www.dep.state.fl.us/legal/Rules/shared/18-20.pdf](http://www.dep.state.fl.us/legal/Rules/shared/18-20.pdf)

Florida Administrative Code, Chapter 18-21: Sovereignty Submerged Lands Management  
[www.dep.state.fl.us/legal/Rules/shared/18-21.pdf](http://www.dep.state.fl.us/legal/Rules/shared/18-21.pdf)

Florida Administrative Code, Chapter 62-302: Surface Water Quality Standards  
(Rule designating Outstanding Florida Waters is at 62-302.700)  
[www.dep.state.fl.us/legal/Rules/shared/62-302/62-302.pdf](http://www.dep.state.fl.us/legal/Rules/shared/62-302/62-302.pdf)

CITIZEN SUPPORT ORGANIZATION AGREEMENT

THIS AGREEMENT is made the 10<sup>th</sup> day of APRIL, 2015, by the State of Florida Department of Environmental Protection ("Department") for the purposes of recognizing The Aquatic Preserve Alliance of Central Florida, Inc., hereinafter called "Alliance" as an approved Citizen Support Organization for the Wekiva River Aquatic Preserve (including the designated reach of the Middle St. Johns River) and Tomoka Marsh Aquatic Preserve.

PARTIES

1. The Department is an agency of the state created under section 20.255, F.S.
2. The Wekiva River Aquatic Preserve (including the designated reach of the Middle St. Johns River) and Tomoka Marsh Aquatic Preserve is a field office within the Department's Florida Coastal Office (FCO), hereinafter collectively called "WR/TMAP."
3. The WR/TMAP acts as manager over the Wekiva River Aquatic Preserve (including the designated reach of the Middle St. Johns River) and Tomoka Marsh Aquatic Preserve.
4. The Alliance is a not-for-profit Florida corporation incorporated under the provisions of chapter 617, F.S., and approved by the Department of State.

PURPOSE

5. Within the Wekiva River Aquatic Preserve (including the designated reach of the Middle St. Johns River) and Tomoka Marsh Aquatic Preserve, the WR/TMAP conducts resource management activities, restoration and enhancement of habitats and research and educational programs that benefit stakeholders and the public.
6. The Alliance desires to act as an approved Citizen Support Organization ("CSO") for the WR/TMAP, with all rights and privileges provided in section 20.2551, F.S.
7. By this Letter of Agreement, the WR/TMAP has determined that the Alliance's organization and purpose, as provided in the Alliance's Articles of Incorporation, incorporated and made part of this agreement as Attachment A, are consistent with the goals of the Department and are in the best interests of the state.

NOW THEREFORE, it is agreed:

8. The Department hereby grants to the Alliance the exclusive approval to serve as the Citizen Support Organization for the WR/TMAP, in accordance with the provisions of section 20.2551, F.S., subject to all terms and conditions set forth in this agreement.
9. This agreement shall take effect upon execution and shall continue indefinitely or until terminated pursuant to paragraphs 10-11, below, or modified pursuant to paragraph 13, below.
10. Any violation of, or failure to comply with, the terms of this approval shall, at the option of the Department, terminate this agreement after three days from receipt of notice in writing to the Alliance. The Alliance shall further ensure that it meets all not for profit corporate management and tax regulations and, in the event that the CSO ever fails to maintain its nonprofit status, it shall immediately notify the Department.
11. This agreement may be terminated by either party without cause after 90 days from the receipt of notice in writing to the other party.



12. In the event that this Agreement is terminated with or without cause or the CSO otherwise ceases to exist, any remaining assets of the CSO shall be transferred to another approved CSO or donated to WR/TMAP.

13. The Department may modify this Agreement at any time by letter modification or substantial rewrite of this Agreement. The Alliance may either execute the modification or terminate its status as a CSO. The Alliance understands that the Department has established and approved a statewide CSO, the Aquatic Preserve Society Inc. All new CSOs will have the opportunity to join the Aquatic Preserve Society Inc. as a chapter member. The Alliance agrees that the Department may modify this Agreement to incorporate provisions relating to the statewide CSO.

14. The Alliance shall have appropriate use of the WR/TMAP's office located at 8300 W. State Road 46 Sanford, FL 32771 when approved in advance of use by the WR/TMAP Manager.

15. The Alliance is hereby authorized to: conduct programs and activities; raise funds; request and receive grants, gifts, and bequests of money; acquire, receive, hold, invest, and administer, in its own name, securities, funds, objects of value, or other property, real or personal; make expenditures to or for the direct or indirect benefit of the WR/TMAP; and conduct official meetings of the Alliance.

16. All notices and orders given to the Alliance may be served by mail at the following address: The Aquatic Preserve Alliance of Central Florida c/o Scott B. Taylor PO Box 1479 Sorrento, FL 32776-1479. All notices and orders given to the WR/TMAP may be served by mail at the following address: FDEP, WR/TMAP Manager 8300 W. State Road 46 Sanford, FL 32771.

17. The WR/TMAP Manager is hereby designated as the Department's agreement manager and shall be responsible for insuring performance of the terms and conditions of this agreement.

18. The WR/TMAP may permit, without charge, appropriate use of WR/TMAP property, equipment, staff and facilities by the Alliance subject to the conditions of this paragraph. Such use must be directly in keeping with the approved purposes of the Alliance, and may not be made at times or places that would unreasonably interfere with the WR/TMAP's use of property and facilities or normal WR/TMAP operations. In order to use property or facilities of the WR/TMAP, the Alliance must:

A. Comply with all WR/TMAP, FCO, and Department policies, rules and regulations as they may be amended periodically;

B. Develop and submit to the WR/TMAP manager, for review and prior written approval, a program or schedule of all projects, activities and events it plans to carry out on WR/TMAP property, including the designation of a specific location and time for such use, no less than 15 business days prior to the project, activity, or event; and

C. Be responsible for maintaining the property, facilities, or equipment assigned in a clean and orderly state.

19. The Alliance agrees that all funds generated by the Alliance will be used for the direct benefit of the office of the WR/TMAP or in accordance with Article III of Attachment A of this agreement. At no time shall less than 85 percent all revenue collected by the Alliance be used for the direct benefit of the office of the WR/TMAP and its Aquatic Preserves.

20. The Alliance agrees to provide for financial reporting by the submittal of:

A. A Monthly gross sales report, submitted quarterly within 30 days of the end of each calendar quarter; and

B. An annual Profit and Loss (P&L) statement, where "annual" means the state fiscal year, July 1 through June 30, submitted within 30 days of the end of each fiscal year.

21. In accordance with section 215.981(2), F.S., should the Alliance's annual expenditures (of the state fiscal year, July 1 through June 30 of each year) exceed \$300,000, the Alliance shall provide for an annual financial audit of its accounts and records to be conducted by an independent certified public accountant in

accordance with Chapter 10.700, Rules of the Auditor General and Financial Accounting Standards No. 117, Financial Statements of Not-For-Profit Organizations established by the Financial Accounting Standards Board. The audit report shall be submitted within 9 months after the end of the fiscal year to the Auditor General and to the WR/TMAP Manager.

22. The Alliance agrees and consents to allow the WR/TMAP, FCO, or the Department to conduct operational and financial reviews of the Alliance's finances without prior notice.

23. By July 1 of each year, the Alliance shall submit a complete Attachment B the Annual Report, including all attachments thereto, to WR/TMAP.

24. The Alliance agrees to comply with Chapter 119, F.S., and allow public access to all documents, papers, letters, or other material subject to provisions of Chapter 119, Florida

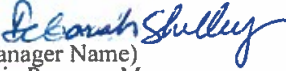
25. It is acknowledged that the Alliance is operating as a citizen support organization and volunteer nonprofit organization for the benefit of the Florida Department of Environmental Protection. As such, activities of the Alliance may be covered by state liability protection as outlined in Sections 110.504 and 768.28, F.S. Nothing in this agreement shall be interpreted to act as a waiver of the state's sovereign immunity.

IN WITNESS WHEREOF, based on the foregoing, the State of Florida Department of Environmental Protection herein approves the Alliance as Citizen Support Organization.

Approved as to form and legality:

STATE OF FLORIDA, DEPARTMENT OF ENVIRONMENTAL PROTECTION

By:   
Attorney

By:   
(Manager Name)  
Aquatic Preserve Manager  
Florida Coastal Office

Signed as a recognition of this LETTER OF AGREEMENT and its conditional approval:

ATTEST:

Alliance:

By:   
Vice-President

By:   
President

RECEIVED  
APR 30 2011  
Florida Coastal Office



## Resource Data

### B.1 / Glossary of Terms

References to these definitions can be found at the end of this list and in Appendix B.2 (References).

**aboriginal** - the original biota of a geographical region. (Lincoln, Boxshall & Clark, 2003)

**anaerobic** - growing or occurring in the absence of molecular oxygen. (Lincoln et al., 2003)

**aquaculture** - the cultivation of aquatic organisms. (Lincoln et al., 2003)

**aquifer** – a body of porous rock or soil through which water passes and in which water gathers (Collin, 2004).

**biodiversity** – the range of species, subspecies or communities in a specific habitat such as a rainforest or a meadow (Collin, 2004).

**biotic community** – a community of organisms in a specific area (Collin, 2004).

**codify** - to arrange laws and rules systematically. (Neufeldt & Sparks, 1990)

**diversity** - a measure of the number of species and their relative abundance in a community. (Lincoln et al., 2003)

**drainage basin (catchment)** - the area from which a surface watercourse or a groundwater system derives its water; watershed. (Allaby, 2005)

**easement** - a right that one may have in another's land. (Neufeldt & Sparks, 1990)

**ecosystem** - a community of organisms and their physical environment interacting as an ecological unit. (Lincoln et al., 2003)

**emergent** - an aquatic plant having most of the vegetative parts above water; a tree which reaches above the level of the surrounding canopy. (Lincoln et al., 2003)

**endangered species** - an animal or plant species in danger of extinction throughout all or a significant portion of its range. (U.S. Fish and Wildlife Service [FWS], 2015)

**endemic** - native to, and restricted to, a particular geographical region. (Lincoln et al., 2003)

**epifauna** – the total animal life inhabiting a sediment surface or water surface; epibenthos. (Lincoln et al., 2003)

**estuary** – a part of a river where it meets the sea and is partly composed of salt water (Collin, 2004).

**extinction** - the disappearance of a species from a given habitat. (Lincoln et al., 2003)

**fauna** - the animal life of a given region, habitat or geological stratum. (Lincoln et al., 2003)

**flora** - the plant life of a given region, habitat or geological stratum. (Lincoln et al., 2003)

**geographic information system (GIS)** - computer system supporting the collection, storage, manipulation and query of spatially referred data, typically including an interface for displaying geographical maps. (Lincoln et al., 2003)

**habitat** – the type of environment in which a specific organism lives (Collin, 2004).

**hydric** - pertaining to water; wet. (Lincoln et al., 2003)

**infauna** - the animal life within a sediment. (Lincoln et al., 2003)

**intertidal zone** - the shore zone between the highest and lowest tides; littoral. (Lincoln et al., 2003)

**listed species** - a species, subspecies, or distinct population segment that has been added to the Federal list of endangered and threatened wildlife and plants. (FWS, 2015)

**mandate** - an order or command; the will of constituents expressed to their representative, legislature, etc. (Neufeldt & Sparks, 1990)

**mesic** - pertaining to conditions of moderate moisture or water supply; used of organisms occupying moist habitats. (Lincoln et al., 2003)

**midden** - a refuse heap; used especially in archaeology. (Lincoln et al., 2003)

**monitoring** – a process of regular checking on the progress of something (Collin, 2004).

**mosaic** - an organism comprising tissues of two or more genetic types; usually used with reference to plants. (Lincoln et al., 2003)

**pollution** – the presence of unusually high concentrations of harmful substances in the environment, as a result of human activity or a natural process (Collin, 2004).

**population** - all individuals of one or more species within a prescribed area. A group of organisms of one species, occupying a defined area and usually isolated to some degree from other similar groups. (Lincoln et al., 2003)

**psammophyte** - a plant growing or moving in unconsolidated sand. (Lincoln et al., 2003)

**ruderal** - pertaining to or living amongst rubbish or debris, or inhabiting disturbed sites. (Lincoln et al., 2003) (FNAI describes ruderal as areas impacted by development measures such as roadways, drainage ditches, navigational channels or are considered hydrological alterations.)

**runoff** - part of precipitation that is not held in the soil but drains freely away. (Lincoln et al., 2003)

**salinity** - a measure of the total concentration of dissolved salts in seawater. (Lincoln et al., 2003)

**sessile** - non-motile; permanently attached at the base. (Lincoln et al., 2003)

**silviculture** - the management of forests or woodlands for the benefit of the entire ecosystem, regardless of whether the land is being exploited commercially for the production of timber and other wood products. Sometimes the term is used interchangeably with "forestry", but is more comprehensive. (Allaby, 2005)

**species** - a group of organisms, minerals or other entities formally recognized as distinct from other groups; the basic unit of biological classification. (Lincoln et al., 2003)

**species of concern** - an informal term referring to a species that might be in need of conservation action. This may range from a need for periodic monitoring of populations and threats to the species and its habitat, to the necessity for listing as threatened or endangered. Such species receive no legal protection and use of the term does not necessarily imply that a species will eventually be proposed for listing. A similar term is "species at risk," which is a general term for listed species as well as unlisted ones that are declining in population. Canada uses the term in its new "Species at Risk Act." "Imperiled species" is another general term for listed as well as unlisted species that are declining. (FWS, 2015)

**stakeholder** - any person or organization who has an interest in the actions discussed or is affected by the resulting outcomes of a project or action. (FWS, 2015)

**subtidal** - environment which lies below the mean low water level. (Allaby, 2005)

**supratidal** - the zone on the shore above mean high tide level. (Lincoln et al., 2003)

**threatened species** - an animal or plant species likely to become endangered within the foreseeable future throughout all or a significant portion of its range. (FWS, 2015)

**turbid** - cloudy; opaque with suspended matter. (Lincoln et al., 2003)

**upland** - land elevated above other land. (Neufeldt & Sparks, 1990)

**vegetation** - plant life or cover in an area; also used as a general term for plant life. (Lincoln et al., 2003)

**water column** - the vertical column of water in a sea or lake extending from the surface to the bottom. (Lincoln et al., 2003)

**watershed** - an elevated boundary area separating tributaries draining in to different river systems; drainage basin. (Lincoln et al., 2003)

**wetland** - an area of low lying land, submerged or inundated periodically by fresh or saline water. (Lincoln et al., 2003)

**wildlife** - any undomesticated organisms; wild animals. (Allaby, 2005)

**xeric** - having very little moisture; tolerating or adapted to dry conditions. (Lincoln et al., 2003)



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### B.3 / Species Lists

#### B.3.1 / Native Species List

Common Name	Species Name	Status
<b>Legend: FT = Federally- and State-Designated Threatened • FE = Federally- and State-Designated Endangered ST = State-Designated Threatened • SE = State-Designated Endangered • SSC = State Species of Special Concern • (S/A) = listed due to similarity of appearance</b>		
<b>Plants</b>		
Giant leather fern	<i>Acrostichum daneifolium</i>	
Bastard false indigo	<i>Amorpha fruticosa</i>	
Torchwood	<i>Amyris elemifera</i>	
Marlberry	<i>Ardisia escallonioides</i>	
Saltwater falsewillow	<i>Baccharis angustifolia</i>	
Groundsel tree	<i>Baccharis halimifolia</i>	
Saltwort	<i>Batis maritima</i>	
Brushy seaside oxeye	<i>Borrichia frutescens</i>	
Pignut hickory	<i>Carya glabra</i>	
Snowberry	<i>Chiococca alba</i>	
Sawgrass	<i>Cladum jamaicense</i>	
Southern swamp lily	<i>Crinum americanum</i>	
Salt grass	<i>Distichlis spicata</i>	
Green-fly orchid	<i>Epidendrum conopseum</i>	
Coral bean	<i>Erythrina herbacea</i>	
White stopper	<i>Eugenia axillaris</i>	
Marsh fimbry	<i>Fimbristylis spadicea</i>	
Florida swamp privet	<i>Forestiera segregata</i>	
Florida pinewood privet	<i>Forestiera segregata</i> var. <i>pinetorum</i>	
Shoal grass	<i>Halodule wrightii</i>	
Scarlet hibiscus	<i>Hibiscus coccineus</i>	
Carolina holly	<i>Ilex ambigua</i>	
Marsh elder	<i>Iva frutescens</i>	
Black needle rush	<i>Juncus roemerianus</i>	
Southern red cedar	<i>Juniperus virginiana</i>	
Carolina sea lavender	<i>Limonium carolinianum</i>	
Christmasberry	<i>Lycium carolinianum</i>	
Wand loosestrife	<i>Lythrum lineare</i>	
Southern magnolia	<i>Magnolia grandiflora</i>	
Wax myrtle	<i>Myrica cerifera</i>	
Southern naiad	<i>Naias quadalupensis</i>	
Shell mound prickly-pear	<i>Opuntia stricta</i>	ST
Red bay	<i>Persea borbonia</i>	
Golden polypody	<i>Phlebodium aureum</i>	
Pickerelweed	<i>Pontederia cordata</i>	
Wild coffee	<i>Psychotria nervosa</i>	
Live oak	<i>Quercus virginiana</i>	
Widgeon grass	<i>Ruppia maritima</i>	
Dwarf palmetto	<i>Sabal minor</i>	
Cabbage palm	<i>Sabal palmetto</i>	
Annual glasswort	<i>Salicornia bigelovii</i>	
Soapberry	<i>Sapindus saponaria</i>	
Perennial glasswort	<i>Sarcocornia ambigua</i>	
Saw palmetto	<i>Serenoa repens</i>	

Common Name	Species Name	Status
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Shoreline seapurslane	<i>Sesuvium portulacastrum</i>	
Saltmarsh cordgrass	<i>Spartina alterniflora</i>	
Sand cordgrass	<i>Spartina bakeri</i>	
Saltmeadow cordgrass	<i>Spartina patens</i>	
Bald cypress	<i>Taxodium distichum</i>	
Cattails	<i>Typha</i> spp.	
Florida coontie	<i>Zamia pumila</i>	
<b>Birds</b>		
Cooper's hawk	<i>Accipiter cooperii</i>	
Sharp-shinned hawk	<i>Accipiter striatus</i>	
Spotted sandpiper	<i>Actitis macularius</i>	
Red-winged blackbird	<i>Agelaius phoeniceus</i>	
Wood duck	<i>Aix sponsa</i>	
Northern pintail	<i>Anas acuta</i>	
Green-winged teal	<i>Anas crecca</i>	
Blue-winged teal	<i>Anas discors</i>	
Anhinga	<i>Anhinga anhinga</i>	
Chuck-will's-widow	<i>Antrostomus carolinensis</i>	
Eastern whip-poor-will	<i>Antrostomus vociferus</i>	
Florida scrub jay	<i>Aphelocoma coerulescens</i>	FT
Ruby-throated hummingbird	<i>Archilochus colubris</i>	
Great egret	<i>Ardea alba</i>	
Great blue heron	<i>Ardea herodias</i>	
Ruddy turnstone	<i>Arenaria interpres</i>	
Lesser scaup	<i>Aythya affinis</i>	
Ring-necked duck	<i>Aythya collaris</i>	
Tufted titmouse	<i>Baeolophus bicolor</i>	
Cedar waxwing	<i>Bombycilla cedrorum</i>	
American bittern	<i>Botaurus lentiginosus</i>	
Great horned owl	<i>Bubo virginianus</i>	
Cattle egret	<i>Bubulcus ibis</i>	
Bufflehead	<i>Bucephala albeola</i>	
Red-tailed hawk	<i>Buteo jamaicensis</i>	
Red-shouldered hawk	<i>Buteo lineatus</i>	
Green heron	<i>Butorides virescens</i>	
Sanderling	<i>Calidris alba</i>	
Dunlin	<i>Calidris alpina</i>	
Rufa red knot	<i>Calidris canutus rufa</i>	FT
Western sandpiper	<i>Calidris mauri</i>	
Least sandpiper	<i>Calidris minutilla</i>	
Semipalmated sandpiper	<i>Calidris pusilla</i>	
Northern cardinal	<i>Cardinalis cardinalis</i>	
Turkey vulture	<i>Cathartes aura</i>	
Veery	<i>Catharus fuscescens</i>	
Hermit thrush	<i>Catharus guttatus</i>	
Gray-cheeked thrush	<i>Catharus minimus</i>	



Common Name	Species Name	Status
<b>Legend: FT</b> = Federally- and State-Designated Threatened • <b>FE</b> = Federally- and State-Designated Endangered <b>ST</b> = State-Designated Threatened • <b>SE</b> = State-Designated Endangered • <b>SSC</b> = State Species of Special Concern • <b>(S/A)</b> = listed due to similarity of appearance		
Swainson's thrush	<i>Catharus ustulatus</i>	
Chimney swift	<i>Chaetura pelagica</i>	
Piping plover	<i>Charadrius melodus</i>	FT
Semipalmated plover	<i>Charadrius semipalmatus</i>	
Killdeer	<i>Charadrius vociferus</i>	
Black tern	<i>Chlidonias niger</i>	
Common nighthawk	<i>Chordeiles minor</i>	
Bonaparte's gull	<i>Chroicocephalus philadelphia</i>	
Northern harrier	<i>Circus Cyaneus</i>	
Marsh wren	<i>Cistothorus palustris</i>	
Sedge wren	<i>Cistothorus platensis</i>	
Yellow-billed cuckoo	<i>Coccyzus americanus</i>	
Northern flicker	<i>Colaptes auratus</i>	
Northern bobwhite	<i>Colinus virginianus</i>	
Common ground-dove	<i>Columbina passerina</i>	
Eastern wood-pewee	<i>Contopus virens</i>	
Black vulture	<i>Coragyps atratus</i>	
American crow	<i>Corvus brachyrhynchos</i>	
Fish crow	<i>Corvus ossifragus</i>	
Yellow rail	<i>Coturnicops noveboracensis</i>	
Blue jay	<i>Cyanocitta cristata</i>	
Bobolink	<i>Dolichonyx oryzivorus</i>	
Pileated woodpecker	<i>Dryocopus pileatus</i>	
Gray catbird	<i>Dumetella carolinensis</i>	
Little blue heron	<i>Egretta caerulea</i>	ST
Reddish egret	<i>Egretta rufescens</i>	ST
Snowy egret	<i>Egretta thula</i>	
Tricolored heron	<i>Egretta tricolor</i>	ST
Swallow-tailed kite	<i>Elanoides forficatus</i>	
White ibis	<i>Eudocimus albus</i>	
Merlin	<i>Falco columbarius</i>	
Peregrine falcon	<i>Falco peregrinus</i>	
Southeastern American kestrel	<i>Falco sparverius paulus</i>	ST
American coot	<i>Fulica americana</i>	
Wilson's snipe	<i>Gallinago delicata</i>	
Common gallinule	<i>Gallinula galeata</i>	
Common loon	<i>Gavia immer</i>	
Gull-billed tern	<i>Gelochelidon nilotica</i>	
Kentucky warbler	<i>Geothlypis formosa</i>	
Common yellowthroat	<i>Geothlypis trichas</i>	
American oystercatcher	<i>Haematopus palliatus</i>	ST
Bald eagle	<i>Haliaeetus leucocephalus</i>	
Worm-eating warbler	<i>Helmitheros vermivorum</i>	
Black-necked stilt	<i>Himantopus mexicanus</i>	
Barn swallow	<i>Hirundo rustica</i>	
Caspian tern	<i>Hydroprogne caspia</i>	
Wood thrush	<i>Hylocichla mustelina</i>	

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Baltimore oriole	<i>Icterus galbula</i>	
Least bittern	<i>Ixobrychus exilis</i>	
Loggerhead shrike	<i>Lanius ludovicianus</i>	
Herring gull	<i>Larus argentatus</i>	
Ring-billed gull	<i>Larus delawarensis</i>	
Great black-backed gull	<i>Larus marinus</i>	
Black rail	<i>Laterallus jamaicensis</i>	
Laughing gull	<i>Leucophaeus atricilla</i>	
Short-billed dowitcher	<i>Limnodromus griseus</i>	
Long-billed dowitcher	<i>Limnodromus scolopaceus</i>	
Swainson's warbler	<i>Limnothlypis swainsonii</i>	
Marbled godwit	<i>Limosa fedoa</i>	
Hooded merganser	<i>Lophodytes cucullatus</i>	
Belted kingfisher	<i>Megaceryle alcyon</i>	
Eastern screech-owl	<i>Megascops asio</i>	
Red-bellied woodpecker	<i>Melanerpes carolinus</i>	
Red-headed woodpecker	<i>Melanerpes erythrocephalus</i>	
Black scoter	<i>Melanitta americana</i>	
White-winged scoter	<i>Melanitta fusca</i>	
Surf scoter	<i>Melanitta perspicillata</i>	
Wild turkey	<i>Meleagris gallopavo</i>	
Swamp sparrow	<i>Melospiza georgiana</i>	
Red-breasted merganser	<i>Mergus serrator</i>	
Northern mockingbird	<i>Mimus polyglottos</i>	
Black-and-white warbler	<i>Mniotilta varia</i>	
Brown-headed cowbird	<i>Molothrus ater</i>	
Wood stork	<i>Mycteria americana</i>	FT
Great crested flycatcher	<i>Myiarchus crinitus</i>	
Yellow-crowned night-heron	<i>Nyctanassa violacea</i>	
Black-crowned night-heron	<i>Nycticorax nycticorax</i>	
Connecticut warbler	<i>Oporornis agilis</i>	
Orange-crowned warbler	<i>Oreothlypis celata</i>	
Tennessee warbler	<i>Oreothlypis peregrina</i>	
Osprey	<i>Pandion haliaetus</i>	
Northern waterthrush	<i>Parkesia noveboracensis</i>	
Savannah sparrow	<i>Passerculus sandwichensis</i>	
Painted bunting	<i>Passerina ciris</i>	
Indigo bunting	<i>Passerina cyanea</i>	
American white pelican	<i>Pelecanus erythrorhynchos</i>	
Brown pelican	<i>Pelecanus occidentalis</i>	
Cliff swallow	<i>Petrochelidon pyrrhonota</i>	
Bachman's sparrow	<i>Peucaea aestivalis</i>	
Double-crested cormorant	<i>Phalacrocorax auritus</i>	
Downy woodpecker	<i>Picoides pubescens</i>	
Hairy woodpecker	<i>Picoides villosus</i>	
Eastern towhee	<i>Pipilo erythrophthalmus</i>	
Summer tanager	<i>Piranga rubra</i>	



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Roseate spoonbill	<i>Platalea ajaja</i>	ST
Glossy ibis	<i>Plegadis falcinellus</i>	
Black-bellied plover	<i>Pluvialis squatarola</i>	
Horned grebe	<i>Podiceps auritus</i>	
Pied-billed grebe	<i>Podilymbus podiceps</i>	
Carolina chickadee	<i>Poecile carolinensis</i>	
Blue-gray gnatcatcher	<i>Poliophtila caerulea</i>	
Sora	<i>Porzana carolina</i>	
Purple martin	<i>Progne subis</i>	
Prothonotary warbler	<i>Protonotaria citrea</i>	
Boat-tailed grackle	<i>Quiscalus major</i>	
Common grackle	<i>Quiscalus quiscula</i>	
Virginia rail	<i>Rallus limicola</i>	
Clapper rail	<i>Rallus longirostris</i>	
Ruby-crowned kinglet	<i>Regulus calendula</i>	
Golden-crowned kinglet	<i>Regulus satrapa</i>	
Bank swallow	<i>Riparia riparia</i>	
Black skimmer	<i>Rynchops niger</i>	ST
Eastern phoebe	<i>Sayornis phoebe</i>	
Ovenbird	<i>Seiurus aurocapilla</i>	
Northern parula	<i>Setophaga americana</i>	
Black-throated blue warbler	<i>Setophaga caerulescens</i>	
Bay-breasted warbler	<i>Setophaga castanea</i>	
Hooded warbler	<i>Setophaga citrina</i>	
Yellow-rumped warbler	<i>Setophaga coronata</i>	
Florida prairie warbler	<i>Setophaga discolor paludicola</i>	
Yellow-throated warbler	<i>Setophaga dominica</i>	
Magnolia warbler	<i>Setophaga magnolia</i>	
Palm warbler	<i>Setophaga palmarum</i>	
Chestnut-sided warbler	<i>Setophaga pensylvanica</i>	
Yellow warbler	<i>Setophaga petechia</i>	
Pine warbler	<i>Setophaga pinus</i>	
American redstart	<i>Setophaga ruticilla</i>	
Blackpoll warbler	<i>Setophaga striata</i>	
Cape may warbler	<i>Setophaga tigrina</i>	
Black-throated green warbler	<i>Setophaga virens</i>	
Yellow-bellied sapsucker	<i>Sphyrapicus varius</i>	
American goldfinch	<i>Spinus tristis</i>	
Chipping sparrow	<i>Spizella passerina</i>	
Northern rough-winged swallow	<i>Stelgidopteryx serripennis</i>	
Forster's tern	<i>Sterna forsteri</i>	
Common tern	<i>Sterna hirundo</i>	
Least tern	<i>Sternula antillarum</i>	ST
Barred owl	<i>Strix varia</i>	
Eastern meadowlark	<i>Sturnella magna</i>	
Tree swallow	<i>Tachycineta bicolor</i>	
Royal tern	<i>Thalasseus maximus</i>	

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Sandwich tern	<i>Thalasseus sandvicensis</i>	
Carolina wren	<i>Thryothorus ludovicianus</i>	
Brown thrasher	<i>Toxostoma rufum</i>	
Lesser yellowlegs	<i>Tringa flavipes</i>	
Greater yellowlegs	<i>Tringa melanoleuca</i>	
Willet	<i>Tringa semipalmata</i>	
Solitary sandpiper	<i>Tringa solitaria</i>	
House wren	<i>Troglodytes hiemalis</i>	
American robin	<i>Turdus migratorius</i>	
Gray kingbird	<i>Tyrannus dominicensis</i>	
Eastern kingbird	<i>Tyrannus tyrannus</i>	
Barn owl	<i>Tyto alba</i>	
Yellow-throated vireo	<i>Vireo flavifrons</i>	
White-eyed vireo	<i>Vireo griseus</i>	
Red-eyed Vireo	<i>Vireo olivaceus</i>	
Blue-headed vireo	<i>Vireo solitarius</i>	
White-winged dove	<i>Zenaida asiatica</i>	
Mourning dove	<i>Zenaida macroura</i>	
<b>Mammals</b>		
River otter	<i>Lutra canadensis</i>	
Bobcat	<i>Lynx rufus</i>	
Round-tailed muskrat	<i>Neofiber alleni</i>	
White-tailed deer	<i>Odocoileus virginianus</i>	
Rice rat	<i>Oryzomys palustris</i>	
Raccoon	<i>Procyon lotor</i>	
Marsh rabbit	<i>Sylvilagus palustris</i>	
Florida manatee	<i>Trichechus manatus latirostris</i>	FT
<b>Reptiles</b>		
American alligator	<i>Alligator mississippiensis</i>	FT(S/A)
Eastern diamondback rattlesnake	<i>Crotalus adamanteus</i>	
Eastern indigo snake	<i>Drymarchon couperi</i>	FT
Gopher tortoise	<i>Gopherus polyphemus</i>	ST
Diamondback terrapin	<i>Malaclemys terrapin</i>	
Atlantic salt marsh snake	<i>Nerodia clarkii taeniata</i>	FT
Florida pine snake	<i>Pituophis melanoleucus mugitus</i>	ST
Peninsula cooter turtle	<i>Pseudemys peninsularis</i>	
<b>Fishes</b>		
Lined sole	<i>Achirus lineatus</i>	
Bonefish	<i>Albula vulpes</i>	
White catfish	<i>Ameiurus catus</i>	
Yellow bullhead	<i>Ameiurus natalis</i>	
Cuban anchovy	<i>Anchoa cubana</i>	
Striped anchovy	<i>Anchoa hepsetus</i>	



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Bay anchovy	<i>Anchoa mitchilli</i>	
American eel	<i>Anguilla rostrata</i>	
Sheepshead	<i>Archosargus probatocephalus</i>	
Hardhead catfish	<i>Ariopsis felis</i>	
Gafftopsail catfish	<i>Bagre marinus</i>	
Silver perch	<i>Bairdiella chrysoura</i>	
Frillfin goby	<i>Bathygobius soporator</i>	
Menhaden	<i>Brevoortia</i> spp.	
Menhaden	<i>Brevoortia tyrannus</i>	
Crevalle jack	<i>Caranx hippos</i>	
Common snook	<i>Centropomus undecimalis</i>	
Rock sea bass	<i>Centropristis philadelphica</i>	
Black sea bass	<i>Centropristis striata</i>	
Atlantic spadefish	<i>Chaetodipterus faber</i>	
Florida blenny	<i>Chasmodes saburrae</i>	
Striped burrfish	<i>Chilomycterus schoepfii</i>	
Atlantic bumper	<i>Chloroscombrus chrysurus</i>	
Spotted whiff	<i>Citharichthys macrops</i>	
Bay whiff	<i>Citharichthys spilopterus</i>	
Darter goby	<i>Ctenogobius boleosoma</i>	
Freshwater goby	<i>Ctenogobius shufeldti</i>	
Spotted seatrout	<i>Cynoscion nebulosus</i>	
Weakfish	<i>Cynoscion regalis</i>	
Sheepshead minnow	<i>Cyprinodon variegatus</i>	
Atlantic stingray	<i>Dasyatis sabina</i>	
Bluntnose stingray	<i>Dasyatis say</i>	
Irish pompano	<i>Diapterus griseus</i>	
Porcupinefish	<i>Diodon hystrix</i>	
Fat sleeper	<i>Dormitator maculatus</i>	
Ladyfish	<i>Elops saurus</i>	
Swamp darter	<i>Etheostoma fusiforme</i>	
Fringed flounder	<i>Etropus crossotus</i>	
Silver jenny	<i>Eucinostomus gula</i>	
Tidewater mojarra	<i>Eucinostomus harengulus</i>	
Striped mojarra	<i>Eugerres plumieri</i>	
Lyre goby	<i>Evorthodus lyricus</i>	
Marsh killifish	<i>Fundulus confluentus</i>	
Gulf killifish	<i>Fundulus grandis</i>	
Striped killifish	<i>Fundulus majalis</i>	
Eastern mosquitofish	<i>Gambusia holbrooki</i>	
Yellowfin mojarra	<i>Gerres cinereus</i>	
Skilletfish	<i>Gobiesox strumosus</i>	
Highfin goby	<i>Gobionellus oceanicus</i>	
Emerald goby	<i>Gobionellus smaragdus</i>	
Naked goby	<i>Gobiosoma bosc</i>	
Code goby	<i>Gobiosoma robustum</i>	
Smooth butterfly ray	<i>Gymnura micrura</i>	

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Scaled sardine	<i>Harengula jaguana</i>	
Brook silverside	<i>Labidesthes sicculus</i>	
Pinfish	<i>Lagodon rhomboides</i>	
Banded drum	<i>Larimus fasciatus</i>	
Spot	<i>Leiostomus xanthurus</i>	
Longnose gar	<i>Lepisosteus osseus</i>	
Florida gar	<i>Lepisosteus platyrhincus</i>	
Redbreast sunfish	<i>Lepomis auritus</i>	
Warmouth	<i>Lepomis gulosus</i>	
Bluegill	<i>Lepomis macrochirus</i>	
Redear sunfish	<i>Lepomis microlophus</i>	
Spotted sunfish	<i>Lepomis punctatus</i>	
Rainwater killifish	<i>Lucania parva</i>	
Gray snapper	<i>Lutjanus griseus</i>	
Lane snapper	<i>Lutjanus synagris</i>	
Tarpon	<i>Megalops atlanticus</i>	
Rough silverside	<i>Membras martinica</i>	
Inland silverside	<i>Menidia beryllina</i>	
Tidewater silverside	<i>Menidia peninsulae</i>	
Southern kingfish	<i>Menticirrhus americanus</i>	
Clown goby	<i>Microgobius gulosus</i>	
Green goby	<i>Microgobius thalassinus</i>	
Opossum pipefish	<i>Micropphis brachyurus</i>	
Atlantic croaker	<i>Micropogonias undulatus</i>	
Largemouth bass	<i>Micropterus salmoides</i>	
Planehead filefish	<i>Monacanthus hispidus</i>	
Striped mullet	<i>Mugil cephalus</i>	
White mullet	<i>Mugil curema</i>	
Speckled worm eel	<i>Myrophis punctatus</i>	
Leather jack	<i>Oligoplites saurus</i>	
Atlantic thread herring	<i>Opisthonema oglinum</i>	
Oyster toadfish	<i>Opsanus tau</i>	
Pigfish	<i>Orthopristis chrysoptera</i>	
Gulf flounder	<i>Paralichthys albigutta</i>	
Summer flounder	<i>Paralichthys dentatus</i>	
Southern flounder	<i>Paralichthys lethostigma</i>	
Fourspot flounder	<i>Paralichthys oblongus</i>	
Sailfin molly	<i>Poecilia latipinna</i>	
Black drum	<i>Pogonias cromis</i>	
Bluefish	<i>Pomatomus saltatrix</i>	
Black crappie	<i>Pomoxis nigromaculatus</i>	
Bighead searobin	<i>Prionotus tribulus</i>	
Cownose ray	<i>Rhinoptera bonasus</i>	
Red drum	<i>Sciaenops ocellatus</i>	
Lookdown	<i>Selene vomer</i>	
Southern puffer	<i>Sphoeroides nephelus</i>	



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Great barracuda	<i>Sphyraena barracuda</i>	
Star drum	<i>Stellifer lanceolatus</i>	
Atlantic needlefish	<i>Strongylura marina</i>	
Redfin needlefish	<i>Strongylura notata</i>	
Timucu	<i>Strongylura timucu</i>	
Blackcheek tonguefish	<i>Symphurus plagiosa</i>	
Chain pipefish	<i>Syngnathus louisianae</i>	
Gulf pipefish	<i>Syngnathus scovelli</i>	
Inshore lizardfish	<i>Synodus foetens</i>	
Permit	<i>Trachinotus falcatus</i>	
Atlantic cutlassfish	<i>Trichiurus lepturus</i>	
Hogchoker	<i>Trinectes maculatus</i>	
Southern hake	<i>Urophycis floridaiana</i>	

### Insects

Salt marsh mosquito	<i>Aedes sollicitans</i>	
Salt marsh mosquito	<i>Aedes taeniorhynchus</i>	
Eastern pigmy blue butterfly	<i>Brephidium isopthalma</i>	

### Crustaceans

Snapping shrimp	<i>Alpheus heterochaelis</i>	
Ivory barnacle	<i>Balanus eburneus</i>	
Blue crab	<i>Callinectes sapidus</i>	
Lesser blue crab	<i>Callinectes similis</i>	
Blue land crab	<i>Cardisoma guanhumii</i>	
Striped hermit crab	<i>Clibanarius vittatus</i>	
Brown shrimp	<i>Farfantepenaeus aztecus</i>	
Pink shrimp	<i>Farfantepenaeus duorarum</i>	
Scuds	<i>Gammarus</i> spp.	
Tanaid	<i>Halmyrapseudes bahamensis</i>	
Wharf roach	<i>Ligia exotica</i>	
White shrimp	<i>Litopenaeus setiferus</i>	
Horseshoe crab	<i>Limulus polyphemus</i>	
Stone crab	<i>Menippe mercenaria</i>	
Grass shrimp	<i>Palaemonetes</i> sp.	
Pea crab	<i>Pinnotheres pisum</i>	
Estuarine mud crab	<i>Rhithropanopeus harrisi</i>	
Wharf crab	<i>Sesarma cinereum</i>	
Purple marsh crab	<i>Sesarma reticulatum</i>	
Mantis shrimp	<i>Squilla empusa</i>	
Red-jointed fiddler	<i>Uca minax</i>	
Sand fiddler crab	<i>Uca pugnator</i>	
Atlantic marsh fiddler	<i>Uca pugnax</i>	
Gulf fiddler	<i>Uca speciosa</i>	
Mangrove fiddler	<i>Uca thayeri</i>	

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<b>Corals</b>		
Sea whip	<i>Leptogorgia virgulata</i>	
<b>Jellyfish</b>		
Moon jelly	<i>Aurelia aurita</i>	
Sea nettle	<i>Chrysaora quinquecirrha</i>	
Cannonball jellyfish	<i>Stomolophus meleagris</i>	
<b>Comb Jellies</b>		
Beroe's comb jellies	<i>Beroe</i> sp.	
<b>Echinoderms</b>		
<b>Mollusks</b>		
Channeled barrel-bubble snail	<i>Acteocina canaliculata</i>	
Atlantic paper mussel	<i>Amygdalum papyrium</i>	
Hooked mussel	<i>Brachidontes recurvus</i>	
Lightning whelk	<i>Busycon perversum</i>	
Conrad's false mussel	<i>Congerina leucophaeata</i>	
Eastern oyster	<i>Crassostrea virginica</i>	
Florida marsh clam	<i>Cyrenoidea floridana</i>	
Florida melampus	<i>Detracia floridana</i>	
Rosy wolfsnail	<i>Euglandina rosea</i>	
Marsh mussel	<i>Guekensia demissa</i>	
Marsh periwinkle	<i>Littorina irrorata</i>	
Common marsh snail	<i>Melampus bidentatus</i>	
Crown conch	<i>Melongena corona</i>	
Dwarf surf clam	<i>Mulinia lateralis</i>	
Olive nerite	<i>Neritina reclivata</i>	
Carolina marsh clam	<i>Polymesoda caroliniana</i>	
Florida marsh clam	<i>Pseudocyrena floridana</i>	
Mimic pond snail	<i>Pseudosuccinea columella</i>	
Dekay's dwarf tellin	<i>Tellina versicolor</i>	
Oyster drill	<i>Urosalpinx cinerea</i>	



### B.3.2 / Listed Species

Common Name	Species Name	Status
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<b>Plants</b>		
Shell mound prickly-pear	<i>Opuntia stricta</i>	SE
<b>Birds</b>		
Florida scrub jay	<i>Aphelocoma coerulescens</i>	FT
Rufa red knot	<i>Calidris canutus rufa</i>	FT
Piping plover	<i>Charadrius melodus</i>	FT
Little blue heron	<i>Egretta caerulea</i>	ST
Reddish egret	<i>Egretta rufescens</i>	ST
Tricolored heron	<i>Egretta tricolor</i>	ST
Southeastern American kestrel	<i>Falco sparverius paulus</i>	ST
American oystercatcher	<i>Haematopus palliatus</i>	ST
Wood stork	<i>Mycteria americana</i>	FT
Roseate spoonbill	<i>Platalea ajaja</i>	ST
Black skimmer	<i>Rynchops niger</i>	ST
Least tern	<i>Sternula antillarum</i>	ST
<b>Mammals</b>		
Florida manatee	<i>Trichechus manatus latirostris</i>	FT
<b>Reptiles</b>		
American alligator	<i>Alligator mississippiensis</i>	FT(S/A)
Eastern indigo snake	<i>Drymarchon couperi</i>	FT
Gopher tortoise	<i>Gopherus polyphemus</i>	ST
Atlantic salt marsh snake	<i>Nerodia clarkii taeniata</i>	FT
Florida pine snake	<i>Pituophis melanoleucus mugitus</i>	ST

### B.3.3 / Invasive Non-native and/or Problem Species

Common Name	Species Name	Plants (FLEPPC* Category) Others (Invasive Status)
<b>Plants</b>		
Australian pine	<i>Casuarina spp.</i>	I
Wild taro	<i>Colocasia esculenta</i>	I
Water hyacinth	<i>Eichhornia crassipes</i>	I
Hydrilla	<i>Hydrilla verticillata</i>	I
Life plant	<i>Kalanchoe pinnata</i>	II
Lantana	<i>Lantana camara</i>	I
Torpedo grass	<i>Panicum repens</i>	I
Water lettuce	<i>Pistia stratiotes</i>	I
Brazilian pepper	<i>Schinus terebinthifolius</i>	I
Cattails	<i>Typha spp.</i>	Problem
<b>Reptiles</b>		
Brown anole	<i>Anolis sagrei</i>	Non-native
<b>Birds</b>		
Rock pigeon	<i>Columba livia</i>	Non-native
European starling	<i>Sturnus vulgaris</i>	Non-native
<b>Mammals</b>		
Raccoon	<i>Procyon lotor</i>	Problem

\*Florida Exotic Pest Plant Council (FLEPPC) categorizes invasive exotic plants as **Category I** (plants that are altering native plant communities by displacing native species, changing community structures or ecological functions, or hybridizing with natives) or **Category II** (plants that have increased in abundance or frequency but have not yet altered Florida plant communities to the extent shown by Category I species).

### B.4 / Arthropod Control Plan

Shapefiles for the boundaries of the aquatic preserve have been made accessible to the appropriate mosquito control district. The area is deemed highly productive and environmentally sensitive. By policy of DEP since 1987, aerial adulticiding is not allowed, but larviciding and ground adulticiding (truck spraying in public use areas) is typically allowed. Mosquito control plans temporarily may be set aside under declared threats to public or animal health, or during a Governor's Emergency Proclamation. Mosquito control plans are typically proposed by local mosquito control agencies when they desire to treat on public lands. There is not an approved arthropod control plan for Tomoka Marsh Aquatic Preserve at this time.



### B.5 / Archaeological Sites Associated with Tomoka Marsh Aquatic Preserve

The list below was derived from information obtained from the Florida Department of State, Division of Historical Resources, and includes sites within .25 miles of Tomoka Marsh Aquatic Preserve.

SiteID	SiteName	Site Type	Location
FL00007	Bulow Sugar Plantation Ruins	Mixed District	Within TMAP
FL00007A	Bulow Plantation-Main House Ruins	House; Sugar mill; Plantation	Within 0.25 miles of TMAP
FL00007C	Bulow Plantation-Slave Houses	Building remains	Within 0.25 miles of TMAP
FL00018	Belle Mead 5	Prehistoric shell midden	Within 0.25 miles of TMAP
FL00019	Belle Mead 6	Prehistoric shell midden	Within 0.25 miles of TMAP
FL00020	Belle Mead 7	Prehistoric shell midden	Within 0.25 miles of TMAP
FL00038	F-8	Archaic Shell Midden; Human Remains noted on site	Within 0.25 miles of TMAP
FL00141	NN	Land-terrestrial; Prehistoric shell midden	Within 0.25 miles of TMAP
FL00142	NN	Land-terrestrial; Historic road segment	Within TMAP
FL00217	South Midden	Orange period shell midden; Ceramics observed	Within TMAP
FL00221	East Creek	Subsurface features are present; Habitation (prehistoric)	Within 0.25 miles of TMAP
FL00230	Lenssen Midden Two	St. Johns period midden	Within TMAP
FL00231	Bulow Creek Site	Ceramic scatter	Within 0.25 miles of TMAP
FL00232	Bulow Creek Mounds	Land-terrestrial	Within 0.25 miles of TMAP
FL00234	Flagler Beach #2	St. Johns period shell and ceramic scatter	Within TMAP
FL00263	Lifeguard Station	Subsurface features are present	Within 0.25 miles of TMAP
FL00897	No Name	Habitation (prehistoric)	Within 0.25 miles of TMAP
VO00063	Tomoka River Midden	Land-terrestrial; Prehistoric burial mound(s)	Within 0.25 miles of TMAP
VO00065	Halifax River 2	Prehistoric midden(s)	Within 0.25 miles of TMAP
VO00066	Halifax River 3	Prehistoric midden(s)	Within 0.25 miles of TMAP
VO00067	Halifax River 4	Prehistoric shell midden	Within TMAP
VO00068	Halifax River 5	Prehistoric midden(s)	Within 0.25 miles of TMAP
VO00081	Tomoka State Park Mounds & Midden	Habitation (prehistoric)	Within TMAP
VO00082	Nocoroco	Historic burial(s)	Within 0.25 miles of TMAP
VO00167	Tomoka Basin 1	Prehistoric midden(s)	Within 0.25 miles of TMAP
VO00193	Addison-Blockhouse	Addison Blockhouse Ruins	Within 0.25 miles of TMAP
VO00245	Mound Grove	Building remains	Within TMAP
VO00246	Bulow Creek Midden	Prehistoric shell midden	Within 0.25 miles of TMAP
VO00248	Belle Mead 1	Prehistoric shell midden	Within TMAP
VO00249	Belle Mead 2	Prehistoric shell midden	Within 0.25 miles of TMAP
VO00255	Old King's Road	Archaeological District	Within 0.25 miles of TMAP
VO00256	Halifax Creek Midden	Prehistoric shell midden	Within 0.25 miles of TMAP
VO00257	Bulow Creek Midden 2	Habitation (prehistoric)	Within TMAP
VO00258	Stevens Inc. Brick	Historic refuse / dump	Within 0.25 miles of TMAP
VO00639	Lost Causeway/Johns Island Dam	Lost Causeway Earthworks	Within 0.25 miles of TMAP
VO00640	Belle Mead Midden	Prehistoric shell midden	Within TMAP
VO02571	Tomoka Stone	Specialized site for procurement of raw materials	Within TMAP
VO02588	Lee Landing	Land-terrestrial	Within TMAP
VO04310	Mount Oswald Plantation	Mixed District	Within TMAP
VO04366	Saw Dust	Other	Within 0.25 miles of TMAP
VO05168	Bacon, Chauncy House	House	Within 0.25 miles of TMAP
VO05169	206 Highbridge Road	House	Within 0.25 miles of TMAP
VO05170	Knox, Charles House	House	Within 0.25 miles of TMAP

SiteID	SiteName	Site Type	Location
VO05171	Perkins, Emma House	House	Within 0.25 miles of TMAP
VO05172	5995 John Anderson Hwy.	House	Within 0.25 miles of TMAP
VO07072	Tomoka Point East	Land-terrestrial	Within 0.25 miles of TMAP
VO07101	US 1 Bridge over Tomoka	Bridge	Within 0.25 miles of TMAP
VO07111	Dilapidated House on US 1	House	Within 0.25 miles of TMAP
VO07112	Duplex A on US 1	Duplex	Within 0.25 miles of TMAP
VO07113	Duplex B on US 1	Duplex	Within 0.25 miles of TMAP
VO07127	Oswald's Ferry Settlement	Land-terrestrial	Within TMAP
VO07165	Rogers Island Midden		Within 0.25 miles of TMAP
VO07182	Dune rubble	Cistern	Within 0.25 miles of TMAP
VO07451	Debris pile	Historic refuse / dump	Within 0.25 miles of TMAP
VO07454	Quarry 1	Other	Within 0.25 miles of TMAP
VO07456	Quarry 2	Other	Within 0.25 miles of TMAP
VO07457	Cedar Spot	Land-terrestrial	Within 0.25 miles of TMAP
VO07458	High Bridge	Ceramic scatter	Within 0.25 miles of TMAP
VO07499	Burns Midden	Burns Midden; St. Johns period habitation	Within 0.25 miles of TMAP
VO07650	Plaza Drive	Prehistoric midden(s)	Within 0.25 miles of TMAP
VO07651	Halifax River 2 Redeposited	Prehistoric shell midden	Within 0.25 miles of TMAP
VO07652	Halifax River3 Redeposited	Artifact scatter-low density (< 2 per sq meter)	Within TMAP
VO08606	Florida East Coast Railroad	Linear Resource	Within 0.25 miles of TMAP
VO09184	Korona Canal Midden	Habitation (prehistoric)	Within 0.25 miles of TMAP
VO09190	Tomoka Basin Midden	Habitation (prehistoric)	Within 0.25 miles of TMAP
VO09191	Tomoka mini-midden	Specialized site for procurement of raw materials	Within 0.25 miles of TMAP
VO09192	Moultrie's Rice Canal	Linear Resource	Within 0.25 miles of TMAP
VO09216	High Bridge	Campsite (prehistoric)	Within TMAP
VO09221	McRae Midden	Specialized site for procurement of raw materials	Within 0.25 miles of TMAP
VO09222	Tomoka River Midden 3	Specialized site for procurement of raw materials	Within TMAP
VO09223	Tomoka River Midden 4	Specialized site for procurement of raw materials	Within 0.25 miles of TMAP
VO09252	Ormond Beach Municipal Airport	Designed Historic Landscape	Within 0.25 miles of TMAP
VO09327	Oswald Indigo Ditch	Linear Resource	Within 0.25 miles of TMAP
VO09390	Leonard B. Knox Bridge	Bridge	Within TMAP
VO09392	Old Dixie Hwy. / Tomoka River	Bridge	Within TMAP
VO09409	Lee's Landing	Land-terrestrial; River/Stream/Creek-riverine	Within TMAP



## Public Involvement

### C.1 / Advisory Committee

The following Appendices contain information about the advisory committee meeting which was held in order to obtain input from the Tomoka Marsh Aquatic Preserve Management Plan Advisory Committee regarding the draft management plan.

#### C.1.1 / List of members and their affiliations

Member	Affiliation
Deborah Shelley	Aquatic Preserve Manager, Tomoka Marsh Aquatic Preserve
Phil Land	Park Manager, Tomoka Basin State Parks
Matthew Bledsoe	Park Manager, Gamble Rogers and North Peninsula state parks
Terry Hansen	DEP DEAR
David Sullivan	Flagler County Commissioner
Tim Telfer	Manager, Flagler County Public Lands and Natural Resource
Mike Lagasse	Land Coordinator, Flagler County
Carl "C.J." Greene	Biologist, FWC Invasive Plant Management Section
Captain Grant Burton	Marine Law Administrator, FWC
Dennis Mudge	Director, UF/IFAS Volusia County
Randy Beardsley	President, Halifax Sport Fishing Club
James Fiske	President, Bulow Parks Historic Alliance, Inc.; Member, Flagler County Historical Society
Paula Wehr	Ormond Scenic Loop & Trail; Past President, Florida Audubon
Dennis Bayer	Property owner
Ron Brockmeyer	SJRWMD
Jan Miller	SJRWMD
Heather Post	Volusia County Commissioner
Tim Baylie	Director, Volusia County Parks
Jim McNelly, Ph.D.	Director, Volusia County Mosquito Control
Georgia Zern	Manager, Volusia County Manatee Protection Program
Katie Tripp	Volusia Soil & Water Conservation District

Regulation, 2601 Blair Stone Road,, Tallahassee, Florida 32399-0772, (850)487-1824 or fax: (850)414-8436. If you are hearing or speech impaired, please contact the agency using the Florida Relay Service, 1(800)955-8771 (TDD) or 1(800)955-8770 (Voice).

If any person decides to appeal any decision made by the Board with respect to any matter considered at this meeting or hearing, he/she will need to ensure that a verbatim record of the proceeding is made, which record includes the testimony and evidence from which the appeal is to be issued.

For more information, you may contact: Mr. Thomas Campbell, Building Codes and Standards Office, Department of Business and Professional Regulation, 2601 Blair Stone Road, Tallahassee, Florida 32399-0772 or call (850)487-1825, refer to [http://www.floridabuilding.org/fbc/meetings/1\\_meetings.htm](http://www.floridabuilding.org/fbc/meetings/1_meetings.htm).

#### DEPARTMENT OF ENVIRONMENTAL PROTECTION

The Florida Department of Environmental Protection, Florida Coastal Office announces a public meeting to which all persons are invited.

DATE AND TIME: Wednesday, June 21, 2017, 6:00 p.m. – 7:30 p.m.

PLACE: Tomoka State Park Recreation Hall, 2099 North Beach Street, Ormond Beach, FL 32174

GENERAL SUBJECT MATTER TO BE CONSIDERED: A draft Tomoka Marsh Aquatic Preserve Management Plan has been prepared by the Florida Coastal Office. The draft plan is available for viewing or download at [http://publicfiles.dep.state.fl.us/CAMA/plans/aquatic/TMAP\\_plan.pdf](http://publicfiles.dep.state.fl.us/CAMA/plans/aquatic/TMAP_plan.pdf). The Florida Coastal Office seeks public comment on the draft. Members of the Tomoka Marsh Aquatic Preserve Management Plan Advisory Committee have also been invited to attend, and listen to comments.

A copy of the agenda may be obtained by contacting: Aquatic Preserve Manager, Deborah Shelley at [Deborah.Shelley@dep.state.fl.us](mailto:Deborah.Shelley@dep.state.fl.us) or (407)330-6727.

Pursuant to the provisions of the Americans with Disabilities Act, any person requiring special accommodations to participate in this workshop/meeting is asked to advise the agency at least 48 hours before the workshop/meeting by contacting: Deborah Shelley at (407)330-6727. If you are hearing or speech impaired, please contact the agency using the Florida Relay Service, 1(800)955-8771 (TDD) or 1(800)955-8770 (Voice).

#### DEPARTMENT OF ENVIRONMENTAL PROTECTION

The Florida Department of Environmental Protection, Florida Coastal Office announces a public meeting to which all persons are invited.

DATE AND TIME: Thursday, June 22, 2017, 9:00 a.m.

PLACE: Tomoka State Park Recreation Hall, 2099 North Beach Street, Ormond Beach, FL 32174

GENERAL SUBJECT MATTER TO BE CONSIDERED: The Tomoka Marsh Aquatic Preserve Management Plan Advisory Committee will meet to discuss possible revisions to the draft Tomoka Marsh Aquatic Preserve Management Plan and comments received at the public meeting scheduled for June 21, 2017 and separately noticed. The draft plan is available for viewing or download at [http://publicfiles.dep.state.fl.us/CAMA/plans/aquatic/TMAP\\_plan.pdf](http://publicfiles.dep.state.fl.us/CAMA/plans/aquatic/TMAP_plan.pdf).

A copy of the agenda may be obtained by contacting: Aquatic Preserve Manager Deborah Shelley at [Deborah.Shelley@dep.state.fl.us](mailto:Deborah.Shelley@dep.state.fl.us) or (407)330-6727.

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#### DEPARTMENT OF HEALTH

The Florida Department of Health announces a public meeting to which all persons are invited.

DATE AND TIME: May 31, 2017, 1:00 p.m.

PLACE: Brevard County Health Department, 2555 Judge Fran Jamieson Way, Melbourne, FL 32940

GENERAL SUBJECT MATTER TO BE CONSIDERED: Inform and solicit feedback from state recognized healthcare coalition representatives for activities, strategies and data related to Budget Period 5, FY 16-17 supporting the continued development of coalitions.

A copy of the agenda may be obtained by contacting: Lela Shepard, (850)245-4444, ext. 3396.

Pursuant to the provisions of the Americans with Disabilities Act, any person requiring special accommodations to participate in this workshop/meeting is asked to advise the agency at least 2 days before the workshop/meeting by contacting: Lela Shepard, (850)245-4444, ext. 3396. If you are hearing or speech impaired, please contact the agency using the Florida Relay Service, 1(800)955-8771 (TDD) or 1(800)955-8770 (Voice).

For more information, you may contact: Lela Shepard, (850)245-4444, ext. 3396.

#### DEPARTMENT OF CHILDREN AND FAMILIES

The Department of Children and Families announces a public meeting to which all persons are invited.

DATE AND TIME: May 25, 2017, 2:00 p.m.





## Florida Department of Environmental Protection

Wekiva River and Tomoka Marsh Aquatic Preserves  
8300 West State Road 46  
Sanford, Florida 32771

Rick Scott  
Governor

Carlos Lopez-Cantera  
Lt. Governor

Noah Valenstein  
Secretary

### Tomoka Marsh Aquatic Preserve Draft Management Plan Advisory Committee Meeting Thursday, June 22, 2017, 9:00 a.m. Tomoka State Park Recreation Hall 2099 North Beach Street Ormond Beach, Florida 32174

Attendees: Tim Baylie, Volusia County Parks and Recreation; Matthew Bledsoe, Gamble Rogers Memorial State Recreation Area; C.J. Greene, Florida Fish and Wildlife Conservation Commission, Invasive Plant Management Section; Mike Lagasse, Flagler County Land Management Coordinator; Jim McNelly, Volusia County Mosquito Control District; Jan Miller, St. Johns River Water Management District; Dennis Mudge, UF/IFAS Extension, Volusia County; Phil Rand, Tomoka Basin State Parks; Katie Tripp, Volusia Soil and Water Conservation District; Paula Wehr, Florida Audubon; Georgia Zern, Volusia County Environmental Management.  
Staff: Deborah Shelley, Tomoka Marsh Aquatic Preserve (TMAP); Barbara Howell (TMAP); Charley DuToit (TMAP); Suzi Porterfield, Guana Tolomato Matanzas, National Estuarine Research Reserve (GTMNERR); Earl Pearson, Florida Coastal Office (FCO); Penny Isom (FCO)

Penny welcomed everyone and introductions were done around the room. A brief recap of the previous night's public meeting was given with the comments from each station read aloud.

The floor was open to discussion regarding the identified issues and any other issues. The discussion flowed across all of the issues but for summary purposes, comments were categorized under one of the three issue sections below. (Comments for issues 3 and 4 were grouped together.)

#### **Issue One: Water Quality**

- Tomoka Basin State Parks (TBSP) requested if Tomoka Marsh Aquatic Preserve (TMAP) could share updated WQ information, such as TMDL assessments, for the park's use in evaluating the effect of their land management programs on the adjacent waterways in the aquatic preserve. The TMAP manager agreed to share water quality information.

- Volusia County Mosquito Control District (VCMCD) asked the TMAP manager if the aquatic preserve had a liaison with county departments that are involved with water quality, such as wastewater treatment facilities and the road and bridge department that manages stormwater utilities. He further recommended the coordination of the aquatic preserve's water quality objectives with the county's project planning for future water quality improvements. (Kelly Young manages water quality monitoring for the county.)
- TMAP indicated that their primary contact for water quality information and ongoing programs is various DEP staff that conduct watershed assessments and TMDL analysis in the waterways of the aquatic preserve.
- Several members of the advisory group have been involved with the mapping and restoration of oyster beds which are a biological indicator of the health of water quality in estuaries.
- St. Johns River Water Management District (SJRWMD) and the University of Central Florida produced an aerial map of oyster beds in the coastal estuaries from the Georgia border to Ponce Inlet. The map shows the general distribution of oyster beds in coastal basins, but the level of definition may not include individual reefs in the aquatic preserve.
- Ground surveys (by water) are needed to map the oyster reefs at TMAP. SJRWMD has surveyed some of the reefs in the aquatic preserve and will continue as resources are available.
- An Oyster Health Index is used at the Guana Tolomato Matanzas National Estuarine Research Reserve (GTMNERR) which would provide a standard protocol for the assessment of oyster beds in TMAP.
- TMAP has a small staff and limited funds to support an oyster survey in the five waterways of the aquatic preserve.
- There are non-profit organizations such as The Estuaries Foundation which coordinate with colleges and universities to involve students in coastal research projects.
- Volunteers in the Citizens Support Organization (CSO) at Gamble Rogers Memorial State Recreation Area (Gamble Rogers) participate in an ongoing project to stabilize shoreline and increase oyster habitat by the placement of oyster bags along the intertidal edge of Smith Creek.
- Volusia County Environmental Management (VCEM) also uses volunteers for their Living Shoreline program which includes the restoration of oyster beds in degraded habitats.
- Septic tanks in residential areas bordering the aquatic preserve have been identified as a source of nutrient contamination.
- The high cost of central sewer connection and monthly fees incurred by homeowners may not generate much public support. Advanced wastewater technology is available to improve the water quality of on-site treatment. Improvements to on-site systems that result in increased nutrient removal or connection to central wastewater systems with potential grant funding is encouraged by TMAP.
- The use of pressure systems rather than gravity flow can reduce the cost of an on-site system.



- New designs of drain fields, such as the use of bio-active sands, have greater efficiency in removing nutrients, particularly nitrogen which is not captured by older septic systems.
- Local governments can reduce the homeowner's expense for central treatment facilities by cost-sharing agreements with state and federal programs. The success of domestic waste improvement projects may depend on the homeowners' sense of ownership and support for water quality improvements in local waterways.
- The discharge of silt from Korona Canal into Bulow Creek is a concern to TBSP. The park manager asked TMAP about monitoring sediment loading in Bulow Creek and if projects were planned to reduce sediments in Korona Canal.
- TMAP mentioned that VCMCD removed several large sandbars in Bulow Creek at the mouth of Korona Canal and installed check dams in the canal to capture sediments before discharge to the creek more than 10 years ago. TMAP agreed that monitoring was needed and that the check dams required regular maintenance by Volusia County.

#### **Issue Two: Wildlife and Habitat**

- The lower Tomoka River and upper Halifax River in TMAP are respectively designated as a state manatee sanctuary and federal manatee refuge. The state and federal designations include boat speed zones and VCEM has developed marina siting standards based on manatee activity and mortality in the waterways.
- There are numerous sources of volunteers for observing manatees in TMAP, but one concern is that citizen-volunteer participation has the potential for disrupting manatee behavior.
- VCEM conducts a program, Manatee Watch, which trains volunteers in the observation and identification of manatees without altering manatee behavior. The program manager is interested in expanding the program to Strickland, Thompson, and Dodson creeks which are known calving and nursing areas. TMAP referred VCEM to the Tomoka State Park which may have more volunteers. The three creeks are not included in the aquatic preserve boundary.
- Several members of the Advisory Group identified the need for educational outreach to individuals and groups that may encounter manatees during recreational use of the TMAP waterways.
- The manager of TBSP suggested that the TMAP CSO, the Aquatic Preserve Alliance of Central Florida, could coordinate with the park CSO to develop programs on manatees, terrapins, horseshoe crabs and other estuarine inhabitants that are of interest to the public.
- It was mentioned again that citizen-volunteer participation has the potential for disrupting manatee behavior and that manatees can potentially be harmed by human interaction.
- Outreach programs to train tour leaders, watercraft vendors, concessionaires and other water-related businesses would increase environmental awareness and promote outdoor ethics to a variety of recreational interests and large numbers of user groups. Several resources were identified including the Society of Ethical Ecotourism and Ripple Effect Outdoors which operate in northeast Florida.
- The eradication and control of invasive upland and aquatic plants is ongoing management program in the aquatic preserve. TMAP has worked with DEP and

the Florida Fish and Wildlife Conservation Commission (FWC) Invasive Plant Management Section (IPMS) since 1990 to map and remove invasive aquatic species from Bulow Creek. In 2009, FWC IPMS assisted TMAP with mapping Australian pine and Brazilian pepper on the Halifax islands and estimated about eleven acres of Brazilian pepper and five acres of Australian pine. Funds were available in the 2016 TMAP budget and a contractor was hired who cut down and stump treated approximately three acres of Australian pine. In May and June 2017, Australian pine was removed from the six northernmost Halifax islands with funds and staff provided by GTMNERR. Additional resources will be needed to eradicate the remaining Australian pine and control Brazilian pepper growth on the 12 islands.

- The manager of the Gamble Rogers' CSO has a "pepper buster" group that works independently, without staff supervision, on weekly treatments of Brazilian pepper in the park. The cutters are chain-saw certified and the crew removes all treated brush to a burn pile at Gamble Rogers.
- The TMAP CSO could recruit, train, and equip volunteers for exotic removal. This would be greatly facilitated by a partnership with the Gamble Rogers CSO.
- TMAP manager mentioned the difficulty of treating exotics on the Halifax islands due to access issues, transporting all equipment by boat, and other potential liabilities related to working with volunteers in remote areas accessible only by boat.
- Funding for hiring experienced contractors for exotic removal is expected to continue and TMAP will coordinate with (FCO), FWC IPMS and other funding sources.
- The Advisory Group continued the discussion of exotics with comments on specific treatment and disposal methods for Australian pines and Brazilian pepper.
- A former TMAP volunteer recalled an early treatment of Australian pine on the Halifax islands by VCMCD in which cut trunks were left on the ground and appeared to deteriorate rapidly compared to other woody species.
- The TMAP manager would like to investigate the use of Australian pine logs for firewood, to reduce damage to native trees which have occasionally been illegally cut at some campsites on the islands.
- VCMCD removes treated Brazilian pepper where feasible, as the standing dead trees form nearly impenetrable thickets making the treatment of Brazilian pepper seedling regrowth a demanding task.
- Volusia County Soil and Water Conservation District added that Brazilian pepper is allelopathic which prevents the growth of native plants under Brazilian pepper stands. The removal or defoliation of the canopy results in Brazilian pepper regeneration which, if not treated, results in a replacement stand of Brazilian pepper.
- FWC IPMS described a mechanical "chipper" that grinds trees and shrubs into mulch that inhibits Brazilian pepper seedling regrowth. Native plants start growth in mulched areas after about a year.
- TBSP uses a Fecon mower which is similar to treatments by a chipper-mulcher but is very compact track vehicle, about the size of a "Bobcat."



- The logistics of transporting a mechanical chipper or mower to the Halifax islands, and crossing wetlands between islands, requires more resources than are currently available to TMAP, but could be considered as possible method of treatment.
- Another option suggested was to use boats to haul away Brazilian pepper cut by hand crews on the islands. The TMAP skiff and other local craft could be enlisted to shuttle debris across the channel to a landing, such as Bicentennial Park, where Brazilian pepper debris could be loaded into trucks and taken to a burn pile.
- SJRWMD has access to a barge that can carry a large volume of vegetation but the cost of moving a barge may be prohibitive. Volusia County Soil and Water Conservation District suggested that the use of a barge might feasibly be obtained as mitigation for a coastal construction project.

**Issues Three and Four: Public Awareness and Public Use**

- In previous sections, the Advisory Group discussed outreach programs aimed at reducing recreational impacts on the estuarine environment and the need to increase public awareness of water quality issues.
- Volusia County Parks and Recreation has developed a software application (app) for mobile phones that provides information for a diversity of outdoor recreational interests, including descriptions of parks and preserves, upland trails and canoe trails, boat launch sites, birding locations and other features. Unlike printed guides, the app has a GIS component, providing directions to a site, and “locate and track” functions for users to plan their own excursions and identify points of interest.
- A concern was stated that the mobile app, designed to appeal to younger users (who almost universally communicate by digital devices) may not understand their potential impact on wildlife habitats, such as shorebird nesting colonies on sandbars, and archeological sites.
- The app is updated annually and although it cannot provide information on seasonal habitat use or short-notice events such as prescribed fires, the app could provide a link to a website for active alerts.
- The primary method of advertising the app is by posting informational signs at trailheads and park entrances. The posters contain a QR code for downloading to mobile phones.
- TMAP would like to provide information on the aquatic preserve, including GIS maps, to be included in future updates of the Volusia County Parks and Recreation mobile app.
- Volusia County Parks and Recreation also described the Sun Trail System, a multi-use, non-motorized trail that is presently proposed for 270 miles, connecting central Florida trails with St. Augustine. The planned extension of a coastal trail to Titusville could include links to kayak and canoe launches in the aquatic preserve.
- TBSP expressed concern about the harvest of blue crabs, noting an increase in traps in the Walter Boardman Bridge area of Bulow Creek. The manager asked if blue crab populations are monitored, and mentioned that unregulated crabbing may be occurring in the backwaters of Bulow Creek State Park.

- FWC regulates the commercial harvest of blue crabs: each boat must be registered with a visible ID number, crab buoys are similarly marked, and each trap must have an identification tag.
- FWC law enforcement has limited personnel for a large patrol area. If unlawful activity is observed, it should be reported to an FWC hotline. If the public or agency staff suspect illegal crabbing, FWC recommends that, in addition to location, the observer note patterns of use that would enable FWC to plan an interdiction action.
- VCEM and VCMCD have done surveys of derelict crab traps in the Mosquito Lagoon. All traps are located by aerial surveys of the shallow lagoon. Then during the closed season, when active crabbers remove their traps, the county removes the remaining derelict traps using an airboat.
- GTMNERR surveys crab traps by boat, identifying each by GPS location, then returning in the closed season to remove derelict traps.
- Aerial and ground surveys would not be effective in locating derelict traps in the lower Tomoka River in TMAP. During the FMRI fish survey in the 1990s, numerous derelict traps were caught in channel trawls. The manager estimated that more than 200 traps were removed during the fish survey.
- Commercial crabbers should be encouraged to use Terrapin Excluder Devices (TEDs) to reduce the bycatch of diamondback terrapins in traps. In addition to educating the public about terrapins and TEDs by information media and presentations, outreach to is needed to provide TEDs to commercial crabbers willing to test the impact of devices on catch and effectiveness in reducing the capture of terrapins in crab traps.
- There are numerous historical and archaeological sites along the shoreline of Tomoka Basin that are eroding, resulting in the deposition of site substrates (oyster shell midden, bricks, etc.) and artifacts in adjacent waterways of the aquatic preserve. TMAP should coordinate with TBSP and the Division of Historical Resources on the management and assessment of these transitional sites with upland and submerged components.

At the close of the meeting, Penny explained the next steps in the management plan process: Acquisition and Restoration Council meeting (a public meeting in Tallahassee), and Governor and Cabinet meeting. The advisory council was reminded that comments could still be added on or before July 5, 2017, and they were thanked for their time and effort.

After the advisory group meeting, the manager of TBSP provided a field tour of the Tomoka Point project which involved the construction of a coquina rock revetment around the shoreline to repair existing and prevent further erosion. Oyster bags were used to create a living reef to dissipate wave energy, and provide habitat for estuarine organisms.



## C.2 / Formal Public Meeting

The following Appendices contain information about the Formal Public Meeting(s) which was held in order to obtain input from the public about the Tomoka Marsh Aquatic Preserve Draft Management Plan.

### C.2.1 / Florida Administrative Register Posting

*Florida Administrative Register*

*Volume 43, Number 98, May 19, 2017*

Regulation, 2601 Blair Stone Road., Tallahassee, Florida 32399-0772, (850)487-1824 or fax: (850)414-8436. If you are hearing or speech impaired, please contact the agency using the Florida Relay Service, 1(800)955-8771 (TDD) or 1(800)955-8770 (Voice).

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**DEPARTMENT OF ENVIRONMENTAL PROTECTION**  
The Florida Department of Environmental Protection, Florida Coastal Office announces a public meeting to which all persons are invited.

**DATE AND TIME:** Wednesday, June 21, 2017, 6:00 p.m. – 7:30 p.m.

**PLACE:** Tomoka State Park Recreation Hall, 2099 North Beach Street, Ormond Beach, FL 32174

**GENERAL SUBJECT MATTER TO BE CONSIDERED:** A draft Tomoka Marsh Aquatic Preserve Management Plan has been prepared by the Florida Coastal Office. The draft plan is available for viewing or download at [http://publicfiles.dep.state.fl.us/CAMA/plans/aquatic/TMAP\\_plan.pdf](http://publicfiles.dep.state.fl.us/CAMA/plans/aquatic/TMAP_plan.pdf). The Florida Coastal Office seeks public comment on the draft. Members of the Tomoka Marsh Aquatic Preserve Management Plan Advisory Committee have also been invited to attend, and listen to comments.

A copy of the agenda may be obtained by contacting: Aquatic Preserve Manager, Deborah Shelley at [Deborah.Shelley@dep.state.fl.us](mailto:Deborah.Shelley@dep.state.fl.us) or (407)330-6727.

Pursuant to the provisions of the Americans with Disabilities Act, any person requiring special accommodations to participate in this workshop/meeting is asked to advise the agency at least 48 hours before the workshop/meeting by contacting: Deborah Shelley at (407)330-6727. If you are hearing or speech impaired, please contact the agency using the Florida Relay Service, 1(800)955-8771 (TDD) or 1(800)955-8770 (Voice).

**DEPARTMENT OF ENVIRONMENTAL PROTECTION**  
The Florida Department of Environmental Protection, Florida Coastal Office announces a public meeting to which all persons are invited.

**DATE AND TIME:** Thursday, June 22, 2017, 9:00 a.m.

**PLACE:** Tomoka State Park Recreation Hall, 2099 North Beach Street, Ormond Beach, FL 32174

**GENERAL SUBJECT MATTER TO BE CONSIDERED:** The Tomoka Marsh Aquatic Preserve Management Plan Advisory Committee will meet to discuss possible revisions to the draft Tomoka Marsh Aquatic Preserve Management Plan and comments received at the public meeting scheduled for June 21, 2017 and separately noticed. The draft plan is available for viewing or download at [http://publicfiles.dep.state.fl.us/CAMA/plans/aquatic/TMAP\\_plan.pdf](http://publicfiles.dep.state.fl.us/CAMA/plans/aquatic/TMAP_plan.pdf).

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**DEPARTMENT OF HEALTH**

The Florida Department of Health announces a public meeting to which all persons are invited.

**DATE AND TIME:** May 31, 2017, 1:00 p.m.

**PLACE:** Brevard County Health Department, 2555 Judge Fran Jamieson Way, Melbourne, FL 32940

**GENERAL SUBJECT MATTER TO BE CONSIDERED:** Inform and solicit feedback from state recognized healthcare coalition representatives for activities, strategies and data related to Budget Period 5, FY 16-17 supporting the continued development of coalitions.

A copy of the agenda may be obtained by contacting: Lela Shepard, (850)245-4444, ext. 3396.

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**DEPARTMENT OF CHILDREN AND FAMILIES**

The Department of Children and Families announces a public meeting to which all persons are invited.

**DATE AND TIME:** May 25, 2017, 2:00 p.m.

2325

Florida Department of Environmental Protection • Florida Coastal Office



# Tomoka Marsh Aquatic Preserve Management Plan Public Meeting

**Wednesday, June 21, 2017**  
**6:00 pm - 7:30 pm**

Tomoka State Park Recreation Hall  
2099 North Beach Street  
Ormond Beach, FL 32174

To view the draft plan, please visit:  
[http://publicfiles.dep.state.fl.us/CAMA/plans/aquatic/TMAP\\_plan.pdf](http://publicfiles.dep.state.fl.us/CAMA/plans/aquatic/TMAP_plan.pdf)

The Florida Department of Environmental Protection's Florida Coastal Office (FCO) is responsible for the management of Florida's 41 aquatic preserves, three National Estuarine Research Reserves, a National Marine Sanctuary, Florida Coastal Management Program, Outer Continental Shelf Program, and Coral Reef Conservation Program. These protected areas comprise more than 4 million acres of the most valuable submerged lands and select coastal uplands in Florida. FCO is updating management plans, and is currently seeking input on the draft Tomoka Marsh Aquatic Preserve management plan.

**Meeting objectives:**

1. Review purpose and process for revising the Tomoka Marsh Aquatic Preserve management plan.
2. Present current draft plan with a focus on issues, goals, objectives and strategies.
3. Receive input on the draft management plan.

The information from the meeting will be compiled and used by FCO in the revision of the draft management plan.

Please contact Deborah Shelley, (407) 330-6727, [Deborah.Shelley@dep.state.fl.us](mailto:Deborah.Shelley@dep.state.fl.us) or visit our website at [www.dep.state.fl.us/coastal/sites/tomoka/](http://www.dep.state.fl.us/coastal/sites/tomoka/) for more information or to request a written copy of the plan. Written comments are welcome and can be submitted by email to [FloridaCoasts@dep.state.fl.us](mailto:FloridaCoasts@dep.state.fl.us) on or before **July 5, 2017**.

Pursuant to the provisions of the Americans with Disabilities Act, any person requiring special accommodations to participate in this workshop/meeting is asked to advise the agency at least 48 hours before the workshop/meeting by contacting Deborah Shelley at (407) 330-6727 or [Deborah.Shelley@dep.state.fl.us](mailto:Deborah.Shelley@dep.state.fl.us). If you are hearing or speech impaired, please contact the agency using the Florida Relay Service, (800) 955-8771 (TDD) or (800) 955-8770 (Voice).

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# CLASSIFIEDS

Thursday, June 8, 2017

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### Announcements

The Florida Department of Environmental Protection, Florida Coastal Office announces a public meeting to receive comments on the Tomoka Marsh Aquatic Preserve draft management plan. The meeting will be held in Volusia County on June 21, 2017, 6:00-7:30 p.m. at Tomoka State Park Recreation Hall, 2099 North Beach Street, Ormond Beach, FL 32174.

A copy of the draft plan is posted at [http://publicfiles.dep.state.fl.us/CAWA/plans/aquatic/TMAP\\_plan.pdf](http://publicfiles.dep.state.fl.us/CAWA/plans/aquatic/TMAP_plan.pdf). For the agenda, contact the preserve Manager, Deborah Shelley by e-mail: Deborah.Shelley@dep.state.fl.us, by phone (407)330-6727, or by mail: 8300 West State Road 46, Sanford, FL 32771. If special accommodation is required for participation contact the manager 48 hours in advance. If you are hearing or speech impaired, please contact the agency using the Florida Relay Service, 1(800)955-8771 (TDD) or 1(800)955-8770 (Voice).

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### This week's Celebrity Cipher answers

**Puzzle One Solution:**  
 "This vast operation is undoubtedly the most complicated and difficult that has ever occurred." — Winston Churchill, on D-Day

**Puzzle Two Solution:**  
 "It would be great to interview men about feminism and not women. They need to change: we know women are great." — Peaches

### This week's Sudoku answers

3	8	1	7	4	2	6	9	5
6	2	7	8	9	5	4	1	3
9	4	5	6	1	3	7	2	8
5	9	2	1	8	4	3	7	6
8	1	3	5	7	6	2	4	9
4	7	6	2	3	9	8	5	1
1	6	9	4	2	8	5	3	7
2	3	8	9	5	7	1	6	4
7	5	4	3	6	1	9	8	2

### This week's Crossword answers

C	O	B	R	A	A	C	T	S	J	A	B	S	A	B	A	O			
A	B	E	A	M	B	L	O	C	E	L	S	M	O	D	A				
L	O	T	O	E	N	A	T	E	A	P	R	O	L	L	E				
F	E	A	T	U	R	E	F	I	L	M	S	A	R	E	T	O			
A	N	C	P	O	E	L	U	N	A	R									
R	E	A	T	T	A	C	H	E	M	E	N	T	E	N	C	L	O	S	E
H	A	O	S	H	O	L	D	B	U	S	H	I	A	N	A				
E	R	I	C	H	E	P	I	S	O	D	E	N	O	T	A	B	L		
A	L	T	H	O	F	E	R	E	T	I	N	A	Y	O	U	R	E		
E	Y	E	S	C	H	A	I	R	S	R	E	N	T						
W	E	A	T	H	E	R	S	A	T	E	L	L	E	T					
G	R	I	T	C	A	N	A	B	I	T	A	P	E	A					
R	E	G	A	L	D	E	T	S	P	L	O	A	T	O	M	E			
A	P	H	E	R	A	N	T	E	N	H	A	S	E	S	K	E	T	I	N
M	E	L	M	O	T	E	S	D	E	A	C	O	N	A	N	D			
P	R	E	C	I	O	U	S	D	E	A	T	H	R	A	T	I	L	E	S
A	N	D	E	S	A	L	T												
A	B	S	T	R	A	L													
R	E	A	T	T	E	M	P	T	S	B	R	A	D	P	R	A	I	T	S

# Observer

PALM COAST

You. Your Neighbors. Your Neighborhood.

John Walsh, Publisher

Invoice 178703

May 24, 2017

Deborah Shelley, Manager  
Wekiva - Middle St. Johns - Tomoka Marsh Aquatic Preserves  
8300 West State Road 46  
Sanford, Florida 32771

Deborah,

Publication of meeting notice on June 8, 2017 in both the Ormond Beach and Palm Coast Observers.

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*Barbara Howell*  
*May 24, 2017*

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THE NEWS-JOURNAL

Published Daily and Sunday  
Daytona Beach, Volusia County, Florida

State of Florida,  
County of Volusia

Before the undersigned authority personally appeared

Cynthia Anderson

who, on oath says that she is .....

LEGAL COORDINATOR

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L 2248118

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JUNE 11, 2017

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published at Daytona Beach, in said Volusia County, Florida,  
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Sworn to and subscribed before me

This 12<sup>th</sup> of JUNE

A.D. 2017

*Deborah L. Keesee*  
.....

49D



The Florida Department of Environmental Protection, Florida Coastal Office announces a public meeting to receive comments on the Tomoka Marsh Aquatic Preserve draft management plan. The meeting will be held in Volusia County on June 21, 2017, 6:00-7:30 p.m. at Tomoka State Park Recreation Hall, 2099 North Beach Street, Ormond Beach, FL 32174. A copy of the draft plan is posted at [http://publicfiles.dep.state.fl.us/CAMA/plans/aquatic/TMAP\\_plan.pdf](http://publicfiles.dep.state.fl.us/CAMA/plans/aquatic/TMAP_plan.pdf). For the agenda, contact the preserve Manager, Deborah Shelley by e-mail: [Deborah.Shelley@dep.state.fl.us](mailto:Deborah.Shelley@dep.state.fl.us), by phone (407)330-6727, or by mail: 8300 West State Road 46, Sanford, FL 32771. If special accommodation is required for participation contact the manager 48 hours in advance. If you are hearing or speech impaired, please contact the agency using the Florida Relay Service, 1(800)955-8771 (TDD) or 1(800)955-8770 (Voice).  
L2248118, June 11, 2017 lt.



## Florida Department of Environmental Protection

Wekiva River and Tomoka Marsh Aquatic Preserves  
8300 West State Road 46  
Sanford, Florida 32771

Rick Scott  
Governor

Carlos Lopez-Cantera  
Lt. Governor

Noah Valenstein  
Secretary

### Tomoka Marsh Aquatic Preserve Draft Management Plan Public Meeting

Wednesday, June 21, 2017, 6:00 – 7:30 p.m.  
Tomoka State Park Recreation Hall  
2099 North Beach Street  
Ormond Beach, Florida 32174

Attendees (12): Ron Brockmeyer, Christine Dann, Charles Gleichmann, Patricia Gleichmann, C.J. Greene, Melissa Lammers, Jim McNelly, Dennis Mudge, Phil Rand, Katie Tripp, Rob Walsh, Paula Wehr  
Staff (7): Deborah Shelley, Barbara Howell, Charley DuToit, Andrea Noel, Suzi Porterfield, Earl Pearson, Penny Isom

Penny welcomed everyone, gave a brief introduction about the purpose of the meeting, and introduced staff from the aquatic preserve, East Coast Region, and Tallahassee.

Deborah gave a PowerPoint presentation about Tomoka Marsh Aquatic Preserve, accomplishments, work being conducted, and issues identified in the management plan.

After the presentation, Penny explained the commenting process. The room was set up so there were four stations, one for each of the four issues identified in the management plan. Attendees worked in two groups to assess and discuss the issues associated with the draft plan. Staff provided background on each issue and recorded comments the public had pertinent to each issue (listed below).

#### Issue One: Water Quality

- Be sure to address storm water and septic
- Expand LAKEWATCH into Tomoka (used to be a lake)
- Lots of septic in Volusia (more than any other county)
- Cut off septic gradually (ask Charles Lee)/was used in South Florida with sea level rise
- Partner with Project H2O
- Work on outreach to communities on fertilizer ordinance
- Talk with Florida Native Plant Society to educate neighborhoods
- Continue marsh restoration to improve water quality



- Evaluate dredging before continuing (avoid what the county did in 2004- too much sedimentation, wiped out fish)
- Septic needs more money
- Some septic may be able to connect to private sewers (North Peninsula Utilities)

#### Issue Two: Wildlife and Habitat

- C.J. will help acquire FWC funds for invasive removal on Halifax islands
- Need new fish survey (very few fish now)
- Bird list update, Paula Wehr can help
- Include info/research about beach nesting birds
- Manatees utilize the aquatic preserve, not inhabit/not distinct populations
- Contact Aquatic Habitat Restoration Enhancement Section (FWC) on salt marsh
- Train and use citizen scientists for wildlife management
- Use wildlife cameras
- Monitor horseshoe crabs (citizen scientists)
- Participate with Christmas Bird Count by Audubon
- Support purchase of McBrayer property (diamondback habitat)
- Incorporate kids' activities to citizen science and management activities
- Work with Park to reduce fees on kids activities/citizen science
- Encourage cities/counties to increase litter pickup
- Partner with state park citizen support organization for education programs
- Work with Boy Scouts and similar organizations

#### Issue Three: Public Involvement

- Have a home group (citizen support organization) with locals
- Facebook- social media
- Attend local workgroups- Halifax Audubon, Flagler Sport Fishing, Native Plant Society
- Connect with Chamber of Commerce
- Post local articles (magazines, newspapers, newsletters, etc.)
- Do school presentations
- High school seniors community volunteer/service
- Invite Master Naturalists for field trips
- Coordinate with state park citizen support organization
- Plant camp- educate teachers/ expand Spruce Creek teacher training
- Encourage ART in the aquatic preserve
- Clyde Butcher exhibit
- Alternative involvement/grant writing

#### Issue Four: Public Use

- DEP and aquatic preserve link with FWC- websites
- Expand children's activities- fishing clinics with FWC
- Eco tour groups incorporate "rules"
- Designate Halifax islands as preserves
- Audio visual material- educational – get QR code
- Better identify speed zones on water especially manatee signage

- Manatee alert phone app / REEL app

After the comments were received, the group reconvened and Penny explained the next steps in the management plan process: an advisory committee meeting, Acquisition and Restoration Council meeting (a public meeting in Tallahassee), and Governor and Cabinet meeting. The public was reminded that comments could still be submitted on or before July 5, 2017. They were thanked for taking time out of their busy schedules to attend and provide valuable feedback.

Meeting was adjourned.



## Goals, Objectives, and Strategies

### D.1 / Current Goals, Objectives and Strategies Table

The following table provides a cost estimate for conducting the management activities identified in this plan. The data is organized by year and Management Program with subtotals for each program and year. The following represents the actual budgetary needs for managing the resources of the aquatic preserve. This budget was developed using data from the Florida Coastal Office (FCO) and other cooperating entities, and is based on actual costs for management activities, equipment purchases and maintenance, and for development of fixed capital facilities. This budget assumes optimal staffing levels to accomplish these strategies, and includes the costs associated with staffing such as salary or benefits. Budget categories identified correlate with the FCO Management Program Areas. The Funding Source column depicts the source of funds with “S” designated for state, “F” for federal, and “O” for other funding sources (e.g. non-profit groups, etc.). Dollar figures in red font indicate funding not available at this time.

Goals, Objectives & Integrated Strategies	Mgmt. Program	Implement. Date (Planned)	Length of Initiative	Est. Avg. Yearly Cost	Funding	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27
<b>Issue 1: Water Quality</b>															
<b>Goal 1: Protect areas with good water quality and, where necessary, improve water quality to maximize utility for natural resource and public needs.</b>															
<b>Objective 1: Continue to coordinate and collaborate with the various entities that collect water quality data within the aquatic preserve.</b>															
Strategy 1: Continue to retrieve and collate water quality data.	Ecosystem Science	2017-2018	Recurring	\$750	F	\$3,000	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500
Strategy 2: Continue to keep updated on ongoing research and regulations related to existing TMDLs.	Ecosystem Science	2017-2018	Recurring	\$500	F	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500
Strategy 3: Continue to coordinate through the BMAP process to support and promote strategies identified that will result in water quality improvements.	Ecosystem Science	2017-2018	Recurring	\$500	F	\$1,500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500
<b>Objective 2: Investigate feasibility of employing benthic data as a tool in aquatic preserve management decisions.</b>															
Strategy 1: Investigate the availability, suitability and adequacy of existing data and their usefulness in assessing benthic habitat health.	Ecosystem Science	2017-2018	Recurring	\$500		\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500
Strategy 2: Acquire additional data sets from agencies and universities and evaluate their suitability for determining habitat change and health.	Ecosystem Science	2017-2018	Recurring	\$200		\$500	\$200	\$200	\$200	\$200	\$200	\$200	\$200	\$200	\$200
Strategy 3: Investigate existing or potential use of a benthic habitat quality index that includes species diversity, physical parameters, and analysis of contaminants of benthic sediments.	Ecosystem Science	2018-2019	Recurring	\$400		\$400	\$400	\$400	\$400	\$400	\$400	\$400	\$400	\$400	\$400
<b>Objective 3: Encourage effective wastewater treatment systems in the preserve watershed.</b>															
Strategy 1: Review existing geographic information systems (GIS)-based maps on the abundance and distribution of septic systems in the Tomoka Marsh Aquatic Preserve watersheds.	Ecosystem Science	2017-2018	Recurring	\$400		\$400	\$400	\$400	\$400	\$400	\$400	\$400	\$400	\$400	\$400

Goals, Objectives & Integrated Strategies	Mgmt. Program	Implement. Date (Planned)	Length of Initiative	Est. Avg. Yearly Cost	Funding	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27
Strategy 2: Coordinate with stakeholders to resolve issues related to OSTDS in areas immediately adjacent to the aquatic preserve.	Ecosystem Science	2017-2018	Recurring	\$500		\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500
Strategy 3: Encourage local health agencies to review and consider new state-of-the-art wastewater treatment ideas or connection to central wastewater systems and reuse.	Ecosystem Science	2017-2018	Recurring	\$200		\$200	\$200	\$200	\$200	\$200	\$200	\$200	\$200	\$200	\$200
<b>Objective 4: Encourage ecologically sound pet sanitation methods on waterfront areas.</b>															
Strategy 1: Conduct a review of resources for proper pet sanitation at aquatic preserve access points (launches, waterfront parks, etc.).	Ecosystem Science	2017-2018	Recurring	\$180		\$400	\$160	\$160	\$160	\$160	\$160	\$160	\$160	\$160	\$160
Strategy 2: Encourage managers of aquatic preserve access points (launches, waterfront parks, etc.) to provide pet waste pickup stations.	Ecosystem Science	2017-2018	Recurring	\$260	F	\$800	\$200	\$200	\$200	\$200	\$200	\$200	\$200	\$200	\$200
Strategy 3: Encourage management entities to monitor pet cleanup stations.	Ecosystem Science	2017-2018	Recurring	\$240	F	\$240	\$240	\$240	\$240	\$240	\$240	\$240	\$240	\$240	\$240
Strategy 4: Encourage placement of informational signs detailing water quality impacts of pet waste at access points.	Ecosystem Science	2017-2018	Recurring	\$240		\$240	\$240	\$240	\$240	\$240	\$240	\$240	\$240	\$240	\$240
<b>Objective 5: Evaluate and, where feasible, support the improvement and effectiveness of stormwater treatment techniques, regulations, and enforcement currently in place.</b>															
Strategy 1: Review and evaluate the effectiveness of local and regional stormwater efforts and plans in the aquatic preserve watersheds.	Ecosystem Science	2017-2018	5 years	\$250		\$500	\$500	\$500	\$500	\$500	\$0	\$0	\$0	\$0	\$0
Strategy 2: Identify, prioritize and, as feasible support the implementation of the most effective stormwater treatment measures in both new and retrofit projects.	Ecosystem Science	2017-2018	5 years	\$250		\$500	\$500	\$500	\$500	\$500	\$0	\$0	\$0	\$0	\$0
<b>Issue 2: Wildlife and Habitat</b>															
<b>Goal 1: Improve habitat in Tomoka Marsh Aquatic Preserve for species diversity.</b>															
<b>Objective 1: Understand aquatic vegetation dynamic including interactions between native and non-native species.</b>															
Strategy 1: Continue coordination with FWC IPMS for control of non-native plant species surveys on Bulow Creek.	Resource Mgt.	2017-2018	Recurring	\$800	F	\$800	\$800	\$800	\$800	\$800	\$800	\$800	\$800	\$800	\$800
Strategy 2: Continue coordination with FWC IPMS for funding and strategies to eradicate or control non-native species throughout the aquatic preserve.	Resource Mgt.	2017-2018	Recurring	\$800	F	\$800	\$800	\$800	\$800	\$800	\$800	\$800	\$800	\$800	\$800



Goals, Objectives & Integrated Strategies	Mgmt. Program	Implement. Date (Planned)	Length of Initiative	Est. Avg. Yearly Cost	Funding	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27
Strategy 3: Investigate funding options for eradicating or controlling non-native species on the Halifax islands.	Resource Mgt.	2017-2018	Recurring	\$800	F	\$800	\$800	\$800	\$800	\$800	\$800	\$800	\$800	\$800	\$800
Strategy 4: Solicit for and work with volunteers to assist with controlling life plant on the Halifax islands.	Resource Mgt.	2017-2018	Recurring	\$400	F	\$400	\$400	\$400	\$400	\$400	\$400	\$400	\$400	\$400	\$400
<b>Goal 2: Improve habitat for wildlife populations in Tomoka Marsh Aquatic Preserve.</b>															
<b>Objective 1: Monitor and assess wildlife populations located within Tomoka Marsh Aquatic Preserve.</b>															
Strategy 1: Continue partnership with the East Coast Diamondback Terrapin Group.	Resource Mgt.	2017-2018	Recurring	\$650	F	\$2,000	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500
Strategy 2: Solicit volunteers to assist with diamondback terrapin monitoring.	Resource Mgt.	2017-2018	Recurring	\$250	F	\$250	\$250	\$250	\$250	\$250	\$250	\$250	\$250	\$250	\$250
Strategy 3: Increase public awareness through various educational outlets (literature, attend public meetings, etc.) about the presence of diamondback terrapin and their habitat within TMAP.	Resource Mgt.	2017-2018	Recurring	\$375		\$1,500	\$250	\$250	\$250	\$250	\$250	\$250	\$250	\$250	\$250
Strategy 4: Continue to encourage, obtain and support interns from Bethune Cookman University interested in studying diamondback terrapin on the Halifax islands.	Resource Mgt.	2017-2018	Recurring	\$500	F	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500
Strategy 5: Coordinate with FWC and other entities to maximize optimum habitat for diamondback terrapin on the Halifax islands, especially if opportunities exist during or after exotic species control.	Resource Mgt.	2017-2018	Recurring	\$400		\$400	\$400	\$400	\$400	\$400	\$400	\$400	\$400	\$400	\$400
<b>Objective 2: Improve understanding of bird populations that use the aquatic preserve.</b>															
Strategy 1: Reinstate quarterly contracted bird survey as funding becomes available.	Resource Mgt.	2017-2018	Recurring	\$1,500		\$3,000	\$3,000	\$3,000	\$3,000	\$500	\$500	\$500	\$500	\$500	\$500
Strategy 2: Consult with statisticians and ornithologists for appropriate analysis of bird survey data to assess population trends.	Resource Mgt.	2017-2018	1 year	\$300		\$3,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
<b>Objective 3: Improve awareness and understanding of manatee populations that inhabit the aquatic preserve.</b>															
Strategy 1: Coordinate with Volusia and Flagler counties for manatee related educational events.	Resource Mgt.	2017-2018	Recurring	\$1,500		\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500
Strategy 2: Place signage at all access points to the aquatic preserve that advises boaters they are entering the aquatic preserve and manatee habitat.	Resource Mgt.	2017-2018	1 year	\$350		\$3,500	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0

Goals, Objectives & Integrated Strategies	Mgmt. Program	Implement. Date (Planned)	Length of Initiative	Est. Avg. Yearly Cost	Funding	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27
<b>Objective 4: Improve degraded or altered salt marsh habitat by partnering with entities that are conducting salt marsh community restoration.</b>															
Strategy 1: Coordinate with the Northern Coastal Basin program and other initiatives for salt marsh community restoration within the aquatic preserve.	Resource Mgt.	2017-2018	Recurring	\$1,400	F	\$1,400	\$1,400	\$1,400	\$1,400	\$1,400	\$1,400	\$1,400	\$1,400	\$1,400	\$1,400
Strategy 2: Encourage restoration projects within the aquatic preserve.	Resource Mgt.	2017-2018	Recurring	\$250	F	\$250	\$250	\$250	\$250	\$250	\$250	\$250	\$250	\$250	\$250
<b>Objective 5: Evaluate oyster habitat at appropriate locations throughout the aquatic preserve.</b>															
Strategy 1: Encourage research and mapping of oyster habitat within the aquatic preserve.	Resource Mgt.	2017-2018	Recurring	\$400	F	\$400	\$400	\$400	\$400	\$400	\$400	\$400	\$400	\$400	\$400
Strategy 2: Encourage the restoration of oyster beds, if needed, within the aquatic preserve.	Resource Mgt.	2017-2018	Recurring	\$400	F	\$400	\$400	\$400	\$400	\$400	\$400	\$400	\$400	\$400	\$400
<b>Objective 6: Reassess the status of fisheries within the aquatic preserve.</b>															
Strategy 1: Coordinate with FWC's Division of Marine Fisheries Management or other entities who conduct fisheries assessments.	Resource Mgt.	2017-2018	Recurring	\$200		\$200	\$200	\$200	\$200	\$200	\$200	\$200	\$200	\$200	\$200
Strategy 2: Encourage and support fisheries surveys within the aquatic preserve.	Resource Mgt.	2017-2018	Recurring	\$200		\$200	\$200	\$200	\$200	\$200	\$200	\$200	\$200	\$200	\$200
<b>Objective 7: Assess habitats on islands within the aquatic preserve.</b>															
Strategy 1: Continue to participate in FCO's <i>All Island Assessment</i> .	Resource Mgt.	2017-2018	2 years	\$800		\$4,000	\$4,000	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Strategy 2: Coordinate with other entities conducting island assessments to share information and minimize duplication of efforts.	Resource Mgt.	2017-2018	Recurring	\$200		\$200	\$200	\$200	\$200	\$200	\$200	\$200	\$200	\$200	\$200
<b>Objective 8: Support and encourage the development of Imperiled Fish and Wildlife Species Management Strategies that addresses imperiled fish and wildlife species.</b>															
Strategy 1: In cooperation with FWC, develop management prescriptions, as staffing and funding allow, for imperiled fish and wildlife species occurring within the aquatic preserve and their associated habitats.	Resource Mgt.	2017-2018	Recurring	\$560		\$560	\$560	\$560	\$560	\$560	\$560	\$560	\$560	\$560	\$560
Strategy 2: In cooperation with FWC, include the development of appropriate imperiled fish and wildlife species survey and monitoring protocols in management prescriptions based on site-specific occurrences, population data, and sustainability potential.	Resource Mgt.	2017-2018	Recurring	\$560		\$560	\$560	\$560	\$560	\$560	\$560	\$560	\$560	\$560	\$560



Goals, Objectives & Integrated Strategies	Mgmt. Program	Implement. Date (Planned)	Length of Initiative	Est. Avg. Yearly Cost	Funding	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27
<b>Goal 3: Reduce the amount of debris in the aquatic preserve.</b>															
<b>Objective 1: Control debris at the sources.</b>															
Strategy 1: Ensure that access points to the aquatic preserve have monofilament line depositories, and trash receptacles with secure lids.	Resource Mgt.	2017-2018	Recurring	\$100	F	\$100	\$100	\$100	\$100	\$100	\$100	\$100	\$100	\$100	\$100
Strategy 2: Encourage managers of local parks, launch sites, marinas, and other facilities to erect informational signage that promotes "Leave No Trace" and "Pack it in, Pack it Out" ethics.	Resource Mgt.	2017-2018	Recurring	\$100	F	\$100	\$100	\$100	\$100	\$100	\$100	\$100	\$100	\$100	\$100
<b>Issue 3: Public Involvement</b>															
<b>Goal 1: Increase public involvement, awareness, and knowledge of Tomoka Marsh Aquatic Preserve.</b>															
<b>Objective 1: Improve public understanding of aquatic preserve submerged resources.</b>															
Strategy 1: Disseminate information to the general public and volunteers through various media outlets.	Education and Outreach	2017-2018	Recurring in 5 years	\$500		\$2,500	\$0	\$0	\$0	\$0	\$2,500	\$0	\$0	\$0	\$0
Strategy 2: Support other agencies' and organizations' submerged resources education efforts.	Education and Outreach	2017-2018	Recurring	\$1,000		\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000
Strategy 3: Ensure that, whenever possible, public access points to the aquatic preserve include signage on the threats and prevention of debris, including promoting "Leave No Trace" and "Pack it in, Pack it Out" ethics.	Education and Outreach	2016-2017	Recurring	Costs included in other strategies											
Strategy 4: Provide information about the aquatic preserve to canoe and kayak vendors for dissemination to the public.	Education and Outreach	2017-2018	Recurring	\$325		\$1,000	\$250	\$250	\$250	\$250	\$250	\$250	\$250	\$250	\$250
<b>Objective 2: Improve public understanding of direct and indirect threats to aquatic preserve water quality.</b>															
Strategy 1: Disseminate information to volunteers and the general public through various media outlets.	Education and Outreach	2017-2018	Recurring	\$500		\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500
Strategy 2: Conduct presentations for homeowner groups to inform local residents on how they can reduce their impacts on the aquatic preserve.	Education and Outreach	2017-2018	Recurring	\$1,000		\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000
Strategy 3: Support other agencies' and organizations' water quality education efforts.	Education and Outreach	2017-2018	Recurring	\$1,000	F	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000
<b>Objective 3: Remove debris in the aquatic preserve.</b>															
Strategy 1: Recruit volunteers to help with cleanup events conducted by aquatic preserve and other organizations.	Resource Mgt.	2017-2018	Recurring	\$500		\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500

Goals, Objectives & Integrated Strategies	Mgmt. Program	Implement. Date (Planned)	Length of Initiative	Est. Avg. Yearly Cost	Funding	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27
Strategy 2: Continue work with partners to achieve cleanups of all accessible shorelines and to establish a maintenance schedule.	Resource Mgt.	2017-2018	Recurring	\$800	F	\$800	\$800	\$800	\$800	\$800	\$800	\$800	\$800	\$800	\$800
Strategy 3: Continue to promote the Adopt-an-Island program on the Halifax islands.	Education and Outreach	2017-2018	Recurring	\$800	F	\$800	\$800	\$800	\$800	\$800	\$800	\$800	\$800	\$800	\$800
Strategy 4: Prior to any cleanup activities, provide information and protocols to volunteers that address protection of archaeological and cultural resources.	Education and Outreach	2017-2018	Recurring	\$560		\$560	\$560	\$560	\$560	\$560	\$560	\$560	\$560	\$560	\$560
<b>Objective 4: Improve public understanding of archaeological and cultural resources associated with the aquatic preserve.</b>															
Strategy 1: Coordinate with DHR/BAR's Underwater Archaeology and Public Lands programs for publications and information for public outreach and education programs specific to archaeological and cultural resources.	Education and Outreach	2017-2018	Recurring	\$640		\$1,000	\$600	\$600	\$600	\$600	\$600	\$600	\$600	\$600	\$600
Strategy 2: Include information about archaeological and cultural resources in existing education and outreach programs presented by aquatic preserve staff.	Education and Outreach	2017-2018	Recurring	\$200		\$200	\$200	\$200	\$200	\$200	\$200	\$200	\$200	\$200	\$200
Strategy 3: Continue to encourage and support volunteers who conduct historical reenactment programs related to the aquatic preserve.	Education and Outreach	2017-2018	Recurring	\$400		\$400	\$400	\$400	\$400	\$400	\$400	\$400	\$400	\$400	\$400
<b>Issue 4: Public Use</b>															
<b>Goal 1: Maintain a safe and natural environment for Tomoka Marsh Aquatic Preserve wildlife, habitats, and user groups.</b>															
<b>Objective 1: Identify human use conflicts with natural resources.</b>															
Strategy 1: Continue to work to identify and address uses in Tomoka Marsh Aquatic Preserve that are potentially illegal and/or are harmful to natural resources.	Public Use	2017-2018	Recurring	\$1,500	F	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500	\$1,500
Strategy 2: Partner with other agencies to develop and distribute information identifying potential use conflicts and methods of prevention.	Public Use	2017-2018	Recurring	\$650		\$2,000	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500
Strategy 3: Provide and encourage volunteer opportunities to promote river stewardship.	Public Use	2017-2018	Recurring	\$500		\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500	\$500
Strategy 4: Continue to promote the use of bycatch reduction devices and encourage sustainable recreational and commercial crabbing.	Public Use	2017-2018	Recurring	\$800		\$800	\$800	\$800	\$800	\$800	\$800	\$800	\$800	\$800	\$800



Goals, Objectives & Integrated Strategies	Mgmt. Program	Implement. Date (Planned)	Length of Initiative	Est. Avg. Yearly Cost	Funding	17-18	18-19	19-20	20-21	21-22	22-23	23-24	24-25	25-26	26-27
<b>Goal 2: Promote low-impact, sustainable recreational opportunities.</b>															
<b>Objective 1: Expand current partnerships to encourage activities that are protective of the rivers' natural resources.</b>															
Strategy 1: Provide information on "Pack it in, Pack it out" and "Leave No Trace" as needed to help concessionaires educate their customers.	Public Use	2017-2018	Recurring	\$425		\$2,000	\$250	\$250	\$250	\$250	\$250	\$250	\$250	\$250	\$250
Strategy 2: Work with private business and concessionaires to improve operational practices, including but not limited to shoreline protection, wake control and litter.	Public Use	2017-2018	Recurring	\$375		\$1,500	\$250	\$250	\$250	\$250	\$250	\$250	\$250	\$250	\$250
Strategy 3: Assist vendors with conveying information about conservation and resource protection to their customers and visitors to the aquatic preserve.	Education and Outreach	2017-2018	Recurring	Costs included in other strategies											
<b>Objective 2: Offer ecotourism programs.</b>															
Strategy 1: Provide ecotourism programs to specifically targeted groups, such as classes or clubs, to better educate them about the aquatic preserve's resources and how they can help protect them.	Public Use	2017-2018	Recurring	\$1,600		\$1,600	\$1,600	\$1,600	\$1,600	\$1,600	\$1,600	\$1,600	\$1,600	\$1,600	\$1,600
<b>Objective 3: Assess the condition of recorded cultural and historical resources within the aquatic preserve.</b>															
Strategy 1: Independently or in partnership with professional archaeologists and/or DHR/BAR staff, inspect at least two known archaeological and cultural sites associated with the aquatic preserve per year, and report findings to the Master Site File or as appropriate.	Resource Mgt.	2017-2018	Recurring	\$1,000		\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000
<b>Objective 4: Promote protection of cultural and historical resources located within or adjacent to the aquatic preserve.</b>															
Strategy 1: Develop and present education programs to the public and interested parties related to specific cultural or historical resources located within the aquatic preserve.	Education and Outreach	2017-2018	Recurring	\$1,000		\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000
Strategy 2: Support existing or solicit and train new volunteers to present programs on specific cultural or historical resources located within the aquatic preserve.	Education and Outreach	2017-2018	Recurring	\$1,000		\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000

## D.2 / Budget Summary Table

The following table provides a summary of cost estimates for conducting the management activities identified in this plan.

Fiscal Year	Ecosystem Science	Resource Management	Education & Outreach	Public Use	Annual Total
2017-2018	\$10,180	\$29,120	\$11,960	\$9,900	\$61,160
2018-2019	\$5,540	\$19,870	\$8,310	\$5,400	\$39,120
2019-2020	\$5,540	\$15,870	\$8,310	\$5,400	\$35,120
2020-2021	\$5,540	\$15,870	\$8,310	\$5,400	\$35,120
2021-2022	\$5,540	\$13,370	\$8,310	\$5,400	\$32,620
2022-2023	\$4,540	\$13,370	\$10,810	\$5,400	\$34,120
2023-2024	\$4,540	\$13,370	\$8,310	\$5,400	\$31,620
2024-2025	\$4,540	\$13,370	\$8,310	\$5,400	\$31,620
2025-2026	\$4,540	\$13,370	\$8,310	\$5,400	\$31,620
2026-2027	\$4,540	\$13,370	\$8,310	\$5,400	\$31,620
<b>Ten Year Totals</b>	<b>\$55,040</b>	<b>\$160,950</b>	<b>\$89,250</b>	<b>\$58,500</b>	<b>\$363,740</b>

## D.3 / Major Accomplishments Since the Approval of the Previous Plan

### Fisheries Surveys

- Participated in two fisheries surveys in the aquatic preserve. The protocol for both surveys followed the Fish and Wildlife Research Institute's Marine Fisheries Independent Monitoring program sampling criteria. These surveys established baseline data and documented the presence of 116 species in 40 families.
- Aquatic preserve staff organized five-person survey teams during 1993-1996 that assisted for each monthly two-day survey at eight fixed stations in the Tomoka and Halifax rivers, enabling the survey to be conducted.
- Staff participated in a second survey that was conducted with computer generated stations chosen randomly during 2001-2006.
- More than 200 derelict crab traps caught in trawls or seine nets were removed from the aquatic preserve during the fisheries surveys.

### Bird Surveys

- Initiated and conducted a one-year monthly survey of wading, shore and other birds associated with the Tomoka River, Thompson and Strickland Creeks and the Tomoka basin in 1995.
- Conducted a one-year monthly survey in 1996 of birds utilizing the Halifax River, Smith Creek, a 1,000-acre mosquito impoundment adjacent to the aquatic preserve, and marshes adjacent to Smith Creek.
- Established baseline data and documented the presence of 180 species in 48 families.
- A bird species check list brochure was created in partnership with Florida Park Service staff and Halifax Audubon volunteers.
- Continued documentation of species during other routine activities.

### Diamondback Terrapin Surveys

- Participated in a two-year survey of diamondback terrapins on the Halifax islands and surrounding areas during 2013-2014 with partners and volunteers.
- Documented use of the islands by diamondback terrapins via GPS points and mapping.
- Purchased equipment for and supported intern who conducted research on the islands.

### Exotic and Nuisance Plant Control

- Conducted eradication and control of exotic or nuisance species activities throughout the aquatic preserve.
- Maintained long-term interagency cooperation and assistance to FWC Invasive Plant Management Section (IPMS) and Florida Park Service staff along nine miles of Bulow Creek.
- Ensured permit conditions for rotary ditching for mosquito control on Halifax islands included removal of Australian pine.
- Surveyed the 76-acre Halifax islands with FWC IPMS and estimated acreage of Brazilian pepper and Australian pine.
- Secured funds for staff and contractors for ongoing program to remove Brazilian pepper and Australian pine from Halifax islands.

### Committees and Technical Support

- Appointed to or served on resource management committees and subcommittees such as the East Coast Diamondback Terrapin Working Group, Halifax River Alliance, the East Coast Estuary Restoration Team, and several Land Management review committees for local state parks.



### **Adopt-an-Island and River Clean-ups**

- Established an Adopt-an-Island program for the 12 Halifax islands where volunteers monitor for marine debris and remove litter from specific islands on a regular basis.
- Participated in numerous clean ups on the Halifax and Tomoka rivers that resulted in thousands of pounds of trash removed from the aquatic preserve.
- Coordinated with citizen groups and agencies such as Volusia County and university and college environmental clubs to obtain volunteers that participated in clean-ups or the Adopt-an-island program.

### **Marsh Restoration**

- Reviewed permits for and supported various marsh restoration projects in the Tomoka and Halifax rivers.
- Supported removal of sand deposition from Bulow Creek at Corona Canal.
- Reviewed permit conditions, lobbied for and insured that sand removed from Bulow Creek was taken off site and deposited at a nearby landfill rather than being deposited along the shoreline.
- Reviewed permits for and inspected marsh restoration sites along the Halifax River and Smith Creek.

### **Archaeological Site Management**

- Monitored archaeological sites within the aquatic preserve.
- Assisted visiting archaeologists, professors and college-level students with transportation, interpretation, and information related to Tomoka Marsh Aquatic Preserve cultural sites.
- Reviewed and commented on the restoration of the aquatic portion of Noco-roco, an important partially submerged archaeological site at Tomoka State Park.

### **Florida Manatee**

- Supported enforcement of state and federal watercraft speed zones in the Tomoka River Manatee Sanctuary and the U.S. Fish and Wildlife Service Manatee Refuge.
- Inspected regulatory signs and reported signage that required maintenance or replacement.

### **Aquatic Preserve Alliance of Central Florida**

- Assisted in establishing a citizen support group for the central Florida aquatic preserves including soliciting for and obtaining board members, assisting with drafting by-laws, providing meeting locations, and providing general support. The group conducts clean-ups, environmental education programs, and fundraising to support research and other activities in central Florida aquatic preserves.

### **Derelict Vessel Removal**

- Coordinated with partners DEP, FWC, EPA, U.S. Coast Guard, the all-volunteer Coast Guard Auxiliary (CGA) and specialized contractors to address the fuel leak and prevent further incidents associated with the 100-foot WWII tugboat *Tutahaco* that was docked in the Halifax River reach of Tomoka Marsh Aquatic Preserve.
- Patrolled the AICW with the Palm Coast CGA Flotilla and submitted coordinates to FWC and U.S. Coast Guard for placement of temporary construction warning buoys.
- Worked closely with partners from February to June 2017 which resulted in containment of the spill, preliminary cleaning of the vessel, and removal of the tugboat via crane and barge to be decontaminated and scrapped in Texas.

### **Resource Manager of the Year**

- Aquatic Preserve Manager Deborah Shelley was awarded the 2016 Jim Stevenson Resource Manager of the Year Award. Deborah was recognized for her thirty years of service managing aquatic resources including the Wekiva River and Tomoka Marsh aquatic preserves. Her nomination was supported by career-spanning colleagues, citizen support groups, environmental advocates and Jim Stevenson.

## Other Requirements

### E.1 | Acquisition and Restoration Council Management Plan Compliance Checklist

Land Management Plan Compliance Checklist Required for State-owned conservation lands over 160 acres			
Item #	Requirement	Statute/Rule	Pg#/App
<b>Section A: Acquisition Information Items</b>			
1	The common name of the property.	18-2.018 & 18-2.021	Ex. Sum.
2	The land acquisition program, if any, under which the property was acquired.	18-2.018 & 18-2.021	p. 1
3	Degree of title interest held by the Board, including reservations and encumbrances such as leases.	18-2.021	p. 1, 6-8
4	The legal description and acreage of the property.	18-2.018 & 18-2.021	Ex. Sum & p. 13
5	A map showing the approximate location and boundaries of the property, and the location of any structures or improvements to the property.	18-2.018 & 18-2.021	p. 13
6	An assessment as to whether the property, or any portion, should be declared surplus. Provide Information regarding assessment and analysis in the plan, and provide corresponding map.	18-2.021	N/A
7	Identification of other parcels of land within or immediately adjacent to the property that should be purchased because they are essential to management of the property. Please clearly indicate parcels on a map.	18-2.021	N/A
8	Identification of adjacent land uses that conflict with the planned use of the property, if any.	18-2.021	p. 49-50
9	A statement of the purpose for which the lands were acquired, the projected use or uses as defined in 253.034 and the statutory authority for such use or uses.	259.032(10)	p. 6
10	Proximity of property to other significant State, local or federal land or water resources.	18-2.021	p. 48-49
<b>Section B: Use Items</b>			
11	The designated single use or multiple use management for the property, including use by other managing entities.	18-2.018 & 18-2.021	p. 11-13
12	A description of past and existing uses, including any unauthorized uses of the property.	18-2.018 & 18-2.021	p. 9-11, 15, 17, 23-27, 30-34, 37, 42-45, 71
13	A description of alternative or multiple uses of the property considered by the lessee and a statement detailing why such uses were not adopted.	18-2.018	N/A
14	A description of the management responsibilities of each entity involved in the property's management and how such responsibilities will be coordinated.	18-2.018	p. 6-8, 51-72
15	Include a provision that requires that the managing agency consult with the Division of Historical Resources, Department of State before taking actions that may adversely affect archeological or historical resources.	18-2.021	App. E.2
16	Analysis/description of other managing agencies and private land managers, if any, which could facilitate the restoration or management of the land.	18-2.021	
17	A determination of the public uses and public access that would be consistent with the purposes for which the lands were acquired.	259.032(10)	p. 70-72
18	A finding regarding whether each planned use complies with the 1981 State Lands Management Plan, particularly whether such uses represent "balanced public utilization," specific agency statutory authority and any other legislative or executive directives that constrain the use of such property.	18-2.021	p. 6-8
19	Letter of compliance from the local government stating that the LMP is in compliance with the Local Government Comprehensive Plan.	BOT requirement	App. E.3



**Land Management Plan Compliance Checklist  
Required for State-owned conservation lands over 160 acres**

Item #	Requirement	Statute/Rule	Pg#/App
20	An assessment of the impact of planned uses on the renewable and non-renewable resources of the property, including soil and water resources, and a detailed description of the specific actions that will be taken to protect, enhance and conserve these resources and to compensate/mitigate damage caused by such uses, including a description of how the manager plans to control and prevent soil erosion and soil or water contamination.	18-2.018 & 18-2.021	
21	*For managed areas larger than 1,000 acres, an analysis of the multiple-use potential of the property which shall include the potential of the property to generate revenues to enhance the management of the property provided that no lease, easement, or license for such revenue-generating use shall be entered into if the granting of such lease, easement or license would adversely affect the tax exemption of the interest on any revenue bonds issued to fund the acquisition of the affected lands from gross income for federal income tax purposes, pursuant to Internal Revenue Service regulations.	18-2.021 & 253.036	N/A
22	If the lead managing agency determines that timber resource management is not in conflict with the primary management objectives of the managed area, a component or section, prepared by a qualified professional forester, that assesses the feasibility of managing timber resources pursuant to section 253.036, F.S.	18-021	N/A
23	A statement regarding incompatible use in reference to Ch. 253.034(10).	253.034(10)	

\*The following taken from 253.034(10) is not a land management plan requirement; however, it should be considered when developing a land management plan: The following additional uses of conservation lands acquired pursuant to the Florida Forever program and other state-funded conservation land purchase programs shall be authorized, upon a finding by the Board of Trustees, if they meet the criteria specified in paragraphs (a)-(e): water resource development projects, water supply development projects, storm-water management projects, linear facilities and sustainable agriculture and forestry. Such additional uses are authorized where: (a) Not inconsistent with the management plan for such lands; (b) Compatible with the natural ecosystem and resource values of such lands; (c) The proposed use is appropriately located on such lands and where due consideration is given to the use of other available lands; (d) The using entity reasonably compensates the titleholder for such use based upon an appropriate measure of value; and (e) The use is consistent with the public interest.

**Section C: Public Involvement Items**

24	A statement concerning the extent of public involvement and local government participation in the development of the plan, if any.	18-2.021	App. C
25	The management prospectus required pursuant to paragraph (9)(d) shall be available to the public for a period of 30 days prior to the public hearing.	259.032(10)	N/A
26	LMPs and LMP updates for parcels over 160 acres shall be developed with input from an advisory group who must conduct at least one public hearing within the county in which the parcel or project is located. Include the advisory group members and their affiliations, as well as the date and location of the advisory group meeting.	259.032(10)	App. C
27	Summary of comments and concerns expressed by the advisory group for parcels over 160 acres	18-2.021	App. C
28	During plan development, at least one public hearing shall be held in each affected county. Notice of such public hearing shall be posted on the parcel or project designated for management, advertised in a paper of general circulation, and announced at a scheduled meeting of the local governing body before the actual public hearing. Include a copy of each County's advertisements and announcements (meeting minutes will suffice to indicate an announcement) in the management plan.	253.034(5) & 259.032(10)	App. C
29	The manager shall consider the findings and recommendations of the land management review team in finalizing the required 10-year update of its management plan. Include manager's replies to the team's findings and recommendations.	259.036	N/A
30	Summary of comments and concerns expressed by the management review team, if required by Section 259.036, F.S.	18-2.021	N/A

**Land Management Plan Compliance Checklist  
Required for State-owned conservation lands over 160 acres**

Item #	Requirement	Statute/Rule	Pg#/App
31	If manager is not in agreement with the management review team's findings and recommendations in finalizing the required 10-year update of its management plan, the managing agency should explain why they disagree with the findings or recommendations.	259.036	N/A
<b>Section D: Natural Resources</b>			
32	Location and description of known and reasonably identifiable renewable and non-renewable resources of the property regarding soil types. Use brief descriptions and include USDA maps when available.	18-2.021	p. 17-20
33	Insert FNAI based natural community maps when available.	ARC consensus	p. 30
34	Location and description of known and reasonably identifiable renewable and non-renewable resources of the property regarding outstanding native landscapes containing relatively unaltered flora, fauna and geological conditions.	18-2.021	Ex Sum
35	Location and description of known and reasonably identifiable renewable and non-renewable resources of the property regarding unique natural features and/or resources including but not limited to virgin timber stands, scenic vistas, natural rivers and streams, coral reefs, natural springs, caverns and large sinkholes.	18-2.018 & 18-2.021	p. 29-38
36	Location and description of known and reasonably identifiable renewable and non-renewable resources of the property regarding beaches and dunes.	18-2.021	N/A
37	Location and description of known and reasonably identifiable renewable and non-renewable resources of the property regarding mineral resources, such as oil, gas and phosphate, etc.	18-2.018 & 18-2.021	p. 16-17
38	Location and description of known and reasonably identifiable renewable and non-renewable resources of the property regarding fish and wildlife, both game and non-game, and their habitat.	18-2.018 & 18-2.021	p. 29-41, App. B.3.1
39	Location and description of known and reasonably identifiable renewable and non-renewable resources of the property regarding State and Federally listed endangered or threatened species and their habitat.	18-2.021	p. 29-41, App. B.3.2
40	The identification or resources on the property that are listed in the Natural Areas Inventory. Include letter from FNAI or consultant where appropriate.	18-2.021	p. 29-38
41	Specific description of how the managing agency plans to identify, locate, protect and preserve or otherwise use fragile, nonrenewable natural and cultural resources.	259.032(10)	p. 38-45, p. 51-72, App. E.2
42	Habitat Restoration and Improvement	259.032(10) & 253.034(5)	
42-A.	Describe management needs, problems and a desired outcome and the key management activities necessary to achieve the enhancement, protection and preservation of restored habitats and enhance the natural, historical and archeological resources and their values for which the lands were acquired.	259.032(10) & 253.034(5)	p. 29-38, 41- 45, 51-72
42-B.	Provide a detailed description of both short (2-year planning period) and long-term (10-year planning period) management goals, and a priority schedule based on the purposes for which the lands were acquired and include a timeline for completion.	259.032(10) & 253.034(5)	App. D.1
42-C.	The associated measurable objectives to achieve the goals.	259.032(10) & 253.034(5)	App. D.1
42-D.	The related activities that are to be performed to meet the land management objectives and their associated measures. Include fire management plans - they can be in plan body or an appendix.	259.032(10) & 253.034(5)	App. D.1
42-E.	A detailed expense and manpower budget in order to provide a management tool that facilitates development of performance measures, including recommendations for cost-effective methods of accomplishing those activities.	259.032(10) & 253.034(5)	App. D.1
43	***Quantitative data description of the land regarding an inventory of forest and other natural resources and associated acreage. See footnote.	253.034(5)	Ex Sum



**Land Management Plan Compliance Checklist  
Required for State-owned conservation lands over 160 acres**

<b>Item #</b>	<b>Requirement</b>	<b>Statute/Rule</b>	<b>Pg#/App</b>
44	Sustainable Forest Management, including implementation of prescribed fire management	18-2.021, 253.034(5) & 259.032(10)	
44-A.	Management needs, problems and a desired outcome (see requirement for # 42-A).	18-2.021, 253.034(5) & 259.032(10)	N/A
44-B.	Detailed description of both short and long-term management goals (see requirement for # 42-B).	18-2.021, 253.034(5) & 259.032(10)	N/A
44-C.	Measurable objectives (see requirement for #42-C).	18-2.021, 253.034(5) & 259.032(10)	N/A
44-D.	Related activities (see requirement for #42-D).	18-2.021, 253.034(5) & 259.032(10)	N/A
44-E.	Budgets (see requirement for #42-E).	18-2.021, 253.034(5) & 259.032(10)	N/A
45	Imperiled species, habitat maintenance, enhancement, restoration or population restoration	259.032(10) & 253.034(5)	
45-A.	Management needs, problems and a desired outcome (see requirement for # 42-A).	259.032(10) & 253.034(5)	p. 29-42, 51-72
45-B.	Detailed description of both short and long-term management goals (see requirement for # 42-B).	259.032(10) & 253.034(5)	App. D.1
45-C.	Measurable objectives (see requirement for #42-C).	259.032(10) & 253.034(5)	App. D.1
45-D.	Related activities (see requirement for #42-D).	259.032(10) & 253.034(5)	App. D.1
45-E.	Budgets (see requirement for #42-E).	259.032(10) & 253.034(5)	App. D.1
46	***Quantitative data description of the land regarding an inventory of exotic and invasive plants and associated acreage. See footnote.	253.034(5)	App. B.3.3
47	Place the Arthropod Control Plan in an appendix. If one does not exist, provide a statement as to what arrangement exists between the local mosquito control district and the management unit.	BOT requirement via lease language	App. B.4
48	Exotic and invasive species maintenance and control	259.032(10) & 253.034(5)	
48-A.	Management needs, problems and a desired outcome (see requirement for # 42-A).	259.032(10) & 253.034(5)	p. 41-42, 65-67, App. D.1
48-B.	Detailed description of both short and long-term management goals (see requirement for # 42-B).	259.032(10) & 253.034(5)	App. D.1
48-C.	Measurable objectives (see requirement for #42-C).	259.032(10) & 253.034(5)	App. D.1
48-D.	Related activities (see requirement for #42-D).	259.032(10) & 253.034(5)	App. D.1
48-E.	Budgets (see requirement for #42-E).	259.032(10) & 253.034(5)	App. D.1

**Section E: Water Resources**

49	A statement as to whether the property is within and/or adjacent to an aquatic preserve or a designated area of critical state concern or an area under study for such designation. If yes, provide a list of the appropriate managing agencies that have been notified of the proposed plan.	18-2.018 & 18-2.021	p. 1-4
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**Land Management Plan Compliance Checklist  
Required for State-owned conservation lands over 160 acres**

Item #	Requirement	Statute/Rule	Pg#/App
50	Location and description of known and reasonably identifiable renewable and non-renewable resources of the property regarding water resources, including water classification for each water body and the identification of any such water body that is designated as an Outstanding Florida Water under Rule 62-302.700, F.A.C.	18-2.021	p. 1-4, 20-28
51	Location and description of known and reasonably identifiable renewable and non-renewable resources of the property regarding swamps, marshes and other wetlands.	18-2.021	p. 32-34
52	***Quantitative description of the land regarding an inventory of hydrological features and associated acreage. See footnote.	253.034(5)	Ex. Sum
53	Hydrological Preservation and Restoration	259.032(10) & 253.034(5)	
53-A.	Management needs, problems and a desired outcome (see requirement for # 42-A).	259.032(10) & 253.034(5)	App. D.1
53-B.	Detailed description of both short and long-term management goals (see requirement for # 42-B).	259.032(10) & 253.034(5)	App. D.1
53-C.	Measurable objectives (see requirement for #42-C).	259.032(10) & 253.034(5)	App. D.1
53-D.	Related activities (see requirement for #42-D).	259.032(10) & 253.034(5)	App. D.1
53-E.	Budgets (see requirement for #42-E).	259.032(10) & 253.034(5)	App. D.1

**Section F: Historical, Archaeological and Cultural Resources**

54	**Location and description of known and reasonably identifiable renewable and non-renewable resources of the property regarding archeological and historical resources. Include maps of all cultural resources except Native American sites, unless such sites are major points of interest that are open to public visitation.	18-2.018, 18-2.021 & per DHR's request	Ex. Sum, p-42-45
55	***Quantitative data description of the land regarding an inventory of significant land, cultural or historical features and associated acreage.	253.034(5)	Ex. Sum, p-42-45
56	A description of actions the agency plans to take to locate and identify unknown resources such as surveys of unknown archeological and historical resources.	18-2.021	App. D.1
57	Cultural and Historical Resources	259.032(10) & 253.034(5)	
57-A.	Management needs, problems and a desired outcome (see requirement for # 42-A).	259.032(10) & 253.034(5)	App. D.1
57-B.	Detailed description of both short and long-term management goals (see requirement for # 42-B).	259.032(10) & 253.034(5)	App. D.1
57-C.	Measurable objectives (see requirement for #42-C).	259.032(10) & 253.034(5)	App. D.1
57-D.	Related activities (see requirement for #42-D).	259.032(10) & 253.034(5)	App. D.1
57-E.	Budgets (see requirement for #42-E).	259.032(10) & 253.034(5)	App. D.1

\*\*While maps of Native American sites should not be included in the body of the management plan, the DSL urges each managing agency to provide such information to the Division of Historical Resources for inclusion in their proprietary database. This information should be available for access to new managers to assist them in developing, implementing and coordinating their management activities.

**Section G: Facilities (Infrastructure, Access, Recreation)**

58	***Quantitative data description of the land regarding an inventory of infrastructure and associated acreage. See footnote.	253.034(5)	p. 75-77
59	Capital Facilities and Infrastructure	259.032(10) & 253.034(5)	



**Land Management Plan Compliance Checklist  
Required for State-owned conservation lands over 160 acres**

Item #	Requirement	Statute/Rule	Pg#/App
59-A.	Management needs, problems and a desired outcome (see requirement for # 42-A).	259.032(10) & 253.034(5)	p. 75-78, App. D.1
59-B.	Detailed description of both short and long-term management goals (see requirement for # 42-B).	259.032(10) & 253.034(5)	App. D.1
59-C.	Measurable objectives (see requirement for #42-C).	259.032(10) & 253.034(5)	App. D.1
59-D.	Related activities (see requirement for #42-D).	259.032(10) & 253.034(5)	App. D.1
59-E.	Budgets (see requirement for #42-E).	259.032(10) & 253.034(5)	App. D.1
60	*** Quantitative data description of the land regarding an inventory of recreational facilities and associated acreage.	253.034(5)	p. 71
61	Public Access and Recreational Opportunities	259.032(10) & 253.034(5)	
61-A.	Management needs, problems and a desired outcome (see requirement for # 42-A).	259.032(10) & 253.034(5)	App. D.1
61-B.	Detailed description of both short and long-term management goals (see requirement for # 42-B).	259.032(10) & 253.034(5)	App. D.1
61-C.	Measurable objectives (see requirement for #42-C).	259.032(10) & 253.034(5)	App. D.1
61-D.	Related activities (see requirement for #42-D).	259.032(10) & 253.034(5)	App. D.1
61-E.	Budgets (see requirement for #42-E).	259.032(10) & 253.034(5)	App. D.1

**Section H: Other/ Managing Agency Tools**

62	Place this LMP Compliance Checklist at the front of the plan.	ARC and managing agency consensus	Front & App. E.1
63	Place the Executive Summary at the front of the LMP. Include a physical description of the land.	ARC and 253.034(5)	Ex. Sum
64	If this LMP is a 10-year update, note the accomplishments since the drafting of the last LMP set forth in an organized (categories or bullets) format.	ARC consensus	App. D.3
65	Key management activities necessary to achieve the desired outcomes regarding other appropriate resource management.	259.032(10)	p. 51-72
66	Summary budget for the scheduled land management activities of the LMP including any potential fees anticipated from public or private entities for projects to offset adverse impacts to imperiled species or such habitat, which fees shall be used to restore, manage, enhance, repopulate, or acquire imperiled species habitat for lands that have or are anticipated to have imperiled species or such habitat onsite. The summary budget shall be prepared in such a manner that it facilitates computing an aggregate of land management costs for all state-managed lands using the categories described in s. 259.037(3) which are resource management, administration, support, capital improvements, recreation visitor services, law enforcement activities.	253.034(5)	App. D.1
67	Cost estimate for conducting other management activities which would enhance the natural resource value or public recreation value for which the lands were acquired, include recommendations for cost-effective methods in accomplishing those activities.	259.032(10)	App. D.1
68	A statement of gross income generated, net income and expenses.	18-2.018	N/A

\*\*\* = The referenced inventories shall be of such detail that objective measures and benchmarks can be established for each tract of land and monitored during the lifetime of the plan. All quantitative data collected shall be aggregated, standardized, collected, and presented in an electronic format to allow for uniform management reporting and analysis. The information collected by the DEP pursuant to s. 253.0325(2) shall be available to the land manager and his or her assignee.

**These procedures apply to state agencies, local governments, and non-profits that manage state-owned properties.**

**A. General Discussion**

Historic resources are both archaeological sites and historic structures. Per Chapter 267, Florida Statutes, *‘Historic property’ or ‘historic resource’ means any prehistoric district, site, building, object, or other real or personal property of historical, architectural, or archaeological value, and folklife resources. These properties or resources may include, but are not limited to, monuments, memorials, Indian habitations, ceremonial sites, abandoned settlements, sunken or abandoned ships, engineering works, treasure trove, artifacts, or other objects with intrinsic historical or archaeological value, or any part thereof, relating to the history, government, and culture of the state.*

**B. Agency Responsibilities**

Per State Policy relative to historic properties, state agencies of the executive branch must allow the Division of Historical Resources (Division) the opportunity to comment on any undertakings, whether these undertakings directly involve the state agency, i.e., land management responsibilities, or the state agency has indirect jurisdiction, i.e. permitting authority, grants, etc. No state funds should be expended on the undertaking until the Division has the opportunity to review and comment on the project, permit, grant, etc.

State agencies shall preserve the historic resources which are owned or controlled by the agency.

Regarding proposed demolition or substantial alterations of historic properties, consultation with the Division must occur, and alternatives to demolition must be considered.

State agencies must consult with Division to establish a program to location, inventory and evaluate all historic properties under ownership or controlled by the agency.

**C. Statutory Authority**

Statutory Authority and more in depth information can be found at: [www.flheritage.com/preservation/compliance/guidelines.cfm](http://www.flheritage.com/preservation/compliance/guidelines.cfm)

**D. Management Implementation**

**Even though the Division sits on the Acquisition and Restoration Council and approves land management plans, these plans are conceptual. Specific information regarding individual projects must be submitted to the Division for review and recommendations.**

Managers of state lands must coordinate any land clearing or ground disturbing activities with the Division to allow for review and comment on the proposed project. Recommendations may include, but are not limited to: approval of the project as submitted, cultural resource assessment survey by a qualified professional archaeologist, modifications to the proposed project to avoid or mitigate potential adverse effects.

Projects such as additions, exterior alteration, or related new construction regarding historic structures must also be submitted to the Division of Historical Resources for review and comment by the Division’s architects. Projects involving structures fifty years of age or older, must be submitted to this agency for a significance determination. In rare cases, structures under fifty years of age may be deemed historically significant. These must be evaluated on a case by case basis.

Adverse impacts to significant sites, either archaeological sites or historic buildings, must be avoided. Furthermore, managers of state property should make preparations for locating and evaluating historic resources, both archaeological sites and historic structures.

**E. Minimum Review Documentation Requirements**

In order to have a proposed project reviewed by the Division, certain information must be submitted for comments and recommendations. The minimum review documentation requirements can be found at: [www.flheritage.com/preservation/compliance/docs/minimum\\_review\\_documentation\\_requirements.pdf](http://www.flheritage.com/preservation/compliance/docs/minimum_review_documentation_requirements.pdf) .

Questions relating to the treatment of archaeological and historic resources on state lands should be directed to:

Deena S. Woodward  
Division of Historical Resources, Bureau of Historic Preservation, Compliance and Review Section  
R. A. Gray Building, 500 South Bronough Street  
Tallahassee, FL 32399-0250  
Phone: (850) 245-6425, Toll Free: (800) 847-7278, Fax: (850) 245-6435





**Florida Department of  
Environmental Protection**

Marjory Stoneman Douglas Building  
3900 Commonwealth Boulevard, MS 235  
Tallahassee, Florida 32399-3000

Rick Scott  
Governor

Carlos Lopez-Cantera  
Lt. Governor

Noah Valenstein  
Secretary

July 2017

Adam Mengel, Planning Director  
Flagler County Planning and Zoning Division  
1769 East Moody Boulevard, Building 2, Suite 105  
Bunnell, Florida 32110

Palmer Pantan, Director  
Volusia County Planning and Development Services  
123 West Indiana Avenue  
DeLand, Florida 32720

Dear Planning Directors:

Attached is a copy of the draft Tomoka Marsh Aquatic Preserve Management Plan. (The plan can also be found at <http://www.dep.state.fl.us/coastal/sites/tomoka/>) The plan was developed with input from the public and the Tomoka Marsh Aquatic Preserve Management Plan Advisory Group. It is anticipated to be reviewed and approved by the Acquisition and Restoration Council at the October 2017 meeting in Tallahassee. We respectfully request, within 30 days of receipt of this letter, your review of the Aquatic Preserve plan for its compliance with the Flagler and Volusia County Comprehensive Plans. Please reply to the physical address (or e-mail address) regarding whether the Tomoka Marsh Aquatic Preserve Management Plan is in compliance with the county's comprehensive plan. Thank you in advance for your time and effort in this matter.

If you have any questions, please don't hesitate to contact me at (850)245-2098 or [Penny.Isom@dep.state.fl.us](mailto:Penny.Isom@dep.state.fl.us).

Sincerely,

A handwritten signature in black ink, appearing to read "Penny Isom".

Penny Isom  
Planning Manager  
Florida Coastal Office

[www.dep.state.fl.us](http://www.dep.state.fl.us)



**Growth and Resource Management Department  
Planning and Development Services**

September 14, 2017

Penny Isom, Planning Manager  
Office of Coastal and Aquatic Managed Areas  
Florida Department of Environmental Protection  
Douglas Building, 3900 Commonwealth Boulevard MS 235  
Tallahassee, FL 32399-3000

Dear Ms. Isom:

Volusia County staff appreciates the opportunity to review the Tomoka Marsh Aquatic Preserve Management Plan. The Volusia County Environmental Management Department and the Volusia County Planning and Development Services Department reviewed the plan for its consistency with the Volusia County Comprehensive Plan. The management plan supports the protection of natural resources within and affecting Volusia County, and is found consistent with the Comprehensive Plan.

Please do not hesitate to contact me if you should require additional comment. My email is [PPanton@volusia.org](mailto:PPanton@volusia.org). My direct phone number is (386) 736-5959 Ext. 12736.

Sincerely,

A handwritten signature in blue ink that reads "Palmer M. Panton".

Palmer M. Panton  
Director, Planning and Development Services

**RECEIVED**

SEP 21 2017

**Florida Coastal Office**

123 West Indiana Avenue, Room 202 • DeLand, FL 32720-4604  
Tel: 386-736-5959 • 386-239-7776 • 386-423-3367  
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## Florida Department of Environmental Protection

Marjory Stoneman Douglas Building  
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Tallahassee, Florida 32399-3000

Rick Scott  
Governor

Carlos Lopez-Cantera  
Lt. Governor

Noah Valenstein  
Secretary

October 23, 2017

Ms. Penny Isom  
Planning Manager  
Florida Coastal Office  
Florida Department of Environmental Protection  
3900 Commonwealth Boulevard, MS 235  
Tallahassee, Florida 32399-3000

**RE: Tomoka Marsh Aquatic Preserve Management Plan**

Dear Ms. Isom:

On **October 20, 2017**, the Acquisition and Restoration Council recommended approval of the **Tomoka Marsh Aquatic Preserve** management plan. Please advise Mr. James Parker of this office when the plan has been approved by the Board of Trustees.

Sincerely,



Raymond V. Spaulding  
Office of Environmental Services  
Division of State Lands  
Department of Environmental Protection



**Tomoka Marsh Aquatic Preserve  
Management Plan**

**Florida Department of Environmental Protection  
Florida Coastal Office**

3900 Commonwealth Blvd., MS #235  
Tallahassee, FL 32399 • [www.aquaticpreserves.org](http://www.aquaticpreserves.org)