Big Bend Seagrasses Aquatic Preserve

Management Plan

Big Bend Seagrasses Aquatic Preserve
3266 North Sailboat Ave.
Crystal River, FL 34428
352.563.0450 • www.dep.state.fl.us/coastal/sites/bigbend

Florida Department of Environmental Protection
Florida Coastal Office
3900 Commonwealth Blvd., MS #235
Tallahassee, FL 32399 • www.FloridaCoasts.org

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October 2015

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Mission Statement

Florida Coastal Office / The mission of the Florida Coastal Office in relation to Florida's 41 aquatic preserves, three National Estuarine Research Reserves, National Marine Sanctuary and Coral Reef Conservation Program 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 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

Big Bend Seagrasses Aquatic Preserve Management Plan	
Lead Agency:	Florida Department of Environmental Protection's (DEP) Florida Coastal Office (FCO)
Common Name of Property:	Big Bend Seagrasses Aquatic Preserve (BBSAP)
Location:	Wakulla, Jefferson, Taylor, Dixie, Levy counties, Florida
Acreage Total:	984,325 acres
Acreage Breakdown for FCO Management Units According to Florida Natural Areas Inventory (FNAI) Natural Community Types	
FNAI Natural Communities	*Acreage according to GIS*
Beach Dune:	15 acres
Coastal Berm:	185 acres
Seagrass Bed:	267,056 acres
Tidal Marsh:	75,167 acres
Tidal Swamp:	90 acres
Sinkhole Limestone Outcrop	Unknown
Shell Mound	5 acres
Alluvial Forest	15 acres
Floodplain Marsh	166 acres
Floodplain Swamp (includes freshwater tidal swamp)	379 acres
Blackwater Stream	361 acres
Alluvial Stream	Unknown
Spring-run Stream	341 acres
Aquatic Cave	Unknown
Consolidated Substrate	Unknown
Unconsolidated Substrate	Unknown
Tidal Flat (subsection of unconsolidated substrate)	6,247 acres
Mollusk Reef	220 acres
Octocoral Bed	Unknown
Sponge Bed	Unknown
Algal Bed	Unknown
Composite Substrate	Unknown
Total Acreage:	**350,237 GIS-acres of known natural communities**
Management Agency:	DEP's FCO
Designation:	Aquatic Preserve
Unique Features:	BBSAP is one of the least developed areas in the state of Florida. The region contains some of the world's vastest coastal salt marshes and seagrass beds. These habitats support economically important commercial and recreational fishing industry and are also critical habitats for many threatened and endangered species such as the West Indian manatee, green sea turtle, and Gulf sturgeon. Cedar Key has one of the most successful hard clam aquaculture industries in the United States.
Archaeological/Historical Sites:	The Department of State's Division of Historical Resources has identified hundreds of archaeological sites in the immediate coastal areas of the Big Bend region. Some examples from the region include: Fort San Marco de Apalachee, Confederate salt works, St. Marks lighthouse, Seahorse Key lighthouse, middens and settlement sites.

Big Bend Seagrasses Aquatic Preserve Management Plan (continued)	
Management Needs / *See Management Issues and Goals*	
Ecosystem Science:	Seagrass communities are vital to the health of the estuaries in BBSAP. Maintaining a strategic long-term seagrass and water quality monitoring program will be crucial in sustaining this important economic resource for future generations.
Education and Outreach:	Education and Outreach programs in BBSAP are critical to the protection, conservation, and enhancement of the 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.
Public Use:	The waters and habitats of BBSAP are of great economic importance to Florida's recreational and commercial fisheries. This region of the gulf supports the largest recreational scallop fishery in the state. The Cedar Key area is renowned for its thriving hard clam (*Mercenaria mercenaria*) aquaculture industry. The numerous wildlife conservation areas and state parks located in or near BBSAP are popular destinations for nature lovers. The dramatic vistas of the gulf and adjacent marshes entice visitors and provide awesome opportunities for wildlife viewing, nature study, environmental education, and photography. Kayaking is becoming more prominent in the region, and the historic Big Bend Saltwater Paddling Trail is sure to entice more visitors to this area of Florida. The trail is part of the larger Florida Circumnavigational Saltwater Paddling Trail that passes through the waters of BBSAP.
Public Involvement:	Public support is vital to the success of government conservation programs. The goal is to foster understanding of the problems facing these fragile ecosystems and the steps needed to adequately manage this important habitat. BBSAP formed an advisory committee group consisting of a variety of stakeholders to provide guidance in identifying management issues to be addressed in the management plan. BBSAP also held two formal public meetings to solicit public comment on the draft plan. In addition, the April 11, 2014 Acquisition and Restoration Council (ARC) meeting was a public meeting in which citizens could comment on the management plan.

FCO/Trustees Approval

FCO approval date: November 12, 2013 **BTIITF approval date**: October 27, 2015

ARC approval date: April 11, 2014

Comments:

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Lighthouse at St. Marks National Wildlife Refuge.

Part I

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) Office of Florida Coastal Office (FCO) as part of a network that includes 41 aquatic preserves, 3 National Estuarine Research Reserves (NERRs), a National Marine Sanctuary, the Coral Reef Conservation Program and the Florida Oceans and Coastal Council. 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.

Our expansive 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.).

This 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.

Map 1 / Florida Coastal Office state-wide managed resources.

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

With increasing development, recreation and economic pressures, aquatic resources have the potential to be significantly impacted, either directly or indirectly. 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. This 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, four comprehensive management programs are identified. In each of these management programs, relevant information about the specific sites is described in an effort to create a comprehensive management plan. It is expected that the specific needs or issues are unique and vary at each location, but the four management programs will remain constant. These management programs are:

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

In addition, unique local and regional issues are identified, and goals, objectives and strategies are established to address these issues. Finally, the program and facility needs required to meet these goals as identified. These components are all key elements in an effective coastal management program and for achieving the mission of the sites.

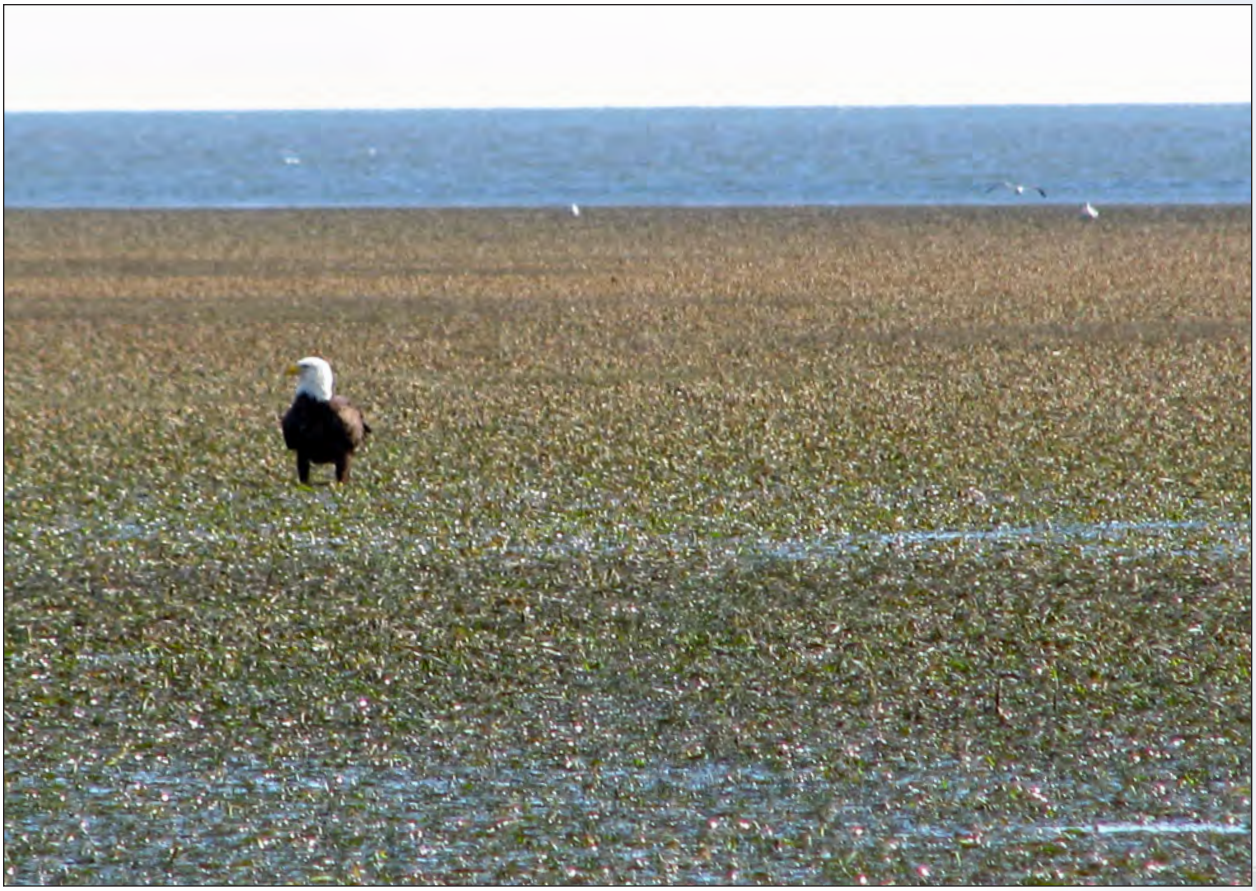
Big Bend Seagrasses Aquatic Preserve (BBSAP) drafted a management plan in 1988, but it was never adopted. Therefore, this will be the first officially adopted management plan for the BBSAP.

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 the Sunshine Law (§286.011, F.S.):

- 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 taken during management plan development. First, staff compose a draft plan after gathering information of current and historic uses and 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. An additional public meeting is held when the plan is reviewed by the Acquisition and Restoration Council for final approval. For additional information about the advisory committee and the public meetings refer to Appendix C - Public Involvement.



Bald eagle in a Cedar Key seagrass bed at low tide.

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 three primary areas: Regulatory Programs, Land and Recreation, and 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 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 and the Coral Reef Conservation Program. The 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. The State of 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 submerged lands of exceptional beauty 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 (the Trustees) created the first aquatic preserve, 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 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, 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's Division of Law Enforcement and local law enforcement agencies. Enforcement of administrative remedies rests with FCO, 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 specifically authorized for inclusion as part of an aquatic preserve.

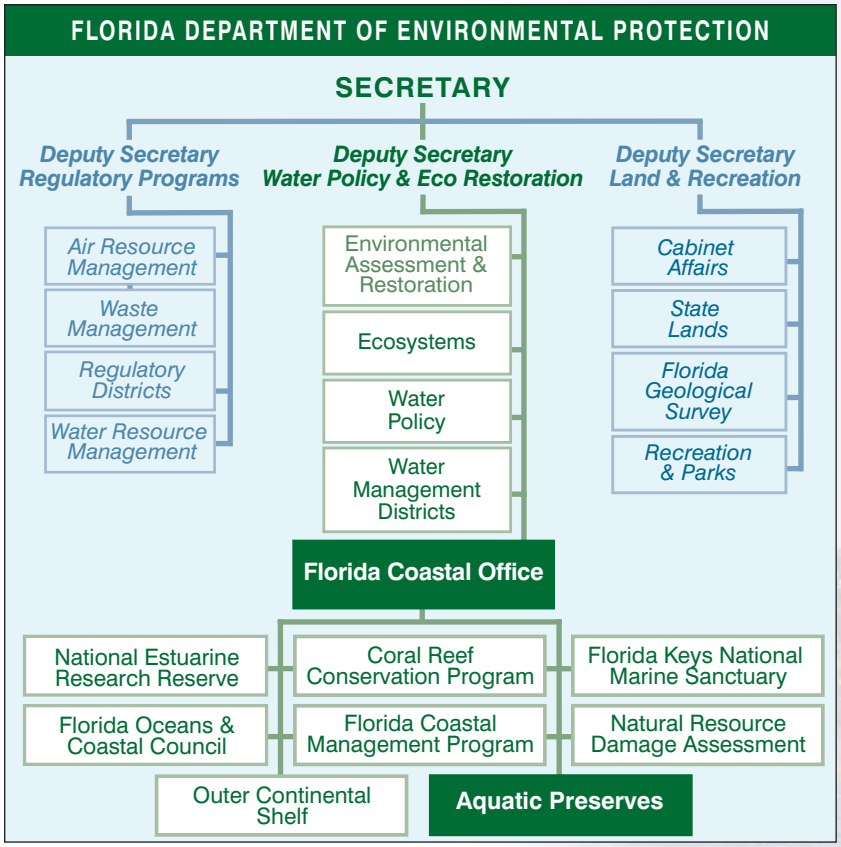


Figure 1 / State structure for managing Aquatic Preserves.

Management responsibilities for aquatic preserves may be fulfilled directly by the Trustees or by staff of 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 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.

FCO staff comments, 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.

Many provisions of the Florida Statutes that empower non-FCO programs within DEP or other agencies may be important to the management of FCO sites. For example, Chapter 403, F.S., authorizes 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, F.A.C., should be read together with Chapter 18-18, F.A.C., or Chapter 18-20, F.A.C., to determine what activities are permissible within an aquatic preserve. If Chapter 18-18, F.A.C., or Chapter 18-20, F.A.C., are silent on an issue, Chapter 18-21, F.A.C., will control; if a conflict is perceived between the rules, the stricter standards of Chapter 18-18, F.A.C., or Chapter 18-20, F.A.C., supersede those of Chapter 18-21, F.A.C. Because Chapter 18-21, F.A.C. 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. "Activity," in the context of the rule, 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.). To be authorized on sovereignty lands, activities must be not contrary to the public interest (Rule 18-21.004, F.A.C.).

Chapter 18-21, F.A.C., 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, it additionally 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, F.A.C. Chapter 18-18, F.A.C., is specific to the Biscayne Bay Aquatic Preserve and is more extensively described in that site's management plan. Chapter 18-20, F.A.C., 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.

Chapter 18-20, F.A.C., 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.

As with statutes, 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 sites is so long as to be impractical to create within the context of this management plan.

Withlacoochee karst features.

Chapter Three

The Big Bend Seagrasses Aquatic Preserve

3.1 / ***Description of Representative Ecosystem Region***

3.1.1 / ***Historical Background***

Archaeological evidence shows that Florida's native peoples have been dependent on aquatic, coastal and adjacent upland resources for more than 12,000 years in the Big Bend region. Along the coast, people developed a hunter/gatherer/fisher lifestyle that supported countless generations of Native Americans until the arrival of the Spanish in 1513. A variety of coastal, estuarine, and near-shore freshwater habitats were utilized, with specific groups focusing on the collection of certain seasonally available resources. Artifacts from the Fort Walton Period (A.D. 900 - European contact) provide evidence that trade networks existed throughout the eastern and central United States. The remains of large marine mammals, sharks, and various fishes available only off-shore indicate the use of large, sea-going canoes. The Fort Walton people were among the first of Florida's native peoples to have contact with the early Spanish explorers in the 16th century. The Florida territory was controlled mostly by the Spanish over the next 250 years, excluding the years between 1763 and 1783, when the territory was controlled by the British. Ultimately, European colonization of Florida, disease, adoption of the Spanish mission way of life, and struggles over New World empires decimated Florida's Native American population. In the years that followed, the Creek Indians from Alabama and Georgia migrated south to occupy Florida (Gannon, 1996).

St. Marks became an important sea port during the 1820s, and by the 1840s, Cedar Key had also become a main shipping port. Products such as cedar, cypress, pine, rosin, and turpentine were the major commodities shipped out of the port. In 1837, the Tallahassee to St. Marks railroad began moving commerce and passengers to and from the sea port, serving as an important transportation route for the cotton economy. The completion of a railroad that connected Fernandina and Cedar Key shaped Cedar

Key into a major port and made the long dangerous trip down the Gulf Coast, around the Florida Keys, and up the Atlantic Coast unwarranted. By the end of the century, the Atlantic, Gulf and West India Transit Railroad connected Cedar Key to Gainesville and other parts of the state and passengers could connect in Cedar Key by steamship to Pensacola, New Orleans, Key West, and Havana (McCarthy, 2007).

Three Seminole Wars, or the Florida Wars, took place between 1816 and 1858. It was during this time that prestigious leaders such as Andrew Jackson and General Zachary Taylor lead troops through the wilderness of the Big Bend region. During the American Civil War (1861–1865) battles were limited in the Big Bend, but ships carried troops and supplies from the Gulf up the rivers of the region to access Florida's interior. Steamboats, navigating the Suwannee River since approximately 1834, serviced some of the forts, turpentine camps, and sawmills along the river. The Battle of Natural Bridge is the only major Civil War combat engagement on Big Bend soil (Gannon, 1996).

Historically, silviculture has been an important resource for the Big Bend region. Red cedar (*Juniperus virginiana*), plentiful between the Suwannee and Withlacoochee rivers, was a very important export in the mid-1800s. By the late 1800s, native Florida pinelands were a major commodity and timbering land resulted in more profit per acre than cotton or corn. After 1880, Big Bend became known as the principle source of old growth cypress. The land is marked by a network of old haul and tram roads that travel deep into the wetlands. By the end of the century, local economies shifted from silviculture to sponging and commercial fishing (Ellis et al., 2001). The small fishing villages throughout this region have experienced slow growth and remained virtually unchanged for decades. Today, the Big Bend region of Florida is known as the "Nature Coast" and is well known for its natural beauty and rich cultural heritage.

The Big Bend Seagrasses Aquatic Preserve (BBSAP) is the largest aquatic preserve in Florida, extending from Apalachee Bay southward to the Withlacoochee River. The BBSAP was established in 1985 and covers approximately 984,325 acres. This portion of the coast is unique in that it is an extensive area with no offshore barrier islands, where a number of rivers, creeks, and marshes discharge directly into the Gulf of Mexico. It is also distinctive in its karst geology, characterized by porous limestone rock which allows water to reach the surface in springs and disappear underground into the Floridan Aquifer. As a result of these mature karst features, numerous sinks, springs, caverns and underground corridors are exclusive to this area. BBSAP is most notable for the extensive seagrass beds and salt marshes that provide critical habitat to a multitude of marine species. These vital communities also help oxygenate the water column, stabilize sediments, and recycle nutrients. Seagrasses are considered essential to the ecological integrity and health of Florida's estuarine ecosystems, and can be used as an environmental indicator of overall water quality (Mattson et al., 2007). These habitats provide ideal conditions for high biodiversity and species richness, and are home to several species of special concern such as the West Indian manatee (*Trichechus manatus*).

In addition to its unique natural beauty and abundant wildlife, BBSAP also holds economic, scientific and cultural value. The waters of BBSAP are of great economic importance to Florida's commercial fisheries. The Florida Fish and Wildlife Conservation Commission (FWC) reported the annual commercial landings for the counties within BBSAP had an estimated value of over six million dollars in 2009. Recreationally, this area draws tourists to the pristine waters for fishing, boating and snorkeling. The scenic panoramas of vast coastal marsh and calm waters allow visitors a feeling of space and solitude. These waters also support the largest recreational scallop fishery in the state (Mattson et al., 2007). The extent of the seagrass beds and the presence of six seagrass species provide abundant opportunities for scientific study. The unique ecological processes and relationships within the seagrass and saltmarsh communities provide invaluable information on a relatively undisturbed ecosystem. In addition to the research opportunities provided by the distinct ecology of the region, biomedical research possibilities abound. The scientific value of the region is furthered through education and community outreach. The people of this region relish their relatively unchanged way of life and respect for their natural surroundings. Their bond with the sea and its resources fosters a sense of stewardship for the waters and a desire to preserve their local heritage.

3.1.2 / General Description

International/National/State/Regional Significance

Established in 1985, and spanning approximately 984,325 acres, BBSAP is the largest aquatic preserve in Florida and remains one of the most pristine coastal areas in the state. Extending from Apalachee Bay southward to the Withlacoochee River, BBSAP encompasses a large complex of estuaries and bays and includes large stretches of coastline that remain largely undeveloped. It has been described as one of the least polluted coastal regions in the continental United States (Livingston, 1990). The karst geology of the region has created features that are exclusive to the area such as sinks, springs, caverns and

the underground corridors of the Floridan Aquifer. Among these, a number of first magnitude springs including Wakulla, Manatee, and Fanning springs, discharge directly into the waters of BBSAP. The sinks and springs give rise to the numerous rivers, creeks, and marshes that flow into the Gulf of Mexico. Containing a diversity of natural communities within its bounds, BBSAP's most outstanding features are the extensive seagrass beds and salt marshes that provide critical structural habitat near shore, and in which a large majority of commercially, recreationally, and ecologically important marine species spend a portion of their life cycles (Mattson et al., 2007). The low wave energy and shallow depths, coupled with the contribution of clear water from the rivers, provide optimum conditions for seagrass meadows. The extent of these beds and the presence of six seagrass species provide abundant opportunities for the scientific study of seagrass habitat. Big Bend is the second largest contiguous area of seagrass habitat in the eastern Gulf of Mexico, covering about 1,158 square miles, making it an important resource not only to Florida but nationally and internationally as well (Mattson, 2000).

The combination of subtropical climate, diverse vegetation, and variety of habitats present in this region provide ideal conditions for high biodiversity and species richness. To date, nearly 2,000 native species have been documented within BBSAP, including more than 800 species of plants and more than 1,000 animal species. There are a number of special interest marine animal species that in some way rely on the seagrass beds within BBSAP. These include some publicized endangered species such as the Florida manatee (*Trichechus manatus latirostris*) and the Atlantic hawksbill (*Eretmochelys imbricata*) and Kemp's ridley (*Lepidochelys kempii*) sea turtles that use seagrass as a food resource. The Suwannee River region supports Essential Fish Habitat and the most viable population of the threatened Gulf sturgeon (*Acipenser oxyrinchus desotoi*). The area's vast seagrass beds with mud and sand substrates are an important marine habitat to this species. In addition to marine species, this area provides habitat to a wide variety of sea and shore birds of special interest including pelicans, ospreys (*Pandion haliaetus*), wood storks (*Mycteria americana*), roseate spoonbills (*Platalea ajaja*), and a large nesting colony of magnificent frigatebirds (*Fregata magnificens*) on Seahorse Key. There are terrestrial mammals of concern in the adjacent uplands as well, such as the endangered Florida panther (*Puma concolor coryi).*

BBSAP is of economic importance to Florida both commercially and recreationally. This productive region of the gulf sustains a very important commercial fishery. FWC reported the annual commercial landings for the counties within BBSAP totaled 3,686,776 pounds of fish and shellfish in 2009, with an estimated value of over six million dollars. The shellfish industry of this region includes the harvest of crab, shrimp, hard clams (*Mercenaria mercenaria*), and eastern oysters (FWC, 2010a). In addition, the Cedar Key area is renowned for its thriving hard clam aquaculture industry. This region of the gulf also accounts for between 25% and 33% of the total commercial blue crab landings in Florida, and supports the largest recreational scallop fishery in the state (Mattson et al., 2007). Both blue crabs (*Callinectes sapidus*) and bay scallops (*Argopecten irradians*) are largely dependent on the seagrass resources that are abundant within BBSAP (Orth & van Montfrans, 1987). Recreationally this area draws tourists to the pristine waters for fishing, boating and snorkeling. Sport fishermen angle mainly for sea trout (*Cynoscion* spp.) and redfish (*Sciaenops ocellatus*), but also tarpon (*Megalops atlanticus*), bull shark (*Carcharhinus leucas*), Spanish mackerel (*Scomberomorus maculatus*), cobia (*Rachycentron canadum*), bluefish (*Pomatomus saltatrix*), jack crevalle (*Caranx hippos*), and flounder (*Paralichthys lethostigma*). The dramatic vistas of the gulf and adjacent marshes entice visitors and these scenic resources provide excellent opportunities for wildlife viewing, nature study, environmental education, and photography. In order for the state to provide protection of these unique resources from further anthropogenic impact, resource management is critical for this area.

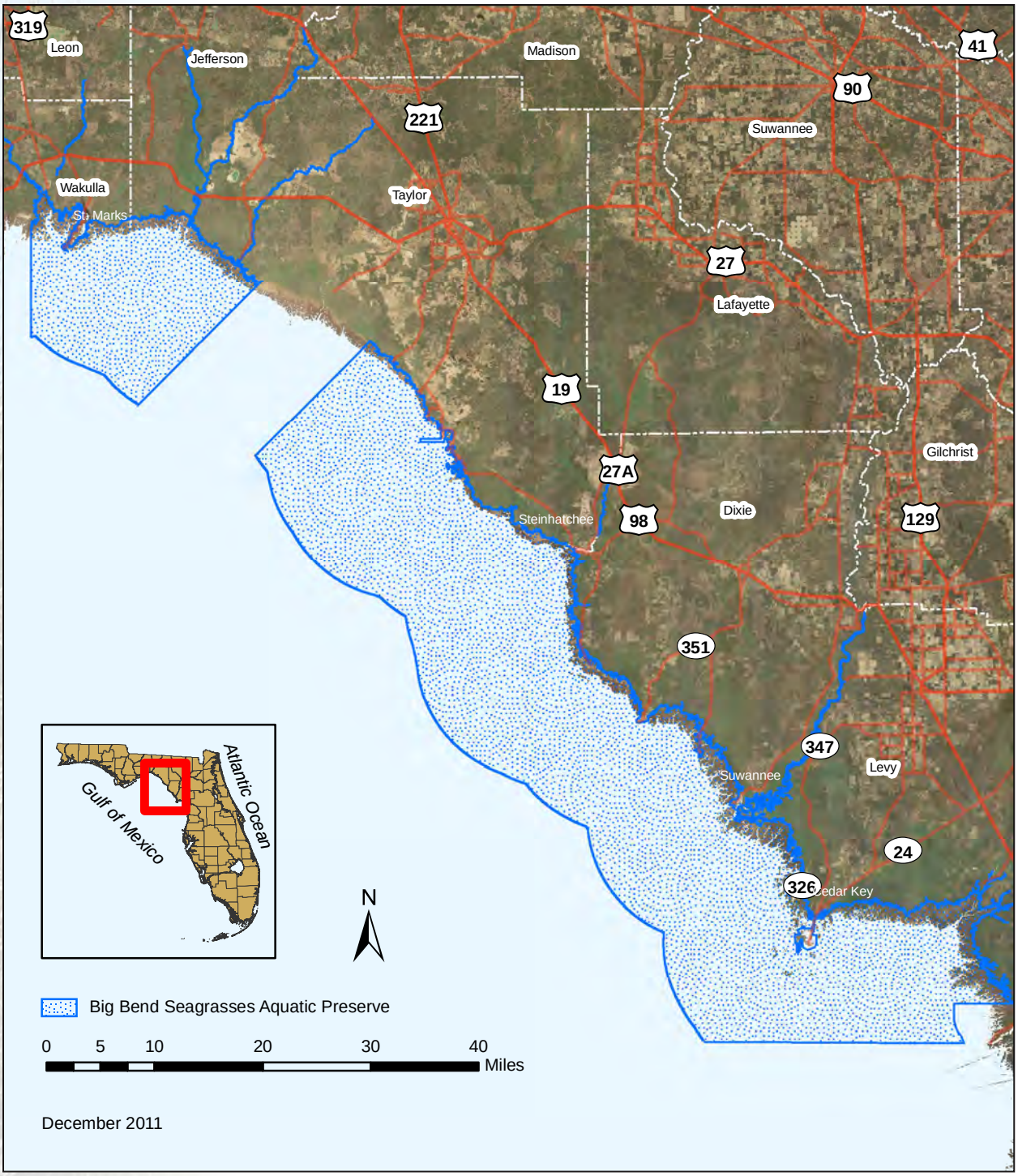
Location/Boundaries

The boundaries of BBSAP encompass approximately 984,325 acres and 1,232 miles of shoreline. BBSAP also spans five counties: Wakulla, Jefferson, Taylor, Dixie, and Levy. BBSAP begins in Wakulla County at the intersection of the westerly mean high water line of the St. Marks River with the mean high water line of the Gulf of Mexico. BBSAP then extends southward through Jefferson, Taylor, Dixie, and Levy counties to the intersection of the northern mean high water line of the Withlacoochee River and the mean high water line of the Gulf of Mexico. The waterward boundary extends three marine leagues into the Gulf of Mexico running parallel to the coastal mean high water line. BBSAP covers portions of Apalachee Bay, Deadman Bay, Suwannee Sound, Waccasassa Bay and Withlacoochee Bay. It also includes coastal drainage areas of nine major rivers including Wakulla River, St. Marks River, Aucilla River, Econfina River, Fenholloway River, Steinhatchee River, Suwannee River, Waccasassa River and Withlacoochee River, as well as numerous other small creeks and streams.

BBSAP boundaries are in close proximity to well established communities such as St. Marks, Steinhatchee, Suwannee, Horseshoe Beach, Cedar Key, and Yankeetown. U.S. Highway 98 and U.S.

Highway 19 run almost parallel to the coastline of BBSAP and provide access to these communities and their respective waterways. A number of well known historical landmarks are located within BBSAP including the Fort San Marcos de Apalache, St. Marks Lighthouse, Cedar Keys Historic and Archaeological District, and Seahorse Key Lighthouse.

BBSAP also includes the state owned submerged lands of the Suwannee River northeasterly to the bridge on U.S. Highway 19, about 28 miles. All navigable tributaries and streams south and west of U.S. Highway 98 and U.S. Highway 19 are included within the bounds of BBSAP. A break in BBSAP boundary of approximately 10 linear miles exists at the mouth of the Fenholloway River, and excludes approximately 90 square nautical miles of submerged lands. Sovereignty submerged lands within 500 feet of any incorporated or unincorporated municipality and manmade canals and channels are also excluded from BBSAP. The BBSAP is managed along with St. Martins Marsh Aquatic Preserve from its office located in Crystal River Preserve State Park at 3266 N. Sailboat Avenue in Crystal River, Florida.



Map 2 / Big Bend Seagrasses Aquatic Preserve.

Surrounding Population Data and Future Projected Changes

The Coastal Zones in the United States have experienced rapid growth and development, and Florida has had the largest percent population change between 1980 and 2003 at 75% (Crossett, Cuilton, Wiley, and Goodspeed, 2004). The Geoplan Center at the University of Florida conducted a study of Florida's population distribution in 2006, and their model shows that the state's population has been projected to more than double by 2060 (Zwick & Carr, 2006). The model showing predicted land use change suggests that the Big Bend region is expected to have significant areas of open space, with the coastal area near Tallahassee remaining relatively undeveloped. The population distribution model, however, suggests that there will be significant new populations near Keaton Beach and Dekle Beach in Taylor County. Although the model demonstrates that the Big Bend region may remain unspoiled, these predictions could be misleading. The predominant agricultural practice throughout the Coastal Lowlands of this region is silviculture, and companies such as Proctor and Gamble, Georgia Pacific, and St. Joe Company have converted the land into highly productive tree farms. These large landholdings have the potential to change dramatically, converting from low density agricultural areas into rural and urban towns and residential communities.

The 1990 Census populations for the coastal counties within BBSAP are included in Table 1. The populations in 1990 Census blocks within 10 miles of the coast are significantly different from the total 1990 Census populations, with the exception of Wakulla County where approximately 77% of the population lived within 10 miles of the coast. As shown below, the 2000 Census populations increased in each of these counties. Wakulla County had the largest population increase at 61% and Taylor County had the least significant increase in population at 12.5%. The U.S. Census Bureau also estimates an increase in populations for coastal BBSAP counties by the 2008 Census.

County	Population 1990	% Population within 10 miles of coast	Population increase by 2000	% Increase over 10 years	Population 2010
Wakulla	14,202	77%	8,661	61%	30,776
Jefferson	11,296	1.8%	1,606	14%	14,761
Taylor	17,111	15.7%	2,145	12.5%	22,570
Dixie	10,585	11.8%	3,242	30%	16,422
Levy	25,923	14.5%	8,527	33%	40,801

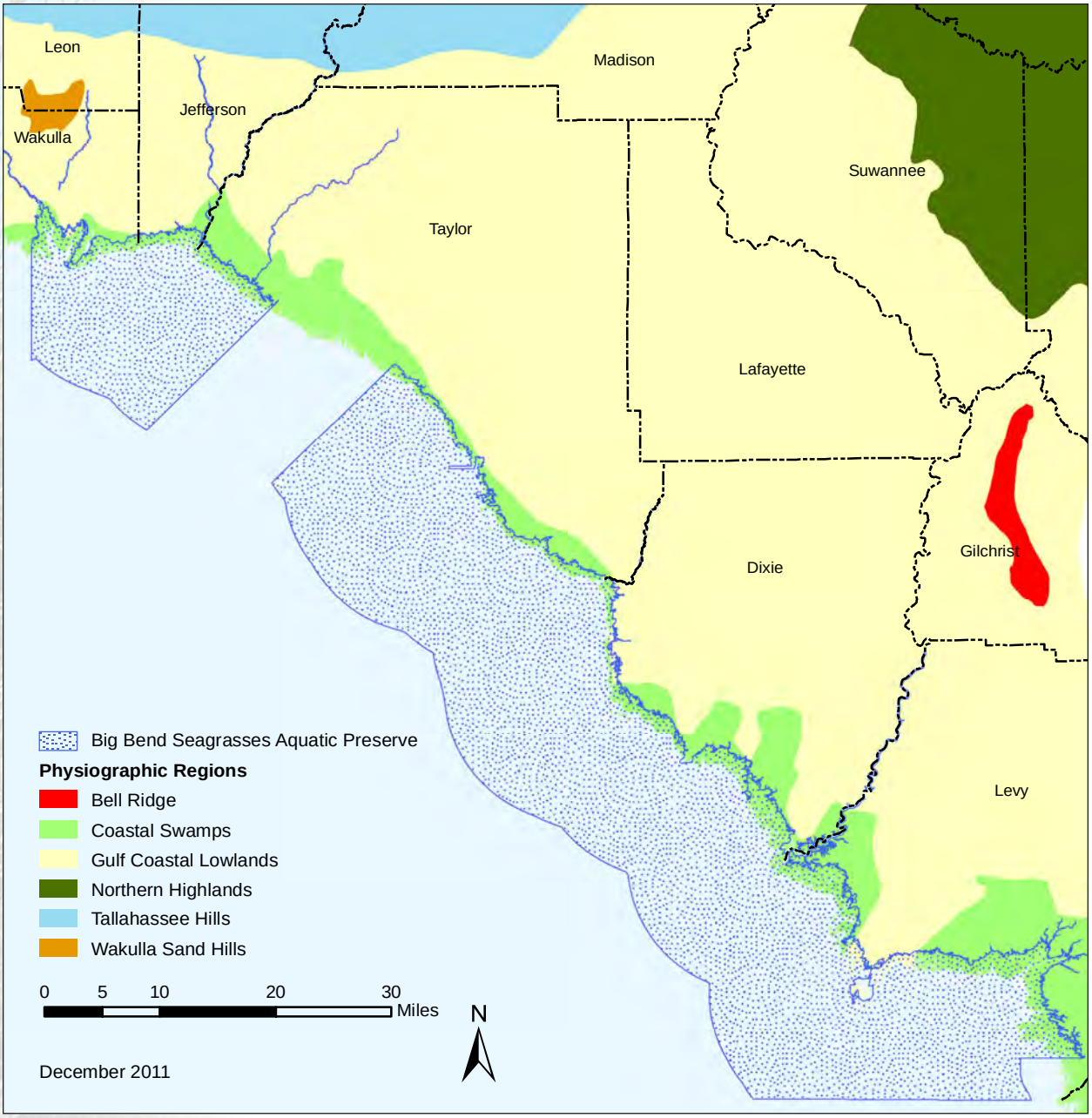
Table 1 / 1990 Census populations and twenty year projections for the coastal counties within Big Bend Seagrasses Aquatic Preserve.

Topography and Geomorphology

BBSAP lies within a submerged extension of the Gulf Coastal Lowlands physiographic province of Florida (White, 1970). The low, flat seaward sloping plain extends coastward from the western edge of the topographically higher Northern and Central Highlands provinces. Land surface slope averages approximately three feet per mile in the vicinity of Wakulla and Jefferson counties at the western end of BBSAP and about two feet per mile in Levy County at the southern end. In general, these slopes continue offshore on the submerged plain for over 20 miles with surface elevations ranging from sea level to over 200 feet in the Northern Highlands near Tallahassee Hills. The topography of the Gulf Coastal Lowlands is characterized by a diverse array of erosional and depositional landforms that have occurred due to sea level fluctuations during the Pliocene-Pleistocene age (Coultas & Hsieh, 1997). As a result, topographical features such as marine terraces, dune fields, flat sandy terrain, bars, and spits are scattered throughout this section of the state. Pleistocene age beach ridges, dunes, and dissected coastal sands are found at the east edge of the coastal plains, where the land surface grades to uplands. This region and the adjacent submarine plain are underlain by a series of these ancient surfaces and shorelines with soluble limestone at or near the lands surface. Dissolution activity and ancient marine processes have resulted in many intricate limestone features such as sinkholes, seeps, caverns and springs. These surface features are described as karst, a term describing landforms that have been modified by dissolution of soluble rock such as limestone or dolostone (Copeland, 2003). During the Pleistocene sea level highstands, the Big Bend region was a drowned karst coastline. Over much of BBSAP area, a thin layer of Pleistocene and Holocene quartz sand overlies the limestone, in many cases filling and masking the karst landscape with the exception of limestone pinnacles breaking the surface (Coultas & Hsieh, 1997). These variations in the limestone terrain and the pronounced karstic features of the Big Bend coast are the basis for its geomorphological complexity.

The Gulf Coastal Lowlands has several notable geomorphic features located inland. For example, the Cody Scarp is the line of demarcation between the Northern Highlands and Gulf Coastal Lowlands and is known as the most persistent topographic break in the state. This abrupt change in elevation represents the landward edge of a transgressive marine erosion event. Many rivers throughout this region recede underground crossing this transition, with the exception of the Suwannee River. In between Wakulla Springs and the Tallahassee Hills lies the Wakulla Sand Hills, an area of relief formed from relict sand dunes. The Woodville Karst Plain is also part of the Gulf Coastal Lowlands and is a localized geomorphic feature in Wakulla County with portions extending into Jefferson and Leon counties. Land surface elevations on the Woodville Karst Plain are low, rarely more than 50 feet above sea level. The plain is characterized by an abundance of shallow sand-filled sinkholes created where permeable sands form a veneer over the shallow, southward-dipping limestone bedrock. Dissolution of the underlying bedrock has caused subsidence that has probably been occurring ever since the area has been above sea level (Coultas & Hsieh, 1997).

The Big Bend region of Florida is typified by a shallow sloping submarine surface, general lack of wave activity, and lack of sediment supply. These three characteristics have created the extensive salt marsh systems within the Coastal Swamp subunit which lies physiographically below the Gulf Coastal Lowlands. This subunit supports both freshwater swamp and salt marsh habitats in the Big Bend region.



 Map 3 / Geology and physiographic provinces of Florida's Big Bend.

This coastal band of wetlands is a mosaic of marsh and hammock vegetation, strongly influenced by the porous limestone bedrock. Many of these marshes have formed in younger muds and silts that have been deposited in depressions within the limestone plain. Localized bedrock highs, or nubs, provide an elevation increase of approximately 1-3 feet which allows formation of bedrock hammock**.** Hammocks have little tolerance for salt and grow where the limestone elevation is high. The marsh grows between the high and low tide lines where the limestone is low enough to be coated by a veneer of mud. In all, BBSAP encompasses some 85,070 acres of salt marsh habitat (Coultas & Hsieh, 1997).

Due to the gradual slope of the coastal and submarine plains within the BBSAP area, small sea level fluctuations during the Pleistocene and Holocene ages resulted in extensive land submergence and emergence during even minimal sea level changes. During this period the sea level low along the Florida Gulf coast was between 12 and 22 meters less than that of present day. As a result, the islands that fringe the Big Bend region are not barrier island formations like the central Gulf coast region. Marine and Aeolian remnant dunes can be found from Steinhatchee to Cedar Key, and islands located in this stretch of coast may be relict Pleistocene dunes (Coultas & Hsieh, 1997). Seahorse Key, located in the Cedar Keys, is the highest point on the Florida Gulf Coast at 15 meters above sea level. South of Cedar Key, the coastal islands are lower in elevation and underlain by limestone bedrock.

The most outstanding geomorphic features within BBSAP are associated with the waterways of the region and their close interaction with groundwater systems. There are nine major rivers in this area including, from north to south, the Wakulla, St. Marks, Aucilla, Econfina, Fenholloway, Steinhatchee, Suwannee, Waccasassa, and Withlacoochee rivers. Most tributaries receive spring discharge from the Floridan aquifer system. Much of the freshwater entering local estuaries is delivered by way of numerous streams and tidal creeks originating from seeps, springs and wetland systems within drainage basins. The constant interplay between the surface and groundwater has created stunning karst characteristics and geomorphic features. The waterways of the region are further discusses in the Hydrology and Watershed section.

Topographic Alterations

There are some notable topographic alterations found within the BBSAP. One such feature is an impoundment included in Hickory Mound, a 14,427 acre wildlife management area (WMA) located in Taylor County, approximately 20 miles west of Perry, Florida. This brackish impoundment is accessible to duck hunters by foot or small boat. Also just south of BBSAP is the western section of the Cross Florida Barge Canal that opens to the gulf at Withlacoochee Bay. Associated with the Withlacoochee River is Lake Rousseau, an impoundment located 11 miles upstream of the river's mouth. The western part of the unfinished canal terminates at Lake Rousseau, and flow of the river is regulated through Inglis Dam. Other topographic alterations throughout the region include road construction, old tram roads, ditching, and channelization (SRWMD, 1991).

Geology

The geology of the Big Bend region is characterized by a classic karst coastal terrain made up of prehistoric surfaces and shorelines with underlying soluble limestone at or near the lands surface. Ages of fluctuation in sea level during periods of glaciation have caused infilling of karstic features by a series of undifferentiated Holocene and Pleistocene quartz sands and sandy clays. These primitive sediments form a thin veneer over the limestone pinnacles just below the surface. Although the Big Bend region is considered a sediment starved coastline, Holocene sediment deposition continues along the major rivers such as the Aucilla, Suwannee, and Withlacoochee. The Suwannee, Steinhatchee, Sopchoppy, and Ochlockonee supply about 109,000 tons of sediment per year to the region (Coultas & Hsieh, 1997). The limestone layered beneath these surface sediments belongs to geologic formations of varied origin. In descending order, these stratigraphic formations include the St. Marks Formation, Suwannee Limestone, the Ocala Group, and the Avon Park Formation. The significant karstic features created by these formations generate a tight interconnection between the Floridan aquifer system and the surface waters of the region.

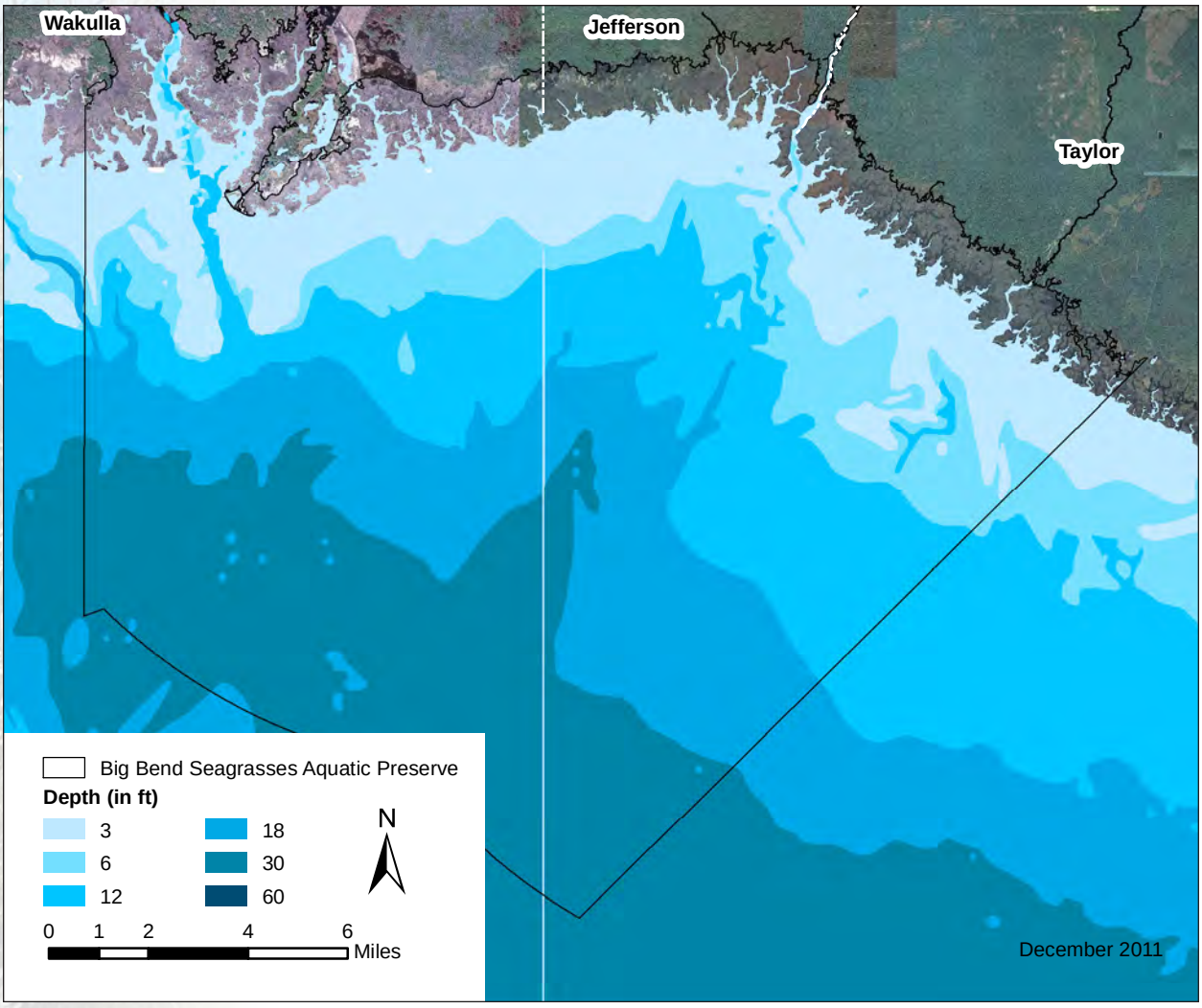
The lower Miocene St. Marks Formation underlies the coastal marshes of south central and southeastern Wakulla County. This formation is characterized by a white to very pale orange to light gray, quartz sandy, fossiliferous marine limestone. It ranges in thickness from 0-30 meters and dominant fossil forms include forams and mollusks. This formation serves as the foundation of the sand filled sinkholes of the Woodville Karst Plain, a localized geomorphic feature. The thin sand and mud overlying the formation give rise to the extensive salt marshes present in this region. The St. Marks Formation is the uppermost unit of the Floridan aquifer system. Small springs are found throughout the coastal marshes of southern

Wakulla County where the potentiometric surface is at or above the surface, and several submarine springs can be found offshore (Coultas & Hsieh, 1997).

The Oligocene Suwannee Limestone is a white to tan, fossiliferous, commonly dolomitic marine limestone. Its abundant fossils include mollusks, echinoids, bryozoans, and corals. Suwannee Limestone is the surficial unit in eastern Jefferson County and most of Taylor County. Boulders and pinnacles of Suwannee Limestone can be seen all along the coastline of this area. Suwannee Limestone serves as the upper unit of the Floridan Aquifer in its outcrop area, and small freshwater springs and seeps are common (Coultas & Hsieh, 1997).

The late Eocene Ocala Group is comprised of three marine limestone formations, the Crystal River, Williston, and Inglis Formations, and is an important unit of the Floridan aquifer system. Characterized as a white to cream, abundantly fossiliferous, chalky to coquinoid limestone, the Ocala Group averages 60 meters in thickness. The limestone formation thins out in the west central part of the state creating an anticlinal feature called the Ocala Platform. Fossils found within these formations include large forams, mollusks, bryozoans, and echinoids. The limestone of the Ocala Group is exposed in areas or covered only by a thin layer of Pleistocene and Holocene undifferentiated sands in all of Dixie County, and in portions of Levy, and Citrus counties. The coastline of Dixie, Levy, and Citrus counties is made up of boulders, pinnacles, and small islands of Ocala Group limestone. Depressions within the limestone have filled in with calcitic muds, silt, organics, and relict marine sands giving rise to the coastal marshes in this region (Coultas & Hsieh, 1997).

The middle Eocene Avon Park Formation is cream to brown to tan, fossiliferous, marine dolomite. Numerous shallow water fossils such as echinoids, mollusks, and marine plants are embedded within this formation. It is the oldest surficial formation in the state and is exposed only in small areas of central and southern Levy County and northernmost Citrus County, along the crest of the Ocala Platform.



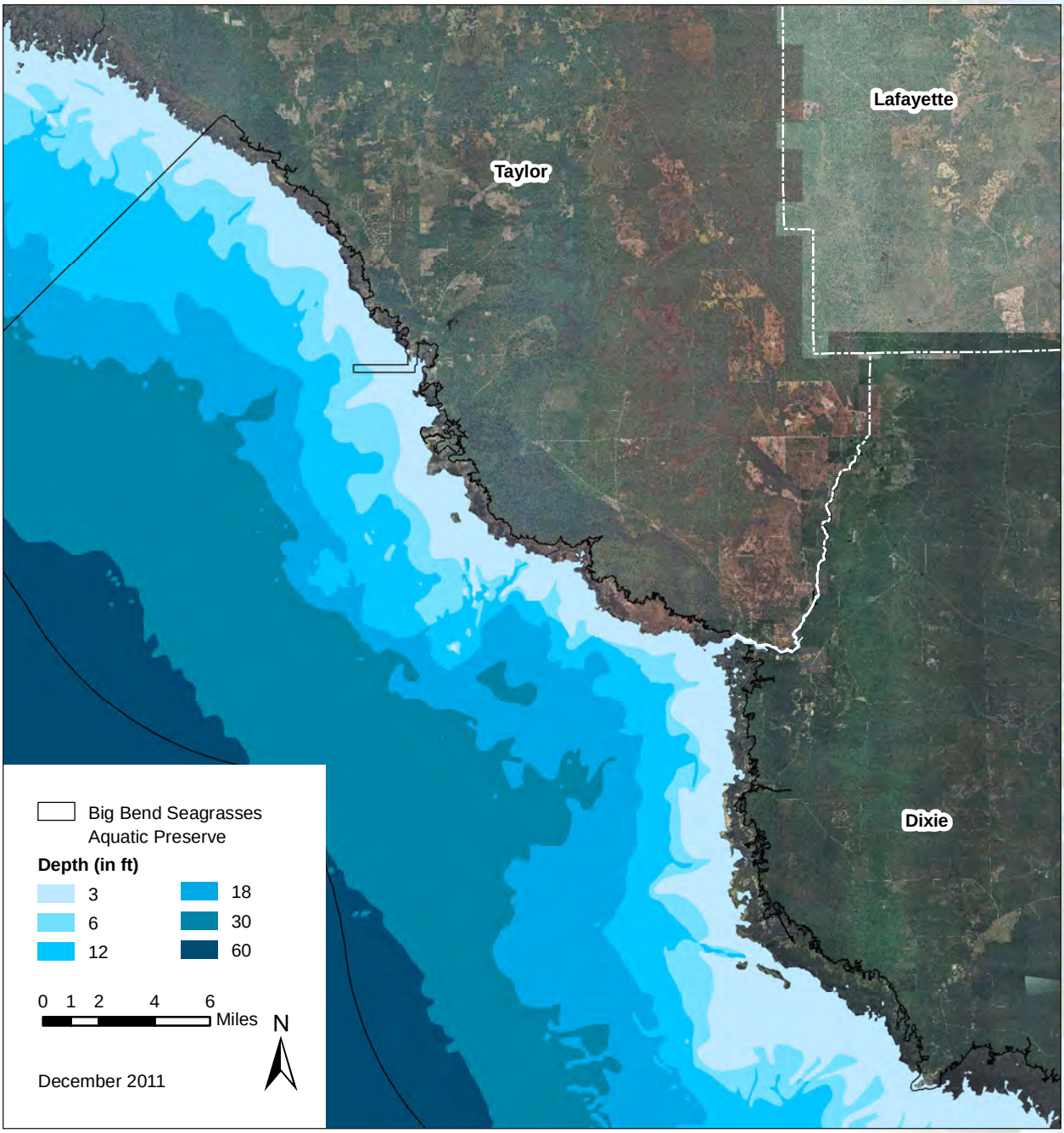
Map 4 / Bathymetry in the upper region of Big Bend Seagrasses Aquatic Preserve.

The thickness of the formation is variable from 0-240 meters, and is mostly overlain by Ocala Group limestone. Like the aforementioned formations, the Avon Park Formation is also part of the Floridan Aquifer (Coultas & Hsieh, 1997).

The layers of Cenozoic marine sediments are underlain by Mesozoic sedimentary rocks including sandstones, claystones, and limestones, most of which are marine in origin. Resting beneath these Mesozioc sedimentary rocks are basement rocks ranging in age from the middle Mesozoic to late Precambrian period. These basement formations consist of igneous and sedimentary rocks and are found at depths in excess of 1,200 meters (Coultas & Hsieh, 1997).

Mineral Resources

The Big Bend region contains deposits of several economic mineral commodities including limestone, dolomite, sand, and peat. Production of crushed stone in Florida provides some 20% of the total value of the state's mineral sector, second only to phosphate production. Limestone accounts for nearly 90% of the state's crushed stone production, shells make up 5% and dolomite makes up 2%, with marl and unspecified stone accounting for the rest. Suwannee Limestone is the main stone of commercial

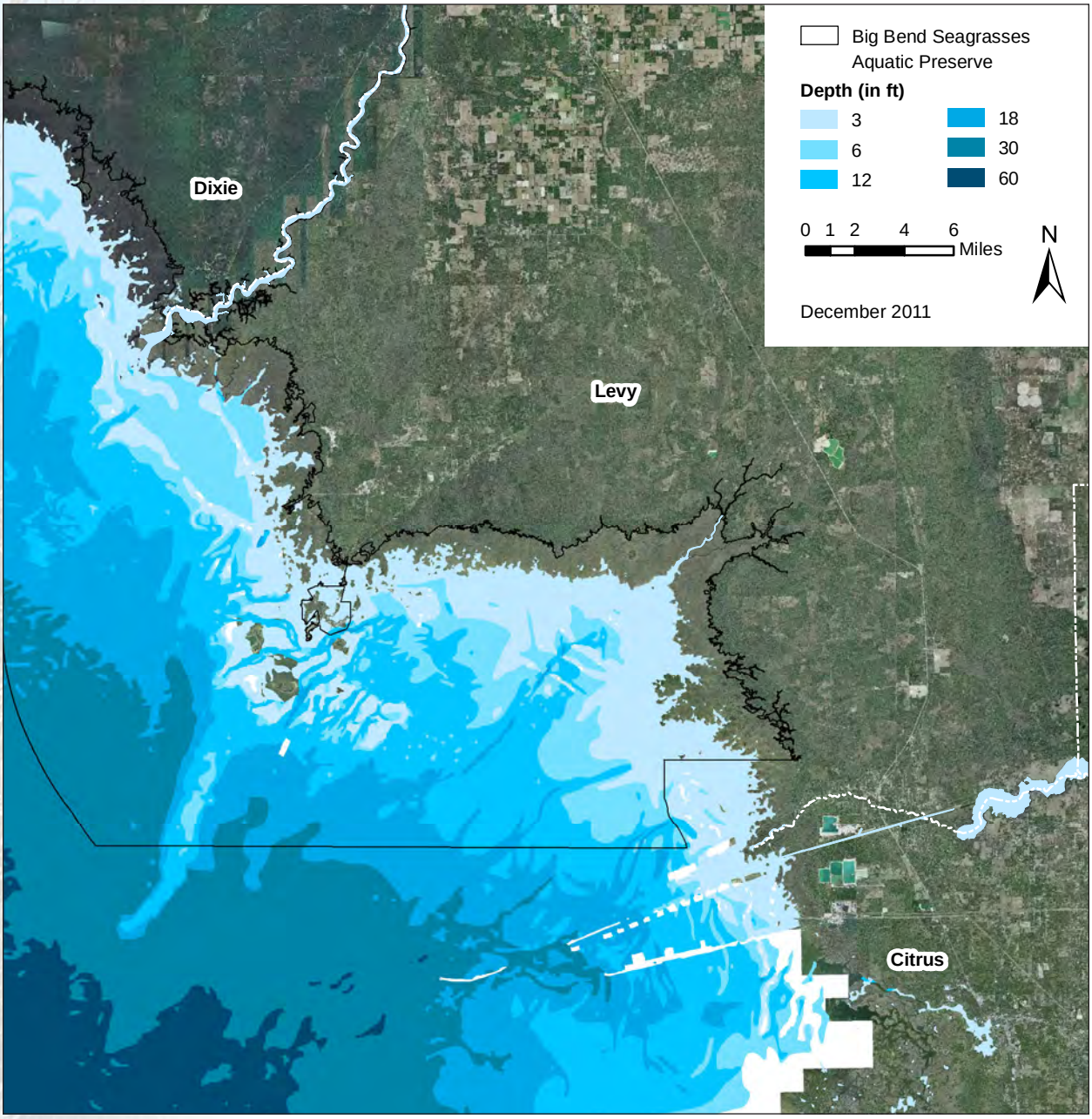


Map 5 / Bathymetry in the middle region of Big Bend Seagrasses Aquatic Preserve.

interest in Florida and is mined throughout Florida and in the Big Bend for use as limestone aggregate. The Ocala Limestone produced in nearby Dixie, Levy, and Citrus counties is soft and largely used as construction fill. Dolostone is a sedimentary rock composed predominantly of the mineral dolomite (Ca, $Mg(CO_3)_2$), and is a primary component of gravel for road construction. Since dolomite is mined from the Avon Park formation and produced mainly in Taylor, Levy, and Citrus counties, it is of great economic importance to this area. Commercial sand deposits of Florida are associated with marine terraces and ancient shorelines. Pleistocene quartz sand deposits of variable thickness are present within BBSAP and a number of private shallow sand mining pits are located within the region. Shallow wetlands in the San Pedro Bay region have the potential for peat formation, but surveys indicate that the peat formed is too thin to be of economic interest. Although phosphate is not mined within the bounds of BBSAP, it is mined in proximity to BBSAP (Randazzo & Jones, 1997).

Soils

Soils of the Gulf of Mexico coastal region are derived from beach deposits, rivers alluvium, or marine terrace deposits. In the Big Bend region, Holocene intertidal calcitic mud commonly overlies Pleistocene sand. Organics derived from decaying marsh grasses intermixed with sand form the surface layer in the coastal marshes. These coastal soils are mostly histosols, such as peat or muck, and dominated by



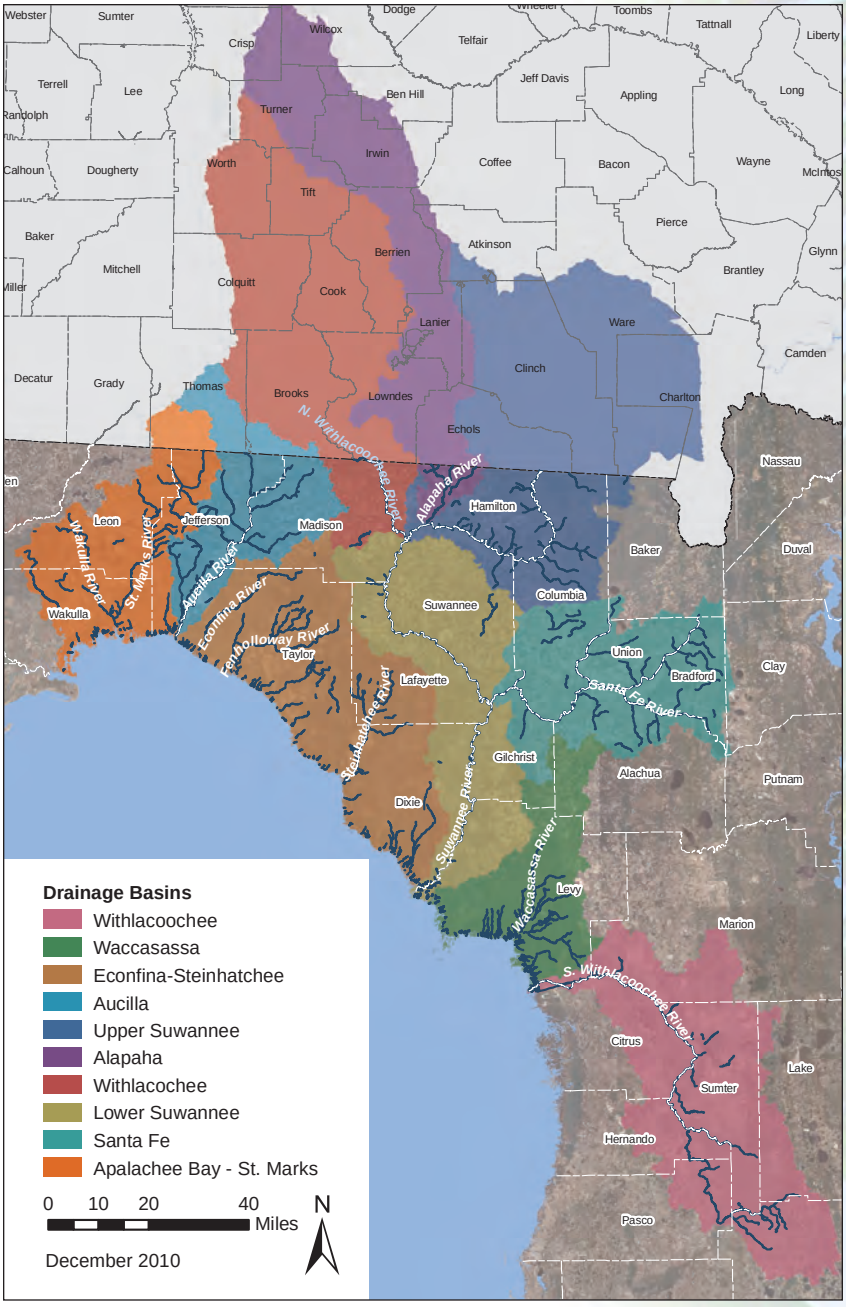
Map 6 | Bathymetry in the lower region of Big Bend Seagrasses Aquatic Preserve.

level, poorly drained organic soils underlain by marl and/or limestone. Coastal marsh soils are typically saline and subject to prolonged flooding. Lower elevation sediments tend to have more clay, organic material, sulfur content, and recently deposited mud and silt (Coultas & Hsieh, 1997). Coultas and Gross (1975) described the soil types in this marsh as varying from coarse-loamy sulfaquents within low marsh, grading to sandy psammaquents and haplaquods within high marsh habitats. The inland parts of the region are typified by pine flatwoods and swamp forest on poorly drained spodosol soils which exhibit nearly level, somewhat poorly to poorly drained sandy soils with dark, sandy subsoil layers.

Hydrology and Watershed

Surface Water - BBSAP encompasses a large complex of estuaries and bays. There are nine major river systems that flow into the waters of BBSAP including, from north to south, the Wakulla, St. Marks, Aucilla, Econfina, Fenholloway, Steinhatchee, Suwannee, Waccasassa, and Withlacoochee rivers. These river systems include numerous streams and tidal creeks originating from seeps, springs, and wetlands systems. Drainage basins within the Big Bend are major regional integrated basins defined by these major stream systems, coastal integrated basins including small local streams draining the coastal regions, and disjointed drainage that may drain into surrounding basins or into the surrounding swamps and marshes. The major drainage basins include the following: Apalachee Bay/ St. Marks, Aucilla, Econfina/ Steinhatchee, Withlacoochee (north), Alapaha, Upper Suwannee, Santa Fe, Lower Suwannee, Waccasassa, and Withlacoochee (south) (see Map 7). Watershed hydrologic responses throughout the region have been altered by land use changes such as, impermeable surfaces, alteration of vegetative cover, road construction, old tram roads, ditching, and channelization (SRWMD, 1991). Hydrologic parameters for the major rivers in BBSAP are listed below in Table 2 and include gage height, stream velocity, discharge and temperature.

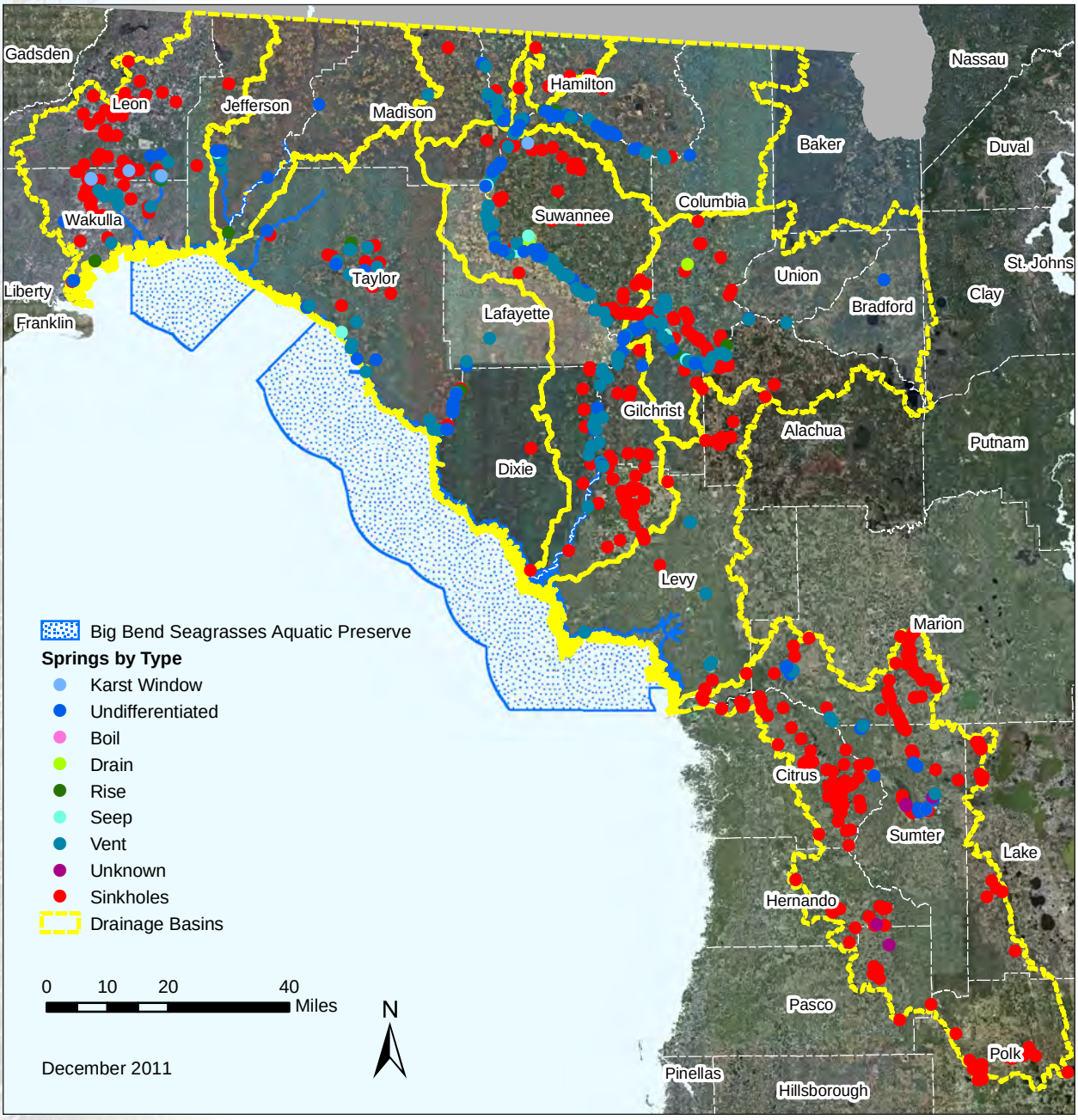
St. Marks Drainage Basin- The St. Marks drainage basin includes 1,181 square miles of which 734 square miles is located in Florida and 447 square miles is in Georgia. The largest tributary is the St. Marks River. The St. Marks River begins in the Red Hills area, which is south of the Florida/Georgia border. The river crosses the Woodville Karst Plain and traverses approximately 36 miles until it reaches the Gulf of Mexico in Apalachee Bay. The river's headwater begins from overland and subsurface seepage from wetlands and is a blackwater coastal river system. Several sinks, creeks, and Lake Miccosukee also



Map 7 / Drainage basins in Big Bend Seagrasses Aquatic Preserve.

contribute to the river's flow (Boning, 2007). These creeks include: Moore Branch, Sweetwater Branch, Burnt Mill Creek, Limestone Creek, Rattle Snake Creek, Rock Creek, Port Leon Creek, Moriah Creek, Shine Creek, Four Mile Creek, Flat Creek and the East River. Starting as a small stream, the river widens just below Horn Spring in Leon County. The most notable geomorphic feature on this river is the Natural Bridge, where the river disappears underground for approximately three-quarters of a mile. It then emerges as a defined river at St. Marks Spring from where it flows over a limestone bottom for about 11 miles to its confluence with the Wakulla River, the river's largest tributary. Several spring features are on the St. Marks River including: St. Mark River Rise, Rhodes Springs 1-4, Horn Spring, Newport Spring, Natural Bridge Spring, St. Marks River Swallet Drain, Panacea Mineral Spring 1-3 and Panacea Mineral Spring.

The Wakulla River is a spring run and originates from Wakulla Springs and is one of the largest and most stunning springs in Florida. The headwaters of the Wakulla originate from runoff and drainage near Tallahassee. Other tributaries of the Wakulla River include: McBride Slough, Big Boggy Branch and First Branch. Wakulla Spring is connected to an extensive network of large-diameter subterranean conduits. Divers have explored and mapped more than a mile of caverns that extend northward from the spring vent (Northwest Florida Water Management District, 2001). The Wakulla River then runs south for about 9 miles through Wakulla County to join the St. Marks River at St. Marks, Florida. Several other springs

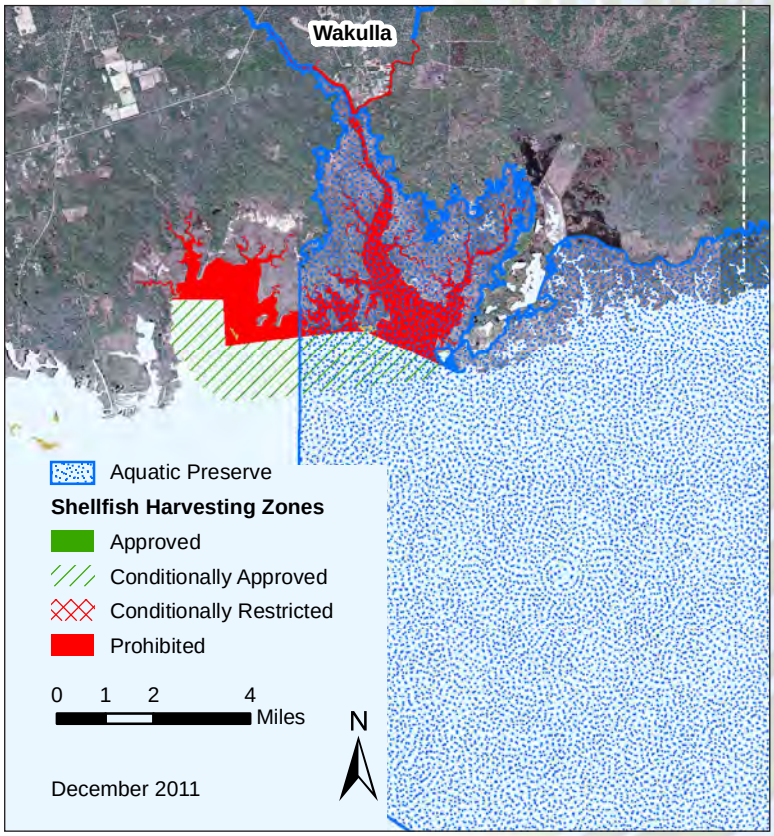


Map 8 / Karst features in the Big Bend Seagrasses Aquatic Preserve drainage basin.

discharge into the Wakulla River including: Wakulla Spring, Sally Ward Spring, McBride Slough Spring, Wakulla No Name Spring, Northside Spring and Indian Spring.

Many other coastal tidal creeks drain into Apalachee Bay within the St. Marks drainage basin and contribute freshwater flow to BBSAP. These include the following: Pinhook River, Oyster Creek, Cow Creek, Deep Creek, Porpoise Creek, Horns Creek, Denham Creek, Africa Bayou, Little Porpoise Creek, Little Grooms Creek, Grooms Creek, Black Rock Creek, Little Redfish Creek, Catfish Creek, Gator Creek and Peter Creek.

Aucilla Drainage Basin - The Aucilla drainage basin is 941 square miles of which 734 square miles are located in Florida and 207 square miles are located in Georgia. The Aucilla River is a medium coastal limestone river that flows approximately 73 miles from Georgia swamplands to the Gulf and is well known for its impressive karst features. The headwaters arise from a series of small creeks and sloughs northeast of Thomasville, Georgia. The river recedes underground near Boston, Georgia and is then swampy and undefined until it reaches Florida (Boning, 2007). The banks of the river are lined with impressive limestone outcrops and the rocky riverbed creates shoals along its length. High limestone banks surround the river and as the river drops down the Cody Scarp onto the Gulf Coastal Lowlands, it runs over a series of shoals known as Big Rapid just south of Lamont. The river then disappears approximately three miles downstream into what is known as the Aucilla River Sinks, a series of sinkholes from which it reemerges several times until it surfaces for the remaining length at Nutall Rise. The tributaries of the Aucilla River drainage basin include: Jones Mill Creek, Beasely Creek, Raysor Creek, Wolf Creek, Sundown Creek, Rocky Creek, Little Aucilla, Connell Creek, Clyatt Mill Creek, Bevel Creek, and Oliver Creek. Two springs discharge into the Aucilla River, Nutall Rise and Walker Spring. The largest tributary to the Aucilla River is the Wacissa River and it joins the Aucilla four miles from the coast (FDNR, 1989). The Wacissa River's tributaries include Caney Branch, Little River, Bailey Mill Creek, Cow Creek, and Welaunee Creek. There are many springs that discharge into the Wacissa River including: Cassidy Springs, Horsehead Spring, Log Spring, Thomas Spring, Wacissa Springs 1-4, Little Blue Spring, Jefferson Blue Spring, Minnow Spring, Buzzard Log Spring, Garner Spring, Big Spring, JEF312991, JEF63991, JEF63992 and JEF63993. (Springs without a "name" are assigned a unique identifier starting with the first three letters of the county where the spring is located.) There are also three springs that discharge into the Little River, a tributary of the Wacissa River - Maggie Springs, JEF64991 and Brumbley Spring.



Map 9 / Shellfish harvesting zones in the upper region of Big Bend Seagrasses Aquatic Preserve.

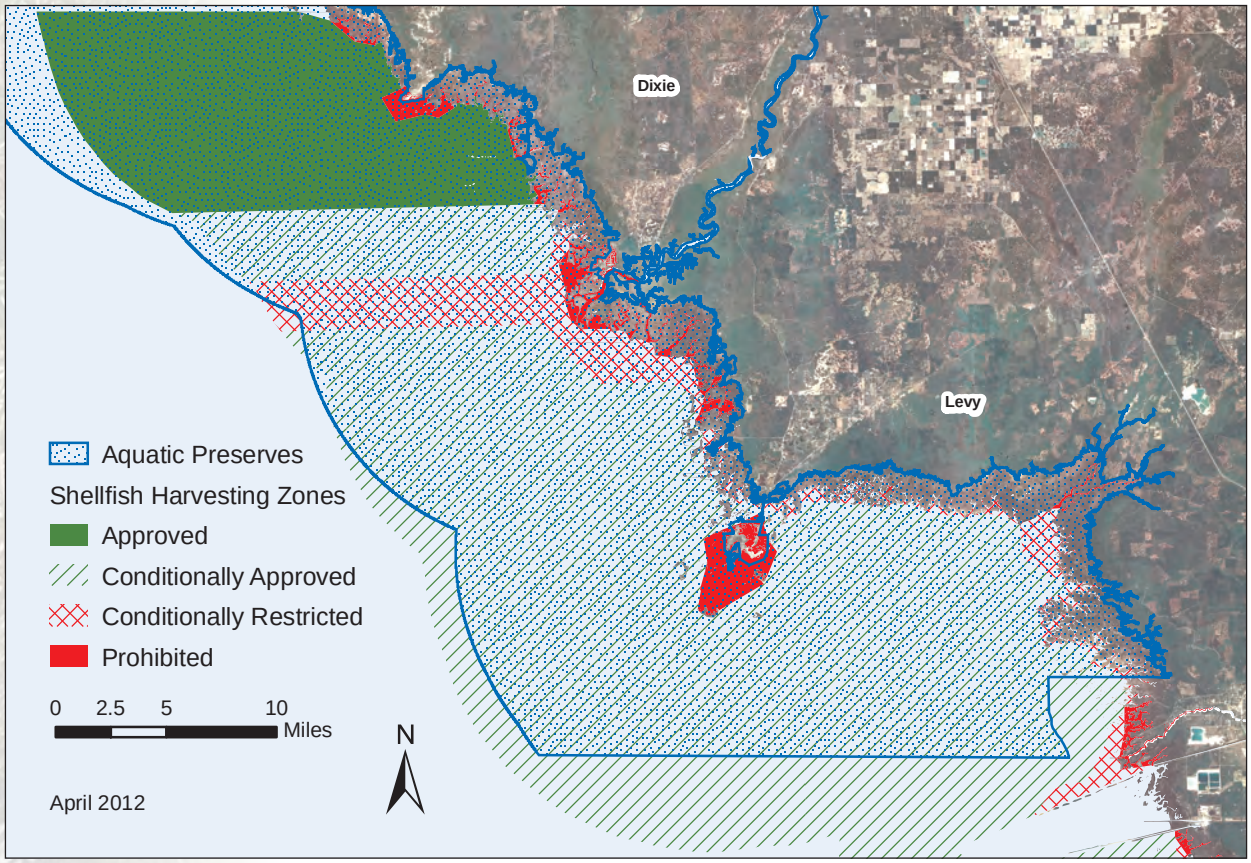
Econfina/Steinhatchee Drainage Basin - The Econfina, Fenholloway, Steinhatchee rivers are included in the Econfina/Steinhatchee drainage basin, which drains 1,859 square miles The Econfina River is a small blackwater river that arises from San Pedro Bay swamps and runs 35 miles to the Gulf of Mexico and Apalachee Bay. The river lies above the Floridan Aquifer separated from it by a thick limestone layer overlain with clay and sand. Some outstanding geologic features found on the Econfina River are rocky shoals interspersed between areas of deeper water and a natural bridge south of U.S. Highway 19. One spring has been identified on the Econfina - TAY730991.

The Fenholloway River is a small blackwater river and also originates in the San Pedro swamps. The river travels 36 miles to the Gulf of Mexico and Apalachee Bay. The majority of flow is fed by drainage, seepage, and by a number of small springs. The tributaries of the Fenholloway are Spring Creek, Pimple Creek, Woods Creek, and Rocky Creek. Eight springs discharge into the Fenholloway River including: Waldo Spring, Campground Spring, Fenholloway Spring, Carleton Spring, Hampton Spring, Folsom Spring, Woods Creek Rise and TAY924993.

The Steinhatchee River is a small coastal river that originates from the wetland systems of Mallory Swamp south of Mayo and flows 28 miles to Deadmans Bay. Although Steinhatchee is fed almost entirely by local runoff and exhibits some characteristics of a blackwater stream, it is also fed by small springs. The Steinhatchee River tributaries include: Sand Hill Creek, Boat Creek, Boggy Creek, Rocky Creek, Eightmile Creek, Mud Creek, Kettle Creek, Reedy Creek, Alligator Branch and Crossway Branch. Springs discharging into the Steinhatchee River and its tributaries include: Steinhatchee River Rise, Beaver Creek Spring, Steinhatchee Spring, Iron Spring, an unnamed spring, Eva Spring, TAY625992, TAY69991, TAY625991, TAY625995, TAY625993, DIX625991, DIX625992, DIX625993 and DIX625994. The Steinhatchee River has some unique karst geomorphic characteristics. During periods of low flow, the river is captured by a sink formation near where U.S. Highway 19 crosses, and flows underground for about one mile before resurfacing. The river also drops several feet approximately eight miles from the Gulf of Mexico at Steinhatchee Falls, a formation of limestone outcroppings (FDNR, 1989).

The Steinhatchee River and its multiple creeks discharge into Deadmans Bay estuary, a broad embayment that is located in coastal Taylor and Dixie counties. The bay has an average depth of 2.24 meters and an average tide height of 1 meter. Tides are mixed semidiurnal with two unequal high and low tides each day (Kuhman, 2004). The average salinity of the bay is 26 parts per thousand (ppt) and the temperature averages 23 °C. Major hydrologic alterations associated with this watershed include a brackish impoundment at Hickory Mound WMA, located west of Perry. As a cooperative effort between Buckeye Cellulose and the Florida Game and Fresh Water Fish Commission (now FWC), an earthen berm with culverts was built in 1968 to create a fluctuating impoundment to enhance waterfowl habitat. FWC regulates the saltwater exchange between the salt marsh seaward of the berm and the brackish marsh behind it. In July 2005, Hurricane Dennis made landfall in Pensacola resulting in considerable damage at Hickory Mound from tidal surge despite the distance. The dike was reconstructed, and the area reopened to the public for recreational use in June 2006.

Many other coastal tidal creeks drain into Apalachee Bay within the Econfina/Steinhatchee drainage basin these include: East Cut Off, Sand Creek, Snipe Creek, Bowden Creek, Redfish Creek, Pearly Island Creek, Cabbage Creek, Pitts Creek, Smith McCullah Creek, Regular Creek, Henderson River, Tetabar Creek, Big Spring Creek, Sand Creek, Island Creek, Okefenokee Slough, Clearwater Creek, Sweetwater Creek, Blue Creek, Fish Creek, Oyster Creek, Crooked, Little Bear Creek, Clay Creek, Dallus Creek, Bayview Creek, Jack Creek, Salt Creek, Bivens Creek, Howard Creek, Rocky Creek, Buck Creek, Cow



Map 10 / Shellfish harvesting zones in the lower region of Big Bend Seagrasses Aquatic Preserve.

Creek, Little Rocky Creek, Whackup Creek, Boggy Creek, Tripod Creek, Lolly Creek, Bulter Creek, Lilly Creek, Amason Creek, Jim Lee Creek, Fishbone Creek, Shired Creek, California Creek, Johnson Creek, Sanders Creek, Bumblebee Creek, North Double Barrel Creek and Harris Creek. Several springs are located on some of the creek systems, these include: Cedar Island Spring, Blue Spring, Jug Island Spring, Jabo Spring, an unnamed spring, TAY616992, TAY616991, TAY77043, TAY77044, TAY77041, TAY77042, TAY69992, TAY69991.

The St. Marks, Aucilla, and Econfina/Steinhatchee drainage basins all drain into Apalachee Bay, a broad embayment on the easternmost end of the Florida panhandle with an area of 685 square miles and an approximate volume of 3,404,160 (1,000 x m^3). It has an average depth of between 1.5 and 3 meters and a residence time of approximately three days. It is in an area of transition between the semidiurnal tides of southwest Florida and the diurnal tides of northwest Florida. Tides are classified as mixed, with an average tide height of 0.75 meters (Luten, 2009). The bay has a mixing zone of about 14 square miles and a saltwater zone of 671 square miles, with an average salinity of 30 ppt. The watershed to estuary ratio is 8:1. Apalachee Bay receives an average of 12.96 million cubic meters per day freshwater from its tributaries, not including discharge from smaller springs and seeps within the basin or estuary. Apalachee Bay is comprised of several different drainage basins and the following section will discuss each drainage basin size and associated attributes.

Suwannee River Drainage Basins and Suwannee Sound Estuary - The Suwannee River is the second largest river in Florida and is characterized as a limestone blackwater river that originates in the Okefenokee Swamp in southern Georgia. The flow from the Okefenokee Swamp is derived from rain and runoff. The Suwannee River flows southwest 238 miles before emptying into the Suwannee Sound and Gulf of Mexico. This fast flowing river has deep channels underlain by karst topography and is characterized by numerous sinks, springs, and caves. It cuts through the limestone terrain, Hawthorne Formation, and forms steep banks and rapids such as Big Shoals, located in the Upper Suwannee River basin (FDNR, 1989). The high banks of the Suwannee River get less and less steep as the river approaches the coast. Fluvial sand deposition is associated with the bottom and mouth of this river (Coultas & Hsieh, 1997). The Suwannee River is the largest discharging river within BBSAP and empties an average of 10,500 cubic feet per second (cfs) of fresh water into the Suwannee Sound estuary. There are several basins that drain into the Suwannee River, the Upper Suwannee Drainage Basin, Northern Withlacoochee Drainage Basin and Santa Fe Drainage Basin. Each of these basins will be discussed in the following sections.

Upper Suwannee River Drainage Basin - The Upper Suwannee River Drainage Basin covers approximately 2,864 square miles of which 905 square miles are located in Florida and 1,959 square miles are located in Georgia. The upper Suwannee River's tributaries in Florida include: Suwannee Canal, Middle Boat Trail, Bay Creek, Alligator Creek, Jones Creek, Suwannoochee Creek, Toms Creek, Little Suwannee Creek, Cypress Creek, Hunter Creek, Roaring Creek, Little Creek, Deep Creek, Browns Branch, Long Branch, Robinson Creek, Falling Creek, Tiger Branch, Sal Marie Branch, Swift Creek, Poucher Branch, Rocky Creek, Jerry Branch, Camp Branch, Sugar Creek, Mill Creek, Mitchell Creek, Guinea Creek, and Holton Creek. Many springs discharge into the upper Suwannee River and include: Bell Springs, COL522982, White Springs, Blue Sink Spring, Louise Springs, HAM522981, Mattair Spring, HAM102371, SUW1019971, HAM1019971, Suwannee Springs, SUW1023971, HAM1019972, HAM1017974, HAM1017973, Blue Spring, HAM1017971, HAM1017972, SUW1017971, SUW925971, Holton Creek Rise, SUW925972, SUW925973, SUW925974, SUW925975, Alapaha River Rise, HAM923972, HAM923973, Stevenson Spring, Seven Sisters Spring, SUW923972, SUW923971, Lime Run Spring/Sink, Lime Springs and Ellaville Springs.

Alapaha Drainage Basin - The Alapaha River is a brown-water river that originates in Georgia and travels 190 miles and discharges into the upper Suwannee River. The Alapaha drainage basin is approximately 1,765 square miles of which 108 square miles are located in Florida and 1,658 square miles are located in Georgia. Tributaries that discharge into the Alapaha include: Alligator Creek, Little Alapaha River, Deep, Willacoochee, and Alapahoochee. There are no known springs that discharge into the Alapaha River.

Northern Withlacoochee Drainage Basin - The northern Withlacoochee River is a limestone blackwater river that begins near Tifton, Georgia. The banks of the river are cut through limestone and there are many shoals. The river is nearly drained through large sinkholes many time of the year. The northern Withlacoochee drainage basin is around 2,402 square miles of which 272 square miles are located in Florida and 2,130 square miles are in Georgia. Several creeks drain into the Northern Withlacoochee including: New River, Cat Creek, Little River, Indian Creek, Warrior Creek, Little River, Tyty Creek, Okapilco Creek and Piscola Creek. There are many springs that discharge into the northern

Withlacoochee River these include: Suwanacoochee Spring, Rosseter Spring, Morgan's Spring, Pott Spring, Tanner Spring, HAM54012, HAM612982, Livingston Spring, MAD612981 and HAM610984.

Santa Fe Drainage Basin - The Santa Fe River is a blackwater spring fed limestone river originating from the Santa Fe Swamp. The river runs 73 miles before discharging into the Suwannee River. The drainage basin encompasses parts of Alachua, Baker, Bradford, Clay, Columbia, Gilchrest, and Union counties and is approximately 1,384 square miles. Many tributaries contribute to the flow of the Santa Fe River including: Santa Fe Lake, Little Santa Fe Lake, Lake Altho, New River, Olustee Creek, Icheetuckee River, Fivemile Creek, Rocky Creek, Little Monteocha Creek, Braggs Branch, Sampson River, Mill Creek, Pareners Branch, Cow Creek, Swift Creek, Turkey Creek, McKinney Brach, Richard Creek, Gum Creek, Water Oak Creek, Alligator Creek. There are a total of 81 known springs in the Santa Fe River Basin including: GIL9972, Myrtles Fissure Spring, Naked Spring, COL930971, Allen Spring, GIL729973, Holly Spring, Oasis Spring, Grassy Hole Spring, COL1105041, Sawdust Spring, Little Devil Spring, Devils Eye Spring, Rum Island Spring, Hornsby Spring, GIL107971, Troop Spring, GIL729972, GIL99971, Coffee Springs, COL917971, GIL1012971, COL101975, Pickard Springs, Treehouse Spring, Santa Fe Spring, COL101975, Trail Spring, SUW917971,Sunbeam Spring, Roaring Spring, GIL1012972, Dogwood Spring, Ginnie Spring, Poe Woods Spring, Columbia Spring, SUW107971, GIL729971,an unnamed spring (2953480824601), COL928971, Cedar Head Spring, COL1012972, Little Blue Spring, Jonathan Spring, Poe Spring, GIL729971, Campground Spring, SUW917972, Wilson Spring, Blue Hole Spring, Mission Springs, Singing Springs, GIL1012974, Twin Spring, July Spring, Johnson Spring, COL101971, ALA930972, Santa Fe River Rise, Heilbronn Springs, GIL107972, Betty Springs, GIL928972, Mill Pond Springs, Siphon Creek Rise, COL1012971, Deer Spring, Lilly Spring, Rose Creek Sink, COL428981, GIL928971, Jamison Springs, Ichetucknee Head Spring, Devils Eye Spring, Devils Ear Spring, Gilchrist Blue Spring, GIL101971, COL101974, ALA930971, Darby Spring and Worthington Spring.

Lower Suwannee Drainage Basin - The Lower Suwannee drainage basin encompasses approximately 1,578 square miles. Many other coastal tidal creeks drain into Suwannee Sound within the Lower Suwannee River drainage basin and include: Springhead Creek, Blacksnake Creek, Bethel Creek, Cedar Branch, Week Creek, Turkey Creek, Flag Creek, Sandfly Creek, Gopher River, Shingle Creek, Wisher Creek, Monden Creek, Dead Boy Creek, Pitt Creek, Sand Creek, Bull Creek, Dan May, Moccasin Creek, Hog Island, Little Harden, Big Magnesia and Little Magnesia.

There are a total of 97 known springs and 2 drains in the Lower Suwannee River. These include: LAF721001, LAF929972, LAF922977, MAD922976, Luraville Spring, Telford Spring, LAF919971, Orange Grove Spring, Owens Spring, LAF710981, LAF919972, SUW919971, Little Other Spring, Little Fanning Spring, Shirley Spring, Allen Mill Pond Springs, LAF924971, Walker Spring, Ellaville Spring, unnamed spring (Dixie 2941100825735), Otter Spring, Rock Sink Spring, LAF718972, Fanning Springs, Branford Spring, Fara Spring, SUW992974, Falmouth Spring, Hidden Spring, SUW922974, Royal Spring, Little Copper Spring, DIX95971, LAF929973, Charles Spring, LAF922975, SUW922971, Peacock Springs, Pump Spring, Cow Spring, LAF721002, McCrabb Spring, Pot Hole Spring, Mearson Spring, GIL847972, Turtle Spring, GIL917972, MAD922973, LAF924972, SUW922972, SUW919973, LAF57981, Convict Spring, Manatee Spring, Copper Springs, Fanning Springs #2, Guaranto Spring, LAF93971, SUW106971, Sun Springs, Fletcher Springs, GIL917973, MAD922972, Perry Spring, Bonnet Spring, Baptizing Spring, Anderson Spring, LAF57982, Iron Springs, Brantley Spring, Fanning Springs # 1, Rock Bluff Springs, Shingle Spring, Lafayette Blue Spring, LAF922976, MAD922974, MAD922971, SUW922973, SUW919974, Suwannee Blue Spring, Hart Springs, Lumbercamp Springs, LAF718971, LAF1024001, Little River Spring, unnamed spring (Dixie 2949090825600), Thomas Spring, LAF929971, MAD922975, Orange Grove Spring, Running Spring #1, Running Spring #2, Bathtub Spring, SUW18971, SUW725971, Bell Spring, Troy Spring and Ruth Spring.

The Suwannee River discharges into the Suwannee Sound estuary which is located on a shallow coastal plain in Levy and Dixie counties with an area of 42 square miles. It has an average depth of between 2 and 3.1 meters and an average tidal height of 1.8 meters. Tides are mixed semidiurnal, with the typical two unequal high and low tides each day (Kuhman, 2007). The sound has a freshwater zone of 2.58 square miles, a saltwater zone of seven square miles, and is well mixed with 50% of its volume exchanged twice daily. The average salinity of the sound is 16 ppt and the temperature averages 23 °C.

Waccasassa River Drainage Basin - The Waccasassa River is a small coastal isolated river in Levy County that flows for some 29 miles to the Gulf of Mexico and Waccasassa Bay. The river headwaters originate from Blue Springs and drainage from a swamp called Devil's Hammock. It connects a series of swamps and small lakes until it reaches the coastal plain where the limestone riverbed becomes more defined (FDNR, 1989). The Waccasassa Bay drainage area covers approximately 901 square miles and includes Gilchrist, Alachua, Levy, and Marion counties.

Waccasassa River tributaries include: Magee Branch, Otter Creek, Cow Creek, Ten Mile Creek, Wekiva River, Bullfrog Creek, Horsehole Creek, North Prong Ten Mile Creek, Porter Slough, Black Prong, Mule Creek, Watch Chain Slough, Chicken Slough, Cabbage Creek, and Crooked Creek. Several springs discharge into Waccasassa tributaries and include: LEV71991, Levy Blue Spring, Wekiva Springs, Big King Springs and Little King Springs. There are many coastal creek systems that discharge into the Waccasassa Bay estuary including: Barnett Creek, McCormick Creek, Big Trout Creek, Little Trout Creek, Ericson Creek, Giger Creek, Clark Creek, Dennis Creek, Seabreeze Creek, Sand Creek, Goose Creek, Lukens Creek, Prodie Creek, Dorset Creek, Spring Creek, Wilder Creek, Sand Creek, Hall Creek, Porpoise Creek, Winzy Creek, King Creek, Jacks Creek, Tripod Creek, West Griffin Creek, East Griffin Creek, Tarpon Creek, Kelly Creek, Deep Creek, Mud Creek, Dry Creek, Rocky Creek, Salt Island Creek, Compass Point Creek, Depew Creek, Mud Creek, Bird Creek, Sheephead Creek, Williams Creek, Trout Creek, Divedapper Creek, Ramsey Creek, Turtle Creek, Richard Creek, Trout Creek, Tooke Creek, Lows Creek, Spring Run Creek, Smith Creek, Thousandmile Creek, Demory Creek, Sandfly Creek, Jones Creek, Covas Creek, Vassey Creek, Fuller Creek, Helverson Creek, MacDonald Creek and Bird Creek. Two springs discharge into Spring Creek - LEV97991 and Lancaster Spring.

The Waccasassa Bay estuary is a small shallow estuary at the mouth of the Waccasassa River with an area of approximately 78 square miles (DeHaven, 2004a). It has an average depth of 1.69 meters and an average tide height of 1.1 meters. Tides are mixed semidiurnal and there are typically two unequal high and low tides each day. The tidal range results in exchange of over 50% of the bay's water volume daily. The average salinity of the bay is 26 ppt and the temperature averages 23 °C.

Withlacoochee River Drainage Basin - The Withlacoochee River is a coastal river that begins in the Green Swamp of northern Polk County. Withlacoochee River is one of the only rivers in the United States to flow from North to South 157 miles to Withlacoochee Bay and the Gulf of Mexico The river's flow is derived from runoff, seepage, and spring discharge. The Withlacoochee Bay drainage area covers approximately 2,067 square miles and includes portions of Citrus, Sumter, Marion, Hernando, Polk, and Lake counties.

The major tributaries to the Withlacoochee River include: Gator Creek, Little Withlacoochee River, Jumper Creek, and Gum Creek, Pond Creek, Grass Creek, Mattress Drain, Cumbee Drain, Cross Creek, Devils Creek, Gum Slough, Rainbow River, Turner Creek, Bell Branch. The river also receives flow from Lake Panasoffkee and the Tsala-Apopka lake complex. The Outlet River on Lake Panasoffkee discharges into the South Withlacoochee. Little Jones Creek and Shady Brook discharge into Lake Panasofkee. Many springs discharge into the Withlacoochee River and its tributaries including: A. Wayne Lee Spring, Beltons Millpond Head Spring 1, Gum Spring #2, Beltons Millpond Head Spring 2A, Rainbow Spring, Rainbow Spring #8, Gum Spring #3, Gum Spring #1, Big Hole Spring, Shady Brook Head Spring #4, Nichols Spring, Henry Green Spring, Beltons Millpond Head Spring 4, Beltons Millpond Head Spring 2B, Shady Brook Head Spring #3, Indian Creek #1 Spring, Alligator Spring , Maintenance Spring, Rainbow Bridge Seep South, Gum Spring #4, Beltons Millpond Head Spring 2, Shady Brook Spring #2, Beltons Millpond Head Spring 3, Rainbow Bridge Seep North, Rainbow Seep #1, Rainbow Spring #1, Indian Creek #3 Spring, Wilson Head Spring, Rainbow Spring North, Rainbow Spring #6, Indian Creek #2 Spring, Rainbow Unnamed Swamp Spring, Gum Spring Main, Rainbow Spring #2, Rainbow Spring #4, Rainbow Spring #5, Bubbling Spring, Rainbow Springs #7, Rainbow Cave Spring, Citrus Blue Spring, Rainbow Spring #3, Rainbow East Seep, Waterfall Springs, Indian Creek #4 Spring, Fenney Spring, Canal 485 Spring 5, Canal 485A Spring 1B, Dobes Hole Spring, Canal 485A Spring 2, Sumter Blue Spring and Riverdale Spring.

The Withlacoochee River discharges in two different areas of the bay, the mouth of the river in Yankeetown and the western portion of the Cross Florida Barge Canal, an important hydrologic alteration of the river that changed the pattern of outflow. The current operating schedule allows flows below 1,540 cfs to go through the bypass canal to the lower Withlacoochee River. Outflows above 1,540 cfs are discharged through the Inglis Dam to the barge canal (The Amy H. Remley Foundation, 2010). Also associated with the altered Withlacoochee River flow is Lake Rousseau, an impoundment located 11 miles upstream of the river's mouth and the eastern point of termination for the unfinished barge canal.

The Withlacoochee Bay is a large and shallow estuary at the mouth of the Withlacoochee River with an area of 81 square miles (DeHaven, 2004b). It has an average depth of 2.24 meters, ranging from about 1-6 meters within the barge canal. Tides are semidiurnal with two unequal high and low tides daily and an average tide height of 1.1 meter. The basin opens to the southwest and mixing occurs with tidal exchange, wind, and near shore currents resulting in exchange of over 50% of bay's volume twice daily. The average salinity of the bay is 19 ppt and the temperature averages 23°C.

River	Gage Height (ft)	Stream Velocity (ft/s)	Discharge (cfs)	Temperature (°C)	USGS Station
Wakulla	3.04	0.71	614		02327022
St. Marks	5.42		670		02326900
Aucilla	5.41		645		02326550
Econfina	3.71		84		02326000
Fenholloway	13.23		148		02325000
Steinhatchee	3.33		117		02324000
Suwannee	3.37	0.83	8280	25.8	02323592
Waccassa	10.91	0.13	105		02313700
Withlacoochee	-0.24				02313274
Withlacochee at Inglis Dam	27.52		145		02313230

Table 2 | Hydrologic parameters for the major rivers discharging into the waters of Big Bend Seagrasses Aquatic Preserve. Averages are reported for gage height, stream velocity, river discharge, and water temperature where available. All parameters are updated daily by the United States Geological Survey (USGS).

Groundwater - The Floridan Aquifer is divided into the following three classes: Class I is unconfined and sole source for groundwater, Class II is semi-confined Floridan Aquifer overlain by the water table aquifer, and Class III is confined Floridan Aquifer overlain with water table aquifer or artesian aquifer. The Floridan Aquifer is Class III on the Northern Highlands side of the Cody Scarp and Class I on the Gulf Coastal Lowlands side. This area is characterized by karst features such as sinkholes, disappearing and reappearing rivers, artesian springs, and drawn down lakes. Groundwater within this region flows from confined to unconfined aquifer, towards the coast or towards the Suwannee and Santa Fe river corridors. River corridors of this region may function as both points of local recharge and discharge, depending on the relationship between the river stage and the potentiometric surface of the aquifer. Groundwater is discharged from the region's numerous springs and seeps when the potentiometric surface is higher than the stream's stage. If the stream's stage is locally higher, groundwater recharge may occur. Aquifer recharge areas of the Big Bend region include the interior drainage basins of Suwannee, Gilchrist, Columbia, Levy and Alachua counties. Important recharge areas are also located in Brooks and Lowndes counties of Georgia. During high river stages, springs and seeps can reverse flow and river water can enter the aquifer.

The high interaction between groundwater and surface waters of the Big Bend gives rise to a multitude of springs, seeps and sinks. BBSAP has a total of 778 documented springs within the BBSAP drainage basins including 50 first magnitude springs. Please see the surface water section for a complete list of spring features for each drainage basin. A total of 468 sinkholes have also been documented in the BBSAP drainage area. Seeps contribute freshwater to the coastal marshes in the BBSAP as well. The approximate amount of freshwater entering the estuary through these seeps is unknown. USGS has recently documented a number of seeps and springs in the marshes and coastal hammocks of the BBSAP using light detection and ranging (LIDAR) remote sensing at night to detect warmer groundwater flow. The following table gives the number and magnitude of the documented springs for each drainage basin in BBSAP (Table 3).

Drainage Basin	Mag. 1	Mag. 2	Mag. 3	Mag. 4	Mag. 5+	Mag. 0	Unknown or N/A	Total
Apalachee/St. Marks River	5	6	8	1		1	8	29
Aucilla River	1	15	4			1	5	26
Econfina/Steinhatchee River	1	17	13	6	2	1	3	43
Upper Suwannee River	4	10	10	11		1		36
Alapaha River	25	147	103	45	4	6	59	389
Northern Withlacoochee River	1	12	3				1	17
Santa Fe River	8	32	24	8	1	1	7	81
Lower Suwannee River	4	39	28	16		1	11	99
Waccasassa River		2	5					7
Southern Withlacoochee River	1	14	8	3	1		24	51

Table 3 | Number and magnitude of the documented springs for each drainage basin within Big Bend Seagrasses Aquatic Preserve.

Surface Water Quality Classifications - Waters of BBSAP have been classified as Outstanding Florida Waters (OFW) since October 29, 1986. OFW are defined as waters designated by the state as worthy of special protection due to their natural attributes. These waters are afforded special protection by DEP due to their high quality, recreational or ecological significance, or their location within state or federally owned lands. This designation is intended to preserve the ambient water quality at the time of the designation. No degradation of water quality, other than allowed by rule, is to be permitted. Stringent standards are applied regarding proposed alterations or potentially damaging activities planned for these waters.

All surface waters of the state have been classified by the DEP according to their designated use, as required by the Clean Water Act**.** Florida has five classes with associated designated uses, which are arranged in order of degree of protection required. Water quality classifications within BBSAP include the following: Class I is designated potable water supplies, Class II is shellfish propagation or harvesting area and Class III is intended for recreation, propagation and maintenance of a healthy, well-balanced population of fish and wildlife. Class II water standards are more stringent concerning bacteriological quality than any other class due to the fact that consumed, uncooked shellfish can concentrate pathogens in quantities significantly higher than the surrounding waters. Every 12 years or less, the Florida Department of Agriculture and Consumer Services conducts regular microbial pollution source surveys (which include but are not limited to enumerating fecal coliform concentrations, identifying point and non-point sources of water pollution, assessing toxic marine plankton, etc) of shellfish harvesting areas to identify all known and potential sources of pollution and determine water quality in shellfish waters. Based upon these surveys, all Class II waters are classified by the department as approved, conditionally approved, restricted, conditionally restricted or prohibited for shellfish harvest. When environmental conditions (specific rainfall and/or, river level) exceed the shellfish harvest area's management plan, the area is closed. Emergencies such as harmful algal blooms, hurricanes, tropical storms, or sewage spills may trigger precautionary closures as well. In the case of rain or river stage closing a shellfish harvesting area, the area is reopened once bacteriological water quality meets National Shellfish Sanitation Program guidelines. All rivers within the BBSAP are designated as Class III water bodies. For a more complete description of surface water quality standards, refer to DEP Chapter 62-302 (Florida Administrative Code): Surface Water Quality Standards.

In addition, BBSAP is designated by the U.S. Environmental Protection Agency as a Gulf Ecological Management Site (GEMS). GEMS are geographic areas that have special ecological significance to the continued protection of fish, wildlife, and other natural resources or that represent unique habitat. The GEMS program is an initiative of the U.S. Environmental Protection Agency Gulf of Mexico Program, and the five Gulf of Mexico states to provide a framework for protection of ecologically important Gulf habitats.

Climate

BBSAP lies in a transition zone between temperate and tropical climates. Due to its latitude and the influence of the Gulf of Mexico, it is generally characterized by a mild subtropical climate. These conditions tend to generate mild winters and long, hot, humid summers. The moderating effect of the Gulf of Mexico on maximum temperatures in the summer and on minimum temperatures in the winter is pronounced along the coast, but diminishes a few miles inland. Wind direction and circulation are influenced by tropical air masses in the spring and summer, and by arctic cold fronts pushing down from the north in the winter. Prevailing winds are typically from a southerly direction during the spring and summer and from a northerly direction during the fall and winter.

Due to the expanse of the BBSAP, average temperatures vary throughout. Using Tallahassee as a reference point in the northern region of BBSAP, the average temperature in January is 52 °F (11.1 °C) with an average low of 40 °F (4.4 °C) and an average high of 64 °F (17.8 °C). On occasion, temperatures fall below freezing at night, and temperatures in the single digits (below -12 °C) have been recorded. The coldest temperature in Florida history was recorded in Tallahassee around the Great Blizzard of 1899, when it dropped to -2 °F (-19 °C) on February 13. In July, the average temperature in Tallahassee is 82 °F (27.8 °C), with an average low of 71 °F (21.7 °C) and an average high of 91 °F (32.8 °C). The highest recorded temperature in Tallahassee is 103 °F (39.4 °C). Using Crystal River as a reference point, the southern region of BBSAP sees an average temperature in January of 61 °F (16.1 °C) with average low of 53 F (11.7 °C) and an average high of 69 °F (20.6 °C). In July, Crystal River has an average temperature of 83 °F (28.3 °C) with an average low temperature of 76 °F (24.4 °C) and an average high of 90 °F (32.2 °C). The lowest recorded temperature in Crystal River is 20 °F (-6.7 °C) and the highest is 98 °F (36.7 °C) (Canty and Associates LLC, 2010).

The BBSAP area is described as having a bi-modal precipitation pattern with a summer and secondary late winter rainy season. In Tallahassee, the average precipitation is 4.7 inches in January and 8.6 inches in July. The average annual precipitation in the northern portion of BBSAP is 63.5 inches, with approximately 115 rainy days. In Crystal River, the average precipitation is 2.1 inches in January and 7.2 inches in July. The southern portion of BBSAP receives an average annual rainfall of 44.5 inches and has around 71 rainy

days per year. Convection storms are frequent in the summer months throughout the region. The last measurable snowfall took place in December 1989 in Tallahassee (Canty and Associates LLC, 2010).

Departures from normal daily maximum or minimum temperatures associated with El Niño or La Niña are significant in Florida, especially during winter months. During El Niño, winter months tend to be cooler and have higher rainfall. Florida can see average temperatures 2 to 3 °F below normal during El Niño years. During La Niña, autumn and spring months tend to be warmer and drier than normal. Temperatures 2 to 4 °F above normal in winter are likely, with the effect more pronounced in north Florida.

The Big Bend region is generally considered to be an area of low wave energy. However, its relatively shallow coastal shelf makes the region susceptible to coastal flooding during storm events. Hurricanes and tropical storms occasionally influence the weather in this region during the summer and late fall. In recent years, major storms that have affected the BBSAP have been Hurricanes Dennis and Wilma in 2005, and Charley in 2004. Although they did not directly hit BBSAP, the impacts of these Category 3-5 storms were felt in the Big Bend. The 1993 "Storm of the Century," also referred to as the "No Name Storm" caused billions of dollars in damages and significant coastal flooding from Apalachicola to Tampa Bay. In 1985, the area felt the impacts of major Hurricanes Elena and Kate. In 1966, the area was hit by the 90 mph winds of Hurricane Alma, and was also impacted by Hurricane Easy in 1950. In 1935, the Florida Keys Labor Day Hurricane battered the Keys before traveling up the gulf coast to make landfall at Cedar Key. The Great Miami Hurricane of 1926 also moved up the central gulf coast of Florida. A strong hurricane devastated the town of Cedar Key in 1896 (McCarthy, 2007).

Warning sirens can be a useful means of notifying community residents of storm warnings and evacuation orders when other forms of communication fail. Several small coastal communities adversely affected by the Storm of the Century were without warning sirens. As of January 1, 2000, Horseshoe Beach, Dekle Beach, Keaton Beach, and Steinhatchee had installed emergency warning sirens. Dixie County is seeking funds for the installation of sirens in the unincorporated communities of Suwannee and Jena.

Natural Communities

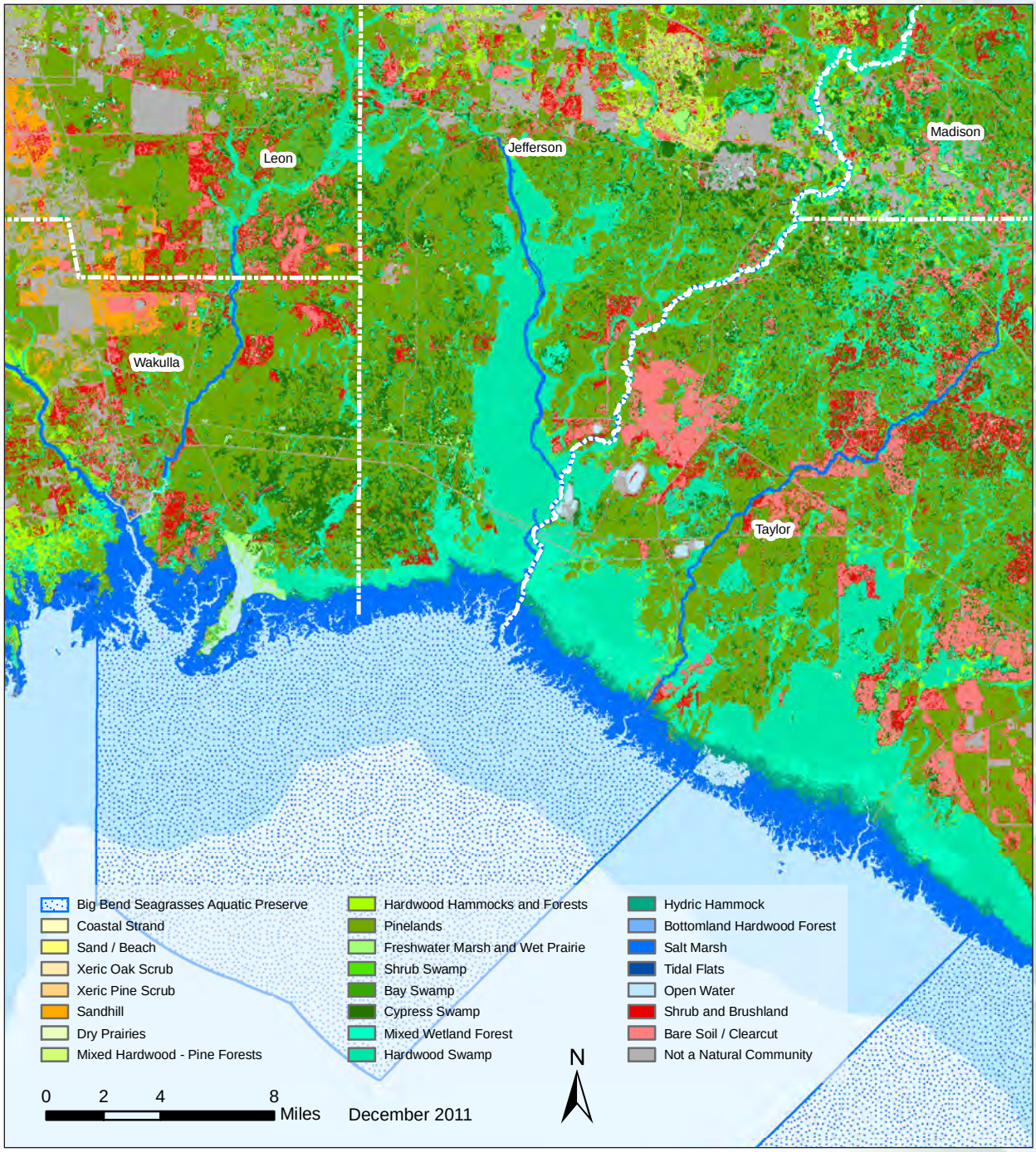
The natural community classification system used in this plan was developed by the Florida Natural Areas Inventory (FNAI) and the Florida Department of Environmental Protection. The community types are defined by a variety of factors, such as vegetation structure and composition, hydrology, fire regime, topography and soil type. The community types are named for the most characteristic biological or physical feature (FNAI and DEP, 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

FNAI Natural Community Type	# Acres	% of Area	Federal Rank	State Rank	Comments
Sinkhole Limestone Outcrop			G2	S2	
Shell Mound			G2	S2	
Alluvial Forest			G4	S3	
Floodplain Marsh			G3	S2	
Floodplain Swamp			G4	S4	
Blackwater Stream			G4	S2	
Alluvial Stream			G4	S2	
Spring-run Stream			G2	S2	
Aquatic Cave			G3	S2	
Consolidated Substrate			G3	S3	
Unconsolidated Substrate			G5	S5	
Mollusk Reef			G3	S3	
Octocoral Bed			G2	S1	
Sponge Bed			G2	S2	
Algal Bed			G3	S2	
Seagrass Bed			G2	S2	
Salt Marsh			G4	S4	
Mangrove Swamp			G3	S3	
Composite Substrate			G3	S3	

Table 4 | Summary of natural communities in Big Bend Seagrasses Aquatic Preserve.

communities in Florida). Appendix B.6 provides a full explanation of the FNAI community types and the ranking system.

The northwest Florida coast is a fine example of a transition zone between temperate and tropical climates, exhibiting community features of each. BBSAP includes a number of community types, but is most notably characterized by expansive coastal saltwater marshes, extensive seagrass beds, and hammock islands. The wide variety of habitat types in close proximity to one another provides valuable transitional habitat, or ecotones. Of the natural communities found within the Big Bend Seagrasses Aquatic Preserve (BBSAP), octocoral bed is ranked by FNAI as S1, Critically Imperiled in Florida. Thirteen of the FNAI community types listed for BBSAP are ranked as S2, Imperiled in Florida, and an additional 10 are ranked as S3, very rare or local throughout range in Florida. The following natural community types are found within BBSAP. Descriptions were taken from the 2010 FNAI Guide to the Natural Communities of Florida.



Map 11 | Habitats surrounding the upper region of Big Bend Seagrasses Aquatic Preserve.

Shell Mound - (synonyms: midden, Indian mound, tropical hammock, maritime hammock, coastal hammock). Shell mound is unusual among the biological communities in that it is largely a result of the activities of Indians, instead of natural physical factors. Shell mound is generally characterized as an elevated mound of mollusk shells and aboriginal garbage 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. In some cases, a sparse shrubby community, sometimes with cactus, may develop in lieu of hammock vegetation. Typical plants include gumbo-limbo (*Bursera simaruba)*, cabbage palm (*Sabal palmetto*), mastic (*Sideroxylon foetidissimum*), red cedar, hackberry *(Prunus padus*), live oak *(Quercus virginiana)*, Florida swampprivet (*Forestiera segregata*), coral bean *(Erythrina herbacea)*, marlberry (*Ardisia escalloniodes),* saffron plum (*Sideroxylon celastrinum)*, sageretia (*Sageretia minutiflora*), coontie (*Zamia pumila*) and others.

Sinkhole Limestone Outcrop - (synonyms: lime sink, sink, solution pit, cenote, grotto, doline, chimney hole, banana hole). Sinkholes are generally characterized as cylindrical or conical depressions with steep limestone walls. The vegetative structure of sinkholes may be that of a well-developed forest where sands cover the rock and/or the sides of the sinkholes are moderately sloped. These conditions are typically confined to the upper portions and around the rim of the sinkhole. Steeper rock walls are generally more or less covered by mosses, liverworts, and ferns with occasional herbs and shrubs in crevices, including such rare and threatened species as Venus'-hair fern (*Adiantum capillus-veneris)* and halberd fern (*Tectaria coriandrifolia).* Typical plants include southern magnolia (*Magnolia grandiflora*), sweetgum (*Liquidambar styraciflua)*, wax myrtle (*Myrica cerifera*), wild grape (*Vitis cinerea* var. *floridana)*, Virginia creeper (*Parthenocissus quinquefolia)*, poison ivy (*Toxicodendron radicans)*, partridgeberry (*Mitchella repens)*, greenbrier (*Smilax* spp.), water oak (*Quercus nigra*), flowering dogwood (*Cornus florida*), horse sugar (*Symplocos tinctoria*), sparkleberry (*Vaccinium arboreum)*, swamp laurel oak (*Q. laurifolia*), live oak, hophornbeam (*Ostrya virginiana)*, tupelo (*Nyssa* spp.), white ash (*Fraxinus americana)*, Florida maple (*Acer saccharum floridanum*), pignut hickory (*Carya glabra)*, beautyberry (*Callicarpa americana)* and gum bumelia (*Bumelia lanuginose*). Sinkholes provide habitat for relictual populations of many species of salamanders and invertebrates that would be unable to survive in otherwise drier areas.

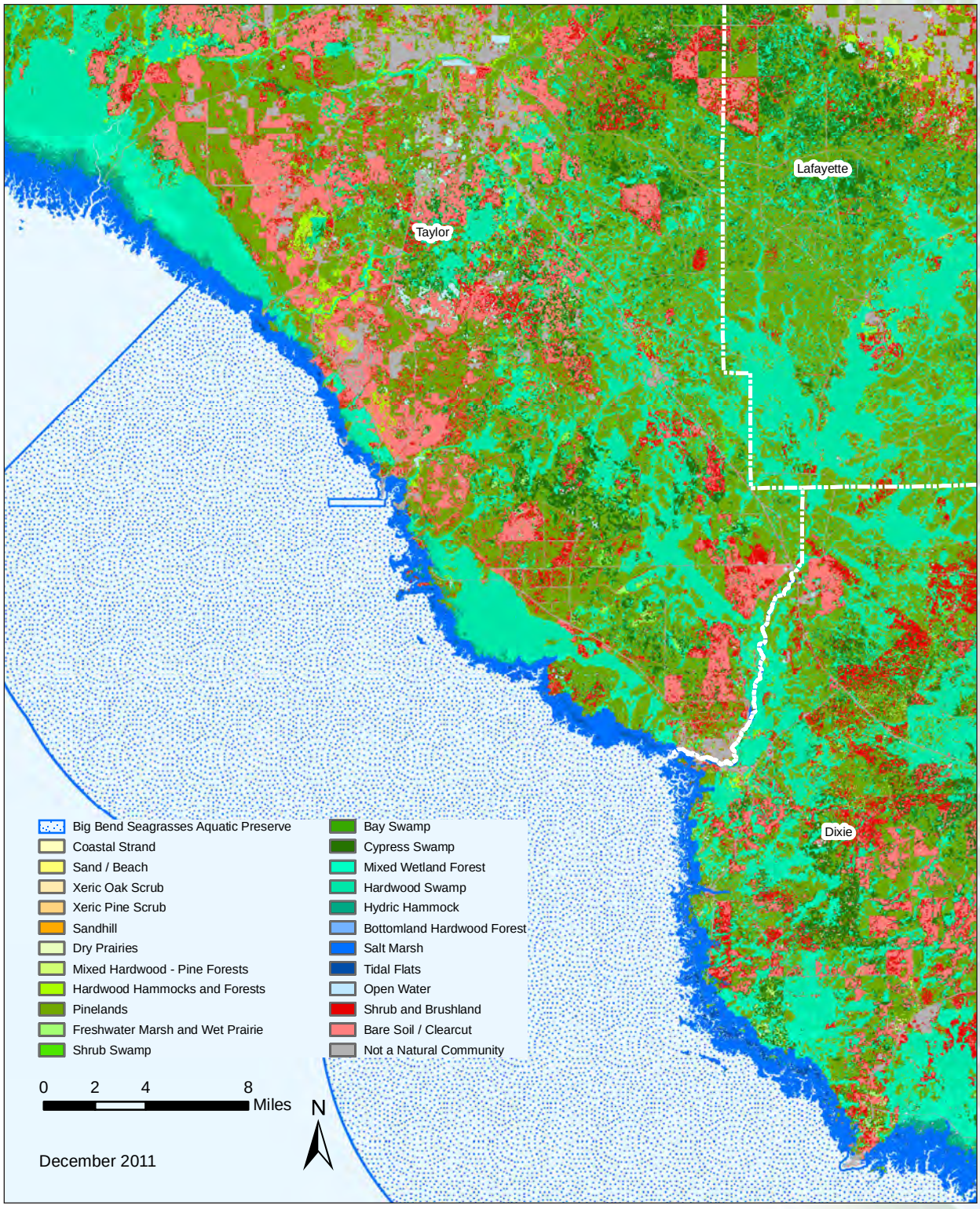
Sinkholes are most common in karst areas where the underlying limestone has been riddled with solution cavities by the chemical and physical actions of underground waters. As these cavities enlarge and become interconnected, large underwater caverns develop. When water tables drop, the cavern roof is no longer supported by the hydrostatic pressure and portions of it may collapse, leaving a deep cylindrical or conical surface depression known as a sinkhole. The organic and mineral debris that collapsed into the cavity may partially occlude, but generally does not completely block, the sinkhole's connections with the underground water table. Thus, sinkholes frequently function as aquifer recharge areas. Some sinkholes are the relics of ancient springs or swallowholes, flow having ceased because of lower water tables.

Sinkholes are extremely fragile communities. Their popularity as recreational areas subjects their flora to trampling and their steep walls to severe erosion from foot traffic and, in some cases, from dirt bikes. Sinkhole lakes attract swimmers and divers whose activities may disturb the aquatic community as well. Sinkholes are also frequently used as dump sites. These activities will degrade water quality in the sinkhole and potentially the underground aquifer (FNAI, 2010).

Alluvial Forest - (synonyms: bottomland hardwoods, seasonally flooded basins or flats, oak-gum-cypress, elm-ash-cottonwood, second bottom, levee forest, river terrace, river ridge). Alluvial forest is a hardwood forest found in river floodplains on low levees, ridges and terraces that are slightly elevated above floodplain swamp and are regularly flooded for a portion of the growing season. The physical environment is greatly influenced by ongoing disturbances created by a fluctuating river bed which is both eroding and depositing substrates. Primary trees found include overcup oak (*Quercus lyrata*), swamp laurel oak, water hickory (*Carya aquatica*), American elm (*Ulmus americana*), green (or pumpkin) ash (*Fraxinus pennsylvanica*), water locust (*Gleditsia aquatica*), river birch (*Betula nigra*), and red maple (*Acer rubrum*). A great diversity of less flood-tolerant hardwoods or swamp species such as cypress (*Taxodium* spp.) and tupelo may also be present, but not dominant elements. Shrubs, small trees, and vines are usually sparse or moderate in abundance with green hawthorn (*Crataegus viridis*), swamp dogwood (*Cornus foemina*), eastern swampprivet (*Forestiera acuminata*), dwarf palmetto (*Sabal minor*), coastal plain willow (*Salix caroliniana*), black willow (*S. nigra*), American hornbeam (*Carpinus caroliniana*), *Hypericum* spp., possumhaw (*Ilex decidua*), and laurel greenbrier (*Smilax laurifolia*) common. Groundcover is variable in abundance with false nettle (*Boehmeria cylindrica*), butterweed (*Packera glabella*), netted chain fern (*Woodwardia areolata*), redtop panicum (*Panicum*

rigidulum), and big carpetgrass (*Axonopus furcatus*) among the herbs most commonly encountered. The ability of both adult plants and seedlings to withstand specific flooding regimes throughout the "ridge and swale" topography of the floodplain often creates a mix of mesophytic and hydrophytic tree species (FNAI, 2010).

Floodplain Marsh - (synonyms: river marsh). Floodplain marshes are wetlands of herbaceous vegetation and low shrubs that occur in river floodplains, mainly in Central Florida and along the St. Johns, Kissimmee and Myakka rivers, on sandy alluvial soils with considerable peat accumulation. Sand cordgrass (*Spartina bakeri*), sawgrass (*Cladium jamaicense*), and maidencane (*Panicum hemitomon*) are common dominants, but various other herbs may be found distributed along a hydrologic gradient.



Map 12. | Habitats surrounding the middle region of Big Bend Seagrasses Aquatic Preserve.

Broadleaf emergents and floating plants, particularly bulltongue arrowhead (*Sagittaria lancifolia*), bladderworts (*Utricularia* spp.), pickerelweed (*Pontederia cordata*), yellow pondlily (*Nuphar advena*) occupy the deepest, most frequently flooded sites, and mixed herbaceous stands are found in the somewhat higher portions of the marsh. In wetter sites, coastal plain willow or common buttonbush (*Cephalanthus occidentalis*) may form shrub thickets. The highest part of the marsh is often a drier, wet prairie-like zone with a large diversity of graminoids and forbs. While the progression from high to low marsh occurs generally from the upland edge to the river edge, these vegetation patches may also be scattered throughout the marsh, which provides a diversity of habitats beneficial to wildlife. Additional herbs can include dotted smartweed (*Polygonum punctatum*), bulrushes (*Scirpus* spp.), common reed (*Phragmites australis*), tickseeds (*Coreopsis* spp.), primrose willows (*Ludwigia* spp.), fimbries (*Fimbristylis* spp.), spikerushes (*Eleocharis* spp.), flat sedges (*Cyperus* spp.), many flower marsh pennywort (*Hydrocotyle umbellata*), soft rush (*Juncus effusus solutus*), grassleaf rush (*J. marginatus*), beak sedges (*Rhynchospora* spp.), rosy camphorweed (*Pluchea rosea*), lemon bacopa (*Bacopa caroliniana*), spadeleaf (*Centella asiatica*), swamp rosemallow (*Hibiscus grandiflorus*), saltmarsh morning glory (*Ipomoea sagittata*), cattails (*Typha* spp.), southern cutgrass (*Leersia hexandra*) and climbing hempvine (*Mikania scandens*). Other than occasional thickets, woody vegetation is generally sparse, although some marshes can be dominated by common buttonbush, coastal plain willow, and/or wax myrtle. Occasionally, cabbage palm and other flood tolerant trees are widely scattered in floodplain marsh, becoming more concentrated in the ecotone to adjacent hydric hammocks (FNAI, 2010).

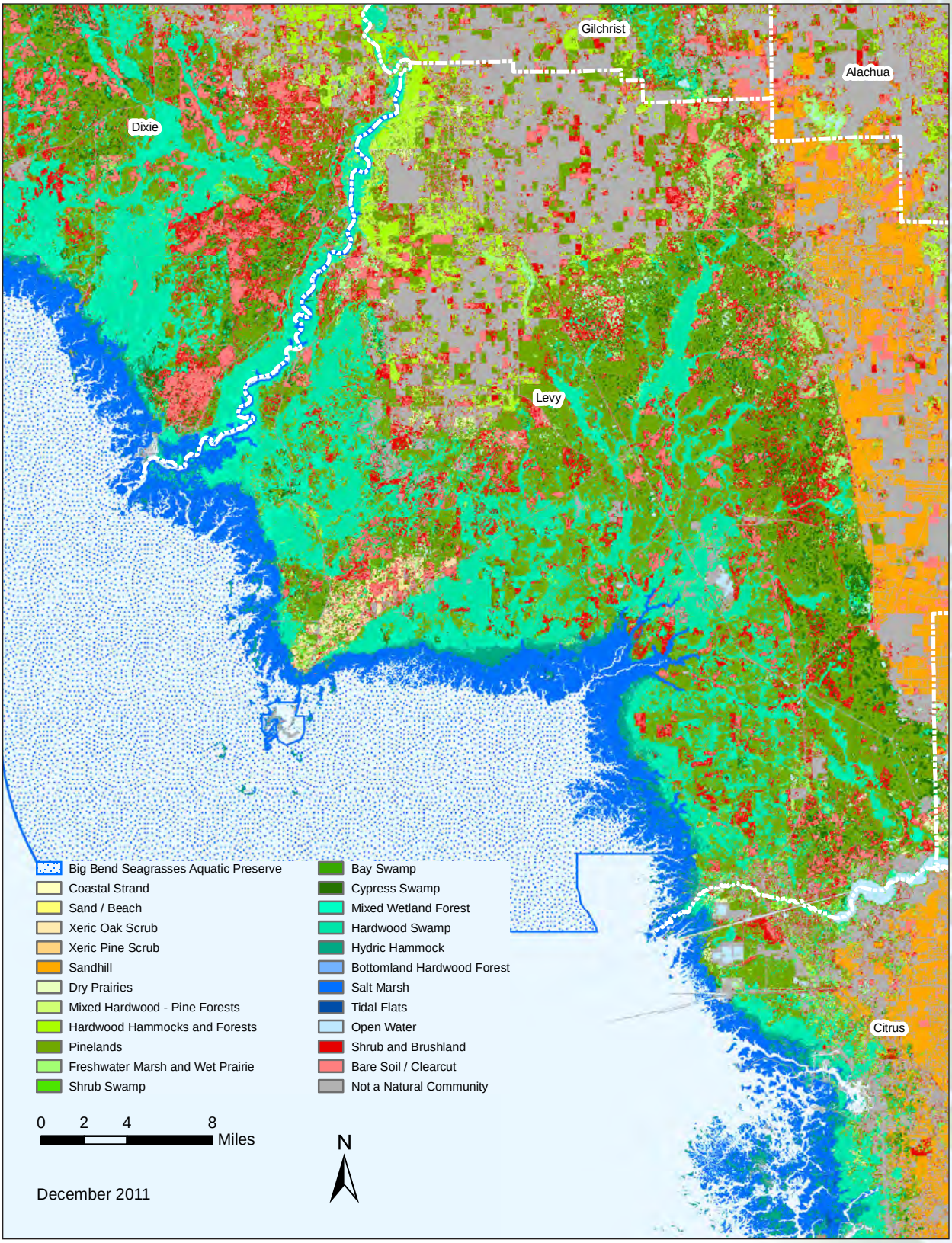
Typical animals include cricket frog (*Acris gryllus*), pig frog (*Rana grylio*), leopard frog (*R. sphenocephala*), American alligator (*Alligator mississippiensis*), eastern mud snake (*Farancia abacura*), banded water snake (*Nerodia fasciata*), striped swamp snake (*Seminatrix pygaea*), great blue heron (*Ardea herodias*), great egret (*A. alba*), snowy egret (*Egretta thula*), little blue heron (*E. caerulea*), tricolored heron (*E. tricolor*), black-crowned night-heron (*Nycticorax nycticorax*), yellow-crowned night-heron (*Nyctanassa violacea*), northern harrier (*Circus cyaneus*), sandhill crane (*Grus canadensis*), raccoon (*Procyon lotor*) and river otter (*Lutra canadensis*).

Floodplain marshes are maintained by regimes of fire and water. Fires apparently burn on a one- to five-year basis under natural conditions and maintain the open herbaceous community by restricting shrub invasion, however, severe fires during drought periods will often burn the mucky peat. Floodplain marshes are flooded with flowing water for about 250 days annually. Shortened hydroperiods will permit invasion by shrubs and subsequent loss of the marsh. Many of these marshes have been degraded by pollution or destroyed by drainage for agricultural uses. Floodplain marshes are associated with, and grade into, wet prairie or riverine communities. They eventually succeed to bog, if succession is not reversed by a muck fire. Most floodplain marshes are freshwater (salinity less than 0.5 ppt); however, saltwater may influence marshes near the mouths of rivers (freshwater tidal marsh variant) and in areas where there is upwelling (FNAI, 2010). The freshwater tidal marsh variant occurs in river mouths that receive pulses of freshwater in response to tides. Salt and freshwater marsh species intermingle as saltwater is diluted by freshwater inflow and tidal fluctuation is damped (Thompson, 1977; Clewell, 1997). These marshes are occasionally influenced by salt water during storms, seasonal high tides, and periods of low river flow. Sawgrass is dominant, forming large stands either directly adjacent to the river, or just behind slightly raised levees of floodplain swamp or hydric hammock vegetation.

Floodplain Swamp - (synonyms: river swamp, bottomland hardwoods, seasonally flooded basins or flats, oak-gum-cypress, cypress-tupelo, slough, oxbow, back swamp). Floodplain swamp is a closed-canopy forest of hydrophytic trees occurring on frequently or permanently flooded hydric soils adjacent to stream and river channels and in depressions and oxbows within floodplains. Trees are often buttressed, and the understory and groundcover are sparse. The canopy is sometimes a pure stand of bald cypress (*Taxodium distichum*), but more commonly bald cypress shares dominance with one or more of the following tupelo species: water tupelo (*Nyssa aquatica*), swamp tupelo (*N. sylvatica* var. *biflora*), or ogeechee tupelo (*N. ogeche*). The “knees” arising from the root systems of both cypress and tupelo are common features in floodplain swamp. Other canopy trees capable of withstanding frequent inundation may be present but rarely dominant, including water hickory, overcup oak, red maple, green ash, American elm, and swamp laurel oak. Pond cypress (*T. ascendens*) is sometimes present in backswamps and depressions of the more hydrologically isolated areas of the floodplain. Floodplain swamp can often occur within a complex mixture of communities including alluvial forest, bottomland forest and baygall. This produces a variable assemblage of canopy and subcanopy species, with less flood tolerant trees and shrubs found on small hummocks and ridges within the swamp. Shrubs and smaller trees such as Carolina ash (*Fraxinus caroliniana*), planer tree (*Planera aquatica*), black willow, titi (*Cyrilla racemiflora*), Virginia willow (*Itea virginica*), common buttonbush, cabbage palm, and dahoon (*Ilex cassine*) may be present. A groundcover of flood tolerant ferns and herbs are found in some floodplain swamps, including lizard’s tail (*Saururus cernuus*), false nettle,

creeping primrose willow, savannah panicum (*Phanopyrum gymnocarpon*), royal fern (*Osmunda regalis* var. *spectabilis*), dotted smartweed, climbing aster (*Symphyotrichum carolinianum*) and string lily (*Crinum americanum*). Swamps with stagnant water typically have a mixture of floating aquatics such as duckweeds (*Lemna* spp.) and Florida mudmidget (*Wolffiella gladiata*). Eastern poison ivy is a frequent vine (FNAI, 2010).

Freshwater Tidal Swamp - (synonyms: tidewater swamp, rivermouth swamp, sweetbay swamp, tupelo-redbay). Freshwater tidal swamps occur on floodplains near the mouths of rivers just inland from



Map 13 | Habitats surrounding the lower region of Big Bend Seagrasses Aquatic Preserve.

mangroves or saltmarshes. Freshwater tidal swamps often occur between reconnected channels, on soils that are highly organic. These swamps are flooded by freshwater at least twice daily in response to tidal cycles. They are extremely vulnerable to hydrological modifications, saltwater intrusion, and clear-cut logging. Freshwater tidal swamp is recognized in the 2010 update as a variant of floodplain swamp. They are swamp forests with well-developed trees inland and increasingly dwarfed trees towards the coast, often with an extensive mat of convoluted surface roots. The dominant trees are usually cabbage palm, black gum (*Nyssa sylvatica)*, bald cypress southern magnolia and red cedar. Other typical plants include water tupelo, pumpkin ash (*Fraxinus profunda*), swamp bay (*Persea palustris*), white cedar (*Chamaecyparis thyoides*), titi, wax myrtle, cocoplum (*Chrysobalanus icaco)*, dahoon holly, myrtle-leaved holly (*Ilex myrtifolia*), saltbush (*Atriplex* spp.), asters (*Aster* spp.) and leather fern (*Acrostichum danaeifolium*). Typical animals include those with marine affinities such as olive nerites and fiddler crabs (*Uca* spp.).

Alluvial Stream - (synonyms: alluvial river, slow flowing river, deep river, muddy stream). Alluvial streams are characterized as perennial or intermittent seasonal watercourses originating in high uplands that are primarily composed of sandy clays and clayey-silty sands. Alluvial stream waters are typically turbid due to a high content of suspended particulates, including clays, silts, and sands, as well as detritus and other organic debris. Water temperatures may fluctuate substantially and are generally correlated with seasonal fluctuations in air temperature. Similarly, other water quality parameters vary substantially and generally fluctuate with seasonal rainfall patterns.

The most important characteristics of alluvial streams are the large range of flow rates and sediment loads encountered. Thus, water depth fluctuates substantially and is generally separated into two distinct stages, a normal or low flow stage and a flood or high flow stage. During the normal low flow stage the water is confined within the stream banks, while during flood stage the water overflows the banks and inundates the adjacent floodplain communities. Flood stages generally occur once or twice each year during winter or early spring and occasionally in summer.

The flood waters transport detritus, minerals and nutrients from the surrounding uplands to the floodplain communities and beyond. This flushing action removes biological waste materials and simultaneously nourishes the floodplain communities. Most important, however, it provides a pulse of nutrient-rich water to the estuarine communities which occur where the stream empties into the sea.

Very few rooted plants occur within the main channel of alluvial streams, largely because the high natural turbidity reduces available light for photosynthesis. Waterlilies (*Nymphaea* spp.), pondlilies (*Nuphar* spp.) and other floating-leaved plants occasionally occur along quiet stretches, while pickerelweed, cattails, and other emergents may fringe the banks. Willows, cottonwood (*Populus* spp.), river birch, silver maple (*Acer saccharinum*), and other trees typically occur along the banks and natural levees. Typical animals include American eel (*Anguilla rostrata*), gizzard shad (*Dorosoma cepedianum*), speckled chub (*Macrhybopsis aestivalis*), madtom (*Noturus* spp), pirate perch (*Aphredoderus sayanus*), striped bass (*Morone saxatilis*), redbreast sunfish (*Lepomis auritus*), warmouth (*Lepomis gulosus*), bluegill (*Lepomis macrochirus*), crappie (*Pomoxis* spp.), darters (*Ammocrypta*, *Crystallaria*, *Etheostoma*, and *Percina* spp.), Alabama waterdog (*Necturus alabamensis*), river frog (*Rana heckscheri*), American alligator, common snapping turtle (*Chelydra serpintina*), alligator snapping turtle (*Macrochelys temminckii*), Florida cooter (*Pseudemys floridana*), river cooter (*P. concinna*), eastern mud turtle (*Kinosternon subrubrum*), common musk turtle (*Sternotherus odoratus*), brown water snake (*Nerodia taxispilota*), belted kingfisher (*Megaceryle alcyon*), Louisiana waterthrush (*Parkesia motacilla*), beaver (*Castor canadensis*) and North American river otter (FNAI, 2010).

Blackwater Stream - (synonyms: blackwater river, blackwater creek). Blackwater streams are characterized as perennial or intermittent seasonal watercourses originating deep in sandy lowlands where extensive wetlands with organic soils function as reservoirs, collecting rainfall and discharging it slowly to the stream. The tea-colored waters of blackwater streams are laden with tannins, particulates, and dissolved organic matter and iron derived from drainage through swamps and marshes. The dark-colored water reduces light penetration and, thus, inhibits photosynthesis and the growth of submerged aquatic plants. Emergent and floating aquatic vegetation may occur along shallower and slower moving sections, but their presence is often reduced because of typically steep banks and considerable seasonal fluctuations in water level. Typical plants include goldenclub (*Orontium aquaticum*), smartweed (*Polygonum* spp.), sedges and grasses (*Poaceae*). Typical animals include longnose gar (*Lepisosteus osseus*), gizzard shad, threadfin shad (*Dorosoma petenense*), redfin pickerel (*Esox americanus americanus*), chain pickerel (*Esox niger*), ironcolor shiner (*Notropis chalybaeus*), Bannerfin shiner (*Cyprinella leedsi*), weed shiner (*Notropis texanus*), blacktail shiner (*Cyprinella venusta*), lake chubsucker (*Erimyzon sucetta*), channel catfish (*Ictalurus punctatus*), banded topminnow (*Fundulus*

cingulatus), pygmy killifish (*Leptolucania ommata*), western mosquitofish (*Gambusia affinis*), mud sunfish (*Acantharchus pomotis*), flier (*Centrarchus macropterus*), Everglades pygmy sunfish (*Elassoma evergladei*), banded sunfish (*Enneacanthus obesus*), redbreast sunfish, dollar sunfish (*Lepomis marginatus*), redear sunfish (*Lepomis microlophus*), spotted sunfish (*Lepomis punctatus*), black crappie (*Pomoxis nigromaculatus*), Alabama waterdog, river frog, American alligator, common snapping turtle, alligator snapping turtle, river cooter, Florida cooter, peninsula cooter (*Pseudemys peninsularis*), common musk turtle, spiny softshell (*Apalone spinifera*), plainbelly watersnake (*Nerodia erythrogaster*), Florida watersnake (*Nerodia fasciata pictiventris*), beaver, and North American river otter (FNAI, 2010).

Spring-run Stream - (synonyms: calcareous stream, spring, or creek). Spring-run streams are perennial water courses which derive most, if not all, of their water from artesian openings in the underground aquifer. Waters issuing from the aquifer are generally clear, circumneutral to slightly alkaline (pH = 7.0 - 8.2), and perennially cool (66 – 75 °F). These conditions saturate the water with important minerals, allow light to penetrate deeply, and reduce the limiting effects of environmental fluctuations, all of which are conducive for plant growth. Thus, spring-run streams are among the most productive aquatic habitats. Typical plants include tapegrass (*Vallisneria americana*), annual wild rice (*Zizania aquatica*), giant cutgrass (*Zizaniopsis miliacea*), arrowheads (*Sagittaria* spp.), southern naiads (*Najas quadalupensis*), pondweeds (*Potamogeton* spp.), and chara (*Chara* spp.). Typical animals include mollusks, stoneflies, mayflies, caddisflies, simuliids, chironomids, American alligator, alligator snapping turtle, Suwannee cooter (*Pseudemys concinna suwanniensis*), loggerhead musk turtle (*Sternotherus minor*), rainbow snake (*Farancia erytrogramma*), plainbelly watersnake, brown watersnake and many fishes.

Spring-run streams generally have sand bottoms or exposed limestone along their central channel. Calcareous silts may form thick deposits in quiet shallow zones, while leaf drift and other debris collect around fallen trees and quiet basins. The latter, along with limestone outcrops and rock debris, form important aquatic habitats for many small aquatic organisms. When undisturbed, submerged aquatic vegetation clothes most of the spring-run stream bottom and provides shelter and an abundant food source for the extensive web of life.

The water emanating from the aquifer is generally clear because of the filtering and absorbing actions of the soils and aquifer limestones through which the water percolates and flows. When the water is deep, it may appear bluish because of light-refraction characteristics that are similar to those which cause the sky to be blue on clear days. If the water sources for the aquifer are substantially influenced by nearby swamps or flatwoods, the spring-run may temporarily become stained with tannins and other dissolved organics during or following periods of heavy rains. When extensive underground cavities connect the spring caverns with nearby sinks and swallow holes, the spring-run may become turbid with suspended particulates during and following heavy rains and floods. Conversely during periods of low rainfall, the aquifer can become supersaturated with calcium, carbonates, and other ions. These chemicals readily precipitate when the water reaches the surface, causing the spring head or boil to appear milky. Human activities affect flow rates by withdrawing water from the aquifer through deep wells. When withdrawal is substantial within the recharge area, spring flow is reduced or, in some cases, ceases entirely.

People can also substantially affect the quality of spring waters. Agricultural, residential, and industrial pollutants may readily leach through soils, especially when they are improperly applied or disposed. If polluted groundwater infiltrates the deep aquifer feeding a spring-run stream, recovery may not be possible. Applications of herbicides to control aquatic plant growth are also detrimental, because their use often induces eutrophication of the stream. Other human-related impacts to spring-run streams include the destruction of aquatic vegetation by overuse or misuse, and the introduction and proliferation of exotic plants and animals. Both of these impacts may be very difficult to control. Overuse is likely to increase because of the limited number of publicly-owned springs and the desires of an increasing population to enjoy their clean, cool, aesthetic qualities and unique recreational opportunities. Exotic species are often severely detrimental to native species, and they may also disrupt recreational activities (FNAI, 2010).

Aquatic Cave - (synonyms: cave, cavern grotto, chamber, chimney, sink, swallow hole, spring rise). Aquatic and terrestrial caves are characterized as cavities below the surface of the ground in karst areas of the state. The limestone aquifers that underlie the entire state of Florida could be considered vast aquatic cave communities. Troglobites (also called phreatobites) are organisms specially evolved to survive in deep cave habitats. The occasional observation of various species of troglobites in deep water wells from several regions in the state suggests that this community could be widespread. However, the dependence of troglobites on detrital inputs and other nutrients imported from the surface generally limits the distribution of well developed aquatic cave communities to karst areas with surface connections.

Wintering American oystercatchers on a Withlacoochee oyster bar.

The area around cave entrances may be densely vegetated with species from the surrounding natural community. Within the cave, however, illumination levels and, thereby, vegetation densities drop rapidly with increased distance from the entrance. Within the limits of light penetration, called the twilight zone, species of algae, mosses, liverworts, and an occasional fern or herbaceous plant may grow. Beyond the twilight zone, plants are generally absent or limited to a few inconspicuous species of fungi that grow on guano or other organic debris. Thus, subterranean natural communities differ from most other natural communities in that living plants are not dominant elements.

The dissolution and corrosion of limestone play active roles in enlarging cave passageways. These forces differ primarily in the slopes of the passageways which result. Since limestone caves initially develop in the aquifer, they are frequently associated with aquifer-related surface features. Thus, a spring run stream issues from an aquatic cave, while sinkhole lakes and occasionally blackwater streams lead into aquatic caves.

Cave waters are generally clear, with deep water appearing bluish. The water may become stained brown from tannins leached from decaying plant matter nearby and carried in with rainwater. The water may also become milky white if fine limestone mud from the bottom of the aquatic cave is suspended in the water column following disturbance. A bottom substrate of organic silts can also muddy the water with suspended particles. Waters are generally circumneutral to alkaline with a high mineral content (particularly calcium bicarbonate and magnesium) and with constant temperature. Flowing water within aquatic caves generally has a lower pH, is often undersaturated with respect to carbonates, and has a relatively richer fauna. Contrastingly, pools that are fed by seepage or dripping water are generally characterized by a high pH, high concentration of dissolved carbonates, low content of organic matter suitable for food, and a sparse fauna. Cave water characteristics may also vary seasonally because of fluvial inputs from interconnected surface streams, or because of detrital pulses and other surface inputs during periods of substantial aquifer recharge. In general, however, aquatic caves are very stable environments with relatively constant physical and chemical characteristics.

Alterations in or around cave entrances will often upset detrital input levels and may also induce significant changes in air circulation patterns and the cave microclimate. Aquatic caves are threatened by pollution of ground and surface waters from agricultural, industrial, and residential sources, as well as by

disturbances from divers. The unique troglobitic species generally have very low population levels and can be severely impacted by overcollection or by changes in nutrient input levels that result from surface manipulations or hydrological alterations (FNAI, 2010).

Consolidated Substrate - (synonyms: hard bottom, rock bottom, limerock bottom, coquina bottom, relic reef). Marine and estuarine consolidated substrates are mineral based natural communities generally characterized as expansive, relatively open areas of subtidal, intertidal and supratidal zones which lack dense populations of sessile plant and animal species. Consolidated substrates are solidified rock or shell conglomerates and include coquina, limerock or relic reef materials. These communities may be sparsely inhabited by sessile, planktonic, epifaunal, and pelagic plants and animals but house few infaunal organisms (i.e., animals living within the substrate).

The three kinds of consolidated substrate communities occurring in Florida are of limited distribution. Coquina, which is a limestone composed of broken shells, corals and other organic debris, occurs primarily along the east coast, in marine areas in the vicinity of St. Johns and Flagler counties. Limerock substrates occur as outcrops of bedded sedimentary deposits consisting primarily of calcium carbonate. This consolidated substrate is more widespread than coquina substrate and can be found in a patchy distribution under both marine and estuarine conditions from north Florida to the lower-most keys in Monroe County. Relic reefs, the skeletal remains of formerly living reefs, are more limited in distribution than limerock outcrops but more common than coquina substrate.

Consolidated substrates are important in that they form the foundation for the development of other marine and estuarine natural communities when conditions become appropriate. Consolidated substrate communities are easily destroyed through siltation or placement of fill, and deliberate removal by actions such as blasting or non-deliberate destruction by forces such as vehicular traffic (FNAI, 2010).

Unconsolidated Substrate - (synonyms: beach, shore, sand bottom, shell bottom, sand bar, mud flat, tidal flat, soft bottom, coralgal substrate, marl, gravel, pebble, calcareous clay). Marine and estuarine unconsolidated substrates are mineral based natural communities generally characterized as expansive, relatively open areas of subtidal, intertidal, and supratidal zones which lack dense populations of sessile plant and animal species. Unconsolidated substrates are unsolidified material and include coralgal, marl, mud, mud/sand, sand or shell. This community may support a large population of infaunal organisms as well as a variety of transient planktonic and pelagic organisms (e.g., tube worms, sand dollars (Clypeasteroida), mollusks, isopods, amphipods, burrowing shrimp (Thalassinidea), and an assortment of crabs).

In general, marine and estuarine unconsolidated substrate communities are the most widespread communities in the world. However, unconsolidated substrates vary greatly throughout Florida, based on surrounding parent material. Unconsolidated sediments can originate from organic sources, such as decaying plant tissues (e.g., mud) or from calcium carbonate depositions of plants or animals (e.g., coralgal, marl and shell substrates). Marl and coralgal substrates are primarily restricted to the southern portion of the state. The remaining four kinds of unconsolidated substrate, mud, mud/sand, sand, and shell, are found throughout the coastal areas of Florida. While these areas may seem relatively barren, the densities of infaunal organisms in subtidal zones can reach the tens of thousands per meter square, making these areas important feeding grounds for many bottom feeding fish, such as red drum (redfish), southern flounder, spot (*Leiostomus xanthurus*), and sheepshead (*Archosargus probatocephalus*). The intertidal and supratidal zones are extremely important feeding grounds for many shorebirds and invertebrates.

Unconsolidated substrates are important in that they form the foundation for the development of other marine and estuarine natural communities when conditions become appropriate. Unconsolidated substrate communities are associated with and often grade into beach dunes, salt marshes, mangrove swamps, seagrass beds, coral reefs, mollusk reefs, worm reefs, octocoral beds, sponge beds, and algal beds.

Unconsolidated substrate communities which are composed chiefly of sand (e.g., sand beaches) are the most important recreational areas in Florida, attracting millions of residents and tourists annually. This community is resilient and may recover from recreational disturbances. However, this community is vulnerable to compaction associated with vehicular traffic on beaches and disturbances from dredging activities and low dissolved oxygen levels, all of which can cause infaunal organisms to be destroyed or to migrate out of the area. Generally these areas are easily recolonized either by the same organisms or a series of organisms which eventually results in the community returning to its original state once the disturbance has ceased. In extreme examples, such as significant alterations of elevation, there is potential for serious long-term impacts from this type of disturbance (FNAI, 2010).

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. In Florida, the most developed mollusk reefs are generally restricted to estuarine areas and are dominated by the Eastern oyster (*Crassostrea virginica*). Less common are mollusk reefs dominated by mussels and others dominated by Vermetid worm shells. Numerous other sessile and benthic invertebrates live among, attached to, or within the collage of mollusk shells. Most common are burrowing sponge (Hadromerida), anemones, mussels, clams, oyster drill (*Urosalpinx* spp.), lightning whelk (*Busycon contrarium*), polychaetes, oyster leech (*Stylochus* spp.), barnacles, blue crab, mud crab (Xanthidae), stone crab (*Menippe mercenaria*), pea crab (Pinnotheridae), amphipods, and starfish (Asteroidea). Several fish also frequently occur near or feed among mollusk reefs, including cownose ray (*Rhinopter bonasus*), gulf menhaden (*Brevoortia patronus*), gafftopsail catfish (*Bagre marinus*), pinfish (*Lagodon rhomboides*), spotted seatrout (*Cynoscion nebulosus*), spot, black drum (*Pogonias cromis*) and striped mullet (*Mugil cephalus*). Mollusk reefs that are exposed during low tides are frequented by a multitude of shorebirds, wading birds, raccoons and other vertebrates. One of the United States' largest wintering populations of American oystercatchers is situated in the heart of the Cedar Keys. The success of this rookery can be attributed to the oyster reefs located here, which are an excellent and tremendously important food source (Schulte, Brown, Reynolds, & the American Oystercatcher Working Group, 2007).

Reef-building mollusks require a hard (consolidated) substrate on which the planktonic larvae (i.e., spat) settle and complete development. The spat dies if it settles on soft (unconsolidated) substrates, such as mud, sand or grass. Hard substrates include rocks, limestone, wood and other mollusk shells. Hard substrates are often limited in estuarine natural communities because of the large amounts of silt, sands and muds that are deposited around river mouths. Once established, however, mollusk reefs can generally persist and often expand by building upon themselves.

The most common kind of mollusk reef, oyster mollusk reefs, occur in water salinities from just above fresh water to just below full strength sea water, but develop most frequently in estuarine water with salinities between 15 and 30 ppt. 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 2 ppt) is also known to be responsible for massive mortality of oyster reefs. Thus, significant increases or decreases in salinity levels through natural or unnatural alterations of freshwater inflow can be detrimental to oyster mollusk reef communities.

Mollusk reefs occupy a unique position among estuarine invertebrates and have been an important human food source since prehistoric times. 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. Declining 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 untreated residential or industrial sewage systems (FNAI, 2010).

In the Big Bend region, research has shown a 66 percent net loss of oyster bar area (124.05 hectares) with losses concentrated on offshore (88 percent), followed by nearshore (61 percent), and inshore bars (50 percent) between 1982 and 2011 (Seavey, Pine, Frederick, Sturmer & Berrigan, 2011). This rapid loss is very likely due to a departure from historical norms, and stems from multiple factors. Extended periods of high salinity are likely stressors of oyster populations, particularly on offshore bars, to the extent that the physical structure of bars are affected by both mortality of older oysters, and the loss of significant recruitment. Once the structure of bars is weakened, bars became less resilient to wave action, particularly during storm events (Seavey et al., 2011). Evidence suggest that the primary mechanism is reduced survival and recruitment as a result of decreased freshwater inputs, thus causing existing bars to be vulnerable to wave action and sea level rise; once bar substrate becomes unconsolidated, the breakdown of the bar may not be reversible. Emerging threats such as sea level rise, increasing storm intensity, and changes to ocean chemistry are much less understood partly because these threats occur at very broad spatial scales and partly because oyster community response to these stressors may be locally confounded with other stressors such as dredging or overharvest. Evidence suggests that increasing human uses of freshwater inland may be an important factor resulting in habitat loss. Understanding the resilience of oyster reef communities in the Gulf to these and other threats is thus important for developing effective conservation, management, and restoration plans for this species and

Sponge beds require hard bottom (consolidated) substrate on which to anchor.

this globally significant habitat (Seavey et al., 2011). Planning for the conservation of oyster habitat in the Gulf should include scenarios that encompass the interaction of global change and local anthropogenic stressors.

Octocoral Bed - (synonyms: gorgonians, sea fans, sea feathers, sea fingers, sea pansies, sea plumes, sea rods, sea whips, soft corals). Marine and estuarine octocoral beds are soft faunal based natural communities characterized as large populations of sessile invertebrates of the Class Anthozoa, Subclass Octocorallia, Orders Gorgonacea and Pennatulacea. The dominant animal species are soft corals such as gorgonians, sea fans (Gorgonacea), sea feathers and sea plumes (*Pseudopterogorgia* spp.), sea fingers (*Briareum asbetinum*), sea pansies (*Renilla* spp.), sea rods (*Plexaura* spp.), and sea whips (*Leptogorgia* spp.). This community is confined to the subtidal zone since the sessile organisms are highly susceptible to desiccation. Other sessile animals typically occurring in association with these soft corals are sea anemones (Actiniaria). An assortment of non-sessile benthic and pelagic invertebrates and vertebrates [e.g., sponges, mollusks, tube worms, burrowing shrimp (Thalassinidea), crabs, isopods, amphipods, sand dollars (Clypeasteroida), and fishes] are associated with octocoral beds. Specific species of interest living on or among the soft corals include the flamingo tongue snail (*Cyphoma gibbosa*) and the giant basket starfish (*Astrophyton muricatum*). Sessile and drift algae can also be found scattered throughout octocoral beds.

Octocoral beds require hard bottom (consolidated) substrate (i.e., coquina, limerock, relic reefs) on which to anchor. Hard bottom substrate occurs sparsely throughout Florida in marine and estuarine areas; however, soft corals prefer the warmer waters of the southern portion of the state, severely limiting the distribution.

Octocoral beds may grade into other marine and estuarine hard bottom subtidal, intertidal, and supratidal communities (i.e., consolidated substrate, sponge bed, coral reef, mollusk reef, worm reef, lithophytic algal bed) as well as soft bottom communities (i.e., unconsolidated substrate, sammophytic algal bed, seagrass bed, salt marsh, mangrove swamp) (FNAI, 2010).

Sponge Bed - (synonyms: branching candle sponge, Florida loggerhead sponge, sheepswool sponge). Marine and estuarine sponge beds are soft faunal based natural communities characterized as dense populations of sessile invertebrates of the phylum Porifera, Class Demospongiae. The dominant animal

A loggerhead sea turtle (Caretta caretta) swims over the lush seagrass beds in the Big Bend Seagrasses Aquatic Preserve.

species are sponges such as branching candle sponge (*Verongia longissima*), Florida loggerhead sponge (*Spheciospongia vesparium*) and sheepswool sponge (*Hippiospongia lachne*). Although concentrations of living sponges can occur in marine and estuarine intertidal zones, sponge beds are confined primarily to subtidal zones. Other sessile animals typically occurring in association with these sponges are stony corals (Scleractinia), sea anemones (Actiniaria), mollusks, tube worms, isopods, amphipods, burrowing shrimp (Thalassinidea), crabs, sand dollars (Clypeasteroida), and fishes. Sessile and drift algae can also be found scattered throughout sponge beds (FNAI, 2010).

Sponge beds require hard bottom (consolidated) substrate (i.e., coquina, limerock, relic reefs) on which to anchor. Hard bottom substrate occurs sparsely throughout Florida in marine and estuarine areas; however, sponges prefer the warmer waters of the southern portion of the state, significantly limiting the distribution severely.

Sponge beds may grade into other marine and estuarine hard bottom subtidal, intertidal and supratidal communities (i.e., consolidated substrate, sponge bed, coral reef, mollusk reef, worm reef, lithophytic algal bed) as well as soft bottom communities (i.e., unconsolidated substrate, ammophytic algal bed, seagrass bed, salt marsh, mangrove swamp) (FNAI, 2010).

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 plant species include star algae (*Anadyomene stellata*), *Argardhiella*, *Avrainvellea*, *Batophora*, *Bryopsis*, *Calothrix*, *Caulerpa*, *Chondria*, *Cladophora*, *Dictyota*, *Digenia*, *Gracilaria*, *Halimeda*, *Laurencia*, *Oscillatoria*, shaving brush (*Penicillus capitatus*), *Rhipocephalus,* and *Sargassum*. 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.

Lithophytic algal beds are thought to be less widespread within Florida than psammophytic algal beds.

The precise distribution of both kinds is not known; however, the distribution is thought to be less than for marine and estuarine seagrass beds.

Marine and estuarine algal beds may grade into seagrass beds, salt marsh, mangrove swamp, or many of the other marine or estuarine natural communities. Supratidal algal beds such as periphyton beds (e.g., blue-green algal mats) may grade into various coastal palustrine and terrestrial natural communities.

Distribution information for algal beds is lacking. The location of major beds must be determined before this natural community can be managed adequately. Existing state dredge and fill laws provide specific protection for marine and estuarine seagrass beds but not for algal beds. The correction of this deficiency could prove to be the most effective management tool available.

The primary threat to marine and estuarine algal beds are dredging and filling activities which physically remove or bury the beds. Other damage occurs from increased turbidity in the water column which reduces available light; pollution, particularly from oil spills; and damage from boats (FNAI, 2010).

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*). Nearly pure stands of any one of these species can occur, but mixed stands are also common. Species of *Halophila* may be intermingled with the other seagrasses, but species of this genus are considerably less common than turtle grass, manatee grass and shoal grass. Widgeon grass (*Ruppia maritima*) can also be found occurring with the previously listed seagrasses although they occur primarily under high salinities while widgeon grass occurs in areas of lower salinity.

Attached to the seagrass leaf blades are numerous species of epiphytic algae and invertebrates. Together, seagrasses and their epiphytes serve as important food sources for manatees, marine turtles, and many fish, including spotted sea trout, spot, sheepshead and redfish. The dense seagrasses also serve as shelter or nursery grounds for many invertebrates and fish, including marine snails, clams, scallops, polychaete worms, pink shrimp, blue crab, starfish (Asteroidea), sea urchins (Echinoidea), tarpon, bonefish (*Albula vulpes*), seahorses (*Hippocampus* spp.), Florida pompano (*Trachinotus carolinus*), permit (*Trachinotus falcatus*), striped mullet, great barracuda (*Sphyraena barracuda*), and long-horned cowfish (*Lactoria cornuta*).

Marine and estuarine seagrass beds occur most frequently on unconsolidated substrates of marl, muck or sand, although they may also occur on other unconsolidated substrates. The dense blanket of leaf blades reduces the wave-energy on the bottom and promotes settling of suspended particulates. The settled particles become stabilized by the dense roots and rhizomes of the seagrasses. Thus, marine and estuarine seagrass beds are generally areas of soil accumulation. Other factors affecting the establishment and growth of seagrass beds include water temperature, salinity, wave-energy, tidal activity and available light. Generally, seagrasses are found in waters with temperatures ranging from between 20° and 30 °C (68°- 86 °F). Seagrasses occur most frequently in areas with moderate current velocities, as opposed to either low or high velocities. Although marine and estuarine seagrass beds are most commonly submerged in shallow subtidal zones, they may be exposed for brief periods of time during extreme low tides.

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.

Seagrass beds are often associated with and grade into unconsolidated substrate, coral reefs, mangrove swamps, and salt marshes, but may also be associated with any other marine and estuarine natural community.

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.

Seagrass beds are also highly vulnerable to oil spills. Low concentrations of oil are known to greatly reduce the ability of seagrasses to photosynthesize. Extreme high temperatures also have adverse impacts on seagrass beds. The area surrounding power plant outfalls, where water temperatures may

exceed 35 °C (95 °F), has been found to be lethal to seagrasses. Seagrass beds are susceptible to long term scarring cuts from boat propellers, anchors and trawls. Such gouges may require many years to become revegetated. When protected from disturbances, seagrasses have the ability to regenerate and recolonize areas. Additionally, some successful replantings of seagrass beds have been conducted. However, the best management is to preserve and protect seagrass beds in their natural state (FNAI, 2010).

Salt Marsh - (synonyms: saltmarsh, 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 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*), perennial saltmarsh aster (*Symphyotrichum tenuifolium*), 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, saltmeadow cordgrass (*Spartina patens*), Gulf cordgrass (*Spartina spartinae*), and sand cordgrass, 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).

Tidal creek and salt marsh vista of coastal Taylor County.

Typical animals include marsh snail, periwinkle, mud snail, spiders, fiddler crabs, marsh crab, green crab, isopods, amphipods, diamondback terrapin (*Malaclemys terrapin*), saltmarsh snake (*Nerodia clarkii*), wading birds, waterfowl, osprey, rails, marsh wrens (*Cistothorus palustris*), seaside sparrows (*Ammodramus maritimus*), muskrat (*Ondatra zibethicus*) and raccoon. Fishes frequently found in this community include bull shark, blacktip shark (*Carcharhinus limbatus*), lemon shark (*Negaprion brevirostris*), bonnethead shark (*Sphyrna tiburo*), southern stingray (*Dasyatis americana),* yellow spotted ray (*Urobatis jamaicensis*), tarpon, ladyfish, bonefish, menhaden, sardines, anchovy, catfish, needlefish, killifish, bluefish (*Pomatomus saltatrix*), blue runner (*Caranx crysos*), lookdown (*Selene vomer*), permit, snapper, grunts, sheepshead, porgies, pinfish, seatrout, red drum, mullet, barracuda, blenny, goby, trigger fish, filefish and puffers.

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. 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 can reach adjacent marine and estuarine communities. These factors make salt marshes extremely valuable as a natural community.

Mangrove Swamp - (synonyms: mangrove forest, mangrove swamp, and mangrove islands). Mangrove swamp is a dense forest occurring along relatively flat, low wave energy, marine and estuarine shorelines. The dominant plants of mangrove swamp are red mangrove (*Rhizophora mangle*), black mangrove (*Avicennia germinans*), white mangrove (*Laguncularia racemosa*), and buttonwood

(*Conocarpus erectus*). These four species can occur either in mixed stands or often in differentiated, monospecific zones that reflect varying degrees of tidal influence, levels of salinity, and types of substrate. Red mangrove often dominates the lowest (or deep-water) zone, followed by black mangrove in the intermediate zone, and white mangrove and buttonwood in the highest, least tidally-influenced zone. Buttonwood often occupies an ecotone, or transition zone, to the adjacent upland community.

The density and height of mangroves and the diversity of associated herbaceous species can vary considerably within a mangrove swamp. Mangroves typically occur in dense stands but may be sparse, particularly in upper tidal reaches where salt marsh species predominate. Mangroves may range from trees more than 80 feet (25 meters) tall to dwarf shrubs growing on solid limestone rock, but most commonly exist at intermediate heights of 10 to 20 feet tall (3 to 7 meters). Mangrove swamps often exist with no understory, although shrubs such as seaside oxeye (*Borrichia arborescens, B. frutescens*) and vines including gray nicker (*Caesalpinia bonduc*), coinvine (*Dalbergia ecastaphyllum*), and rubbervine (*Rhabdadenia biflora*), and herbaceous species such as saltwort (*Batis maritima*), shoregrass (*Monanthochloe littoralis*), perennial glasswort (*Sarcocornia perennis*) and giant leather fern, where present, occur most commonly in openings and along swamp edges (FNAI, 2010).

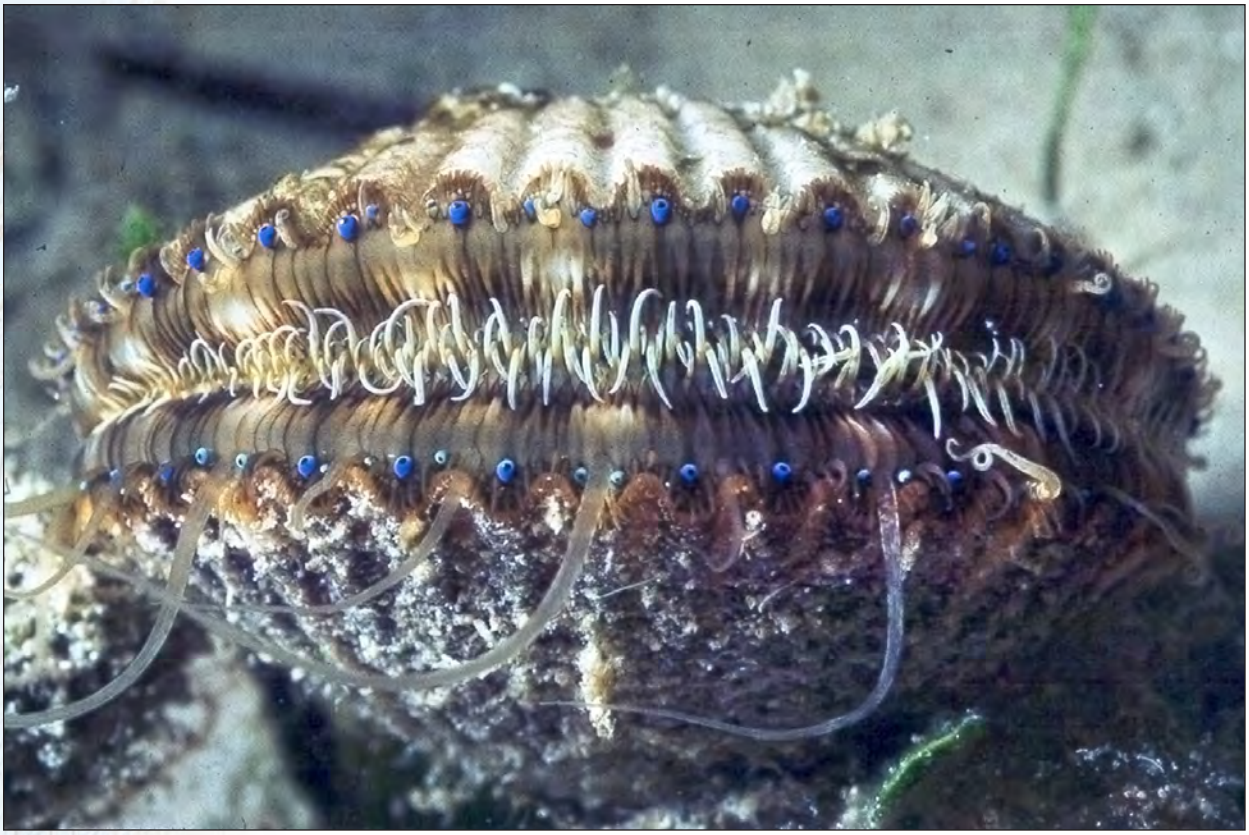
Typical animals of the mangrove swamp include mangrove water snake, brown pelican, white ibis, osprey, bald eagle (*Haliaeetus leucocephalus*), and a variety of shorebirds, herons, egrets, and raccoon. Also included are sponges, oysters, marine worms, barnacles, mangrove tree crabs, fiddler crabs, mosquitoes, and numerous other invertebrates. Fishes are likewise diverse in this community; those most frequently occurring include blacktip shark, lemon shark, nurse shark (*Ginglymostoma cirratum*), bonnethead shark, rays, tarpon, ladyfish, bonefish, menhaden, sardines, lookdown, permit, snapper, sheepshead, porgies, pinfish and mullet.

Several variations of mangrove swamps are generally recognized. These include (1) overwash swamps found on islands which are frequently inundated by the tides; (2) narrow fringe swamps located along waterways and the edges of islands and keys, that are often exposed to the stresses of high winds and therefore do not achieve the highest stature; (3) tall-statured mangrove swamps near the mouths of river floodplains that receive daily salt water flushes; (4) basin swamps growing in depressions slightly inland from the water and often colonized by black and white mangroves; (5) hammock swamps, similar to basin swamps but growing at a slightly higher elevation; and (6) scrub swamps growing over hard substrates such as limestone marl. Mangrove swamps occur in flat coastal areas. The soils are generally saturated with brackish water at all times, and at high tides these same soils are usually inundated with standing water. Mangroves grow on a wide variety of soils ranging from sands to muds. In older mangrove swamps, the sands and muds are usually covered by a layer of peat which has built up from detritus.

American alligators can be found throughout the Big Bend Seagrasses Aquatic Preserve.

The mangrove swamp communities are significant because they function as nursery grounds for most of the state's commercially and recreationally important fish and shellfish. These natural communities are also the breeding grounds for substantial populations of wading birds, shorebirds, and other animals. The continuous shedding of mangrove leaves and other plant components produce as much as 80% of the total organic material available in the aquatic food web. Additionally, mangrove swamps help protect other inland communities by absorbing the brunt of tropical storms and hurricanes.

Composite Substrate - Marine and estuarine composite substrates consist of a combination of natural communities such as "beds" of algae and seagrass or areas with small patches of consolidated and unconsolidated bottom with or without sessile floral and faunal populations. Composite substrates may be dominated by any combination of marine and estuarine sessile flora or fauna, or mineral substrate



During annual seagrass monitoring, staff conduct bay scallop and sea urchin surveys.

type. Typical combinations of plants, animals and substrates representing composite substrates include soft and stony corals (Scleractininia) with sponges on a hard bottom such as a limerock outcrop; psammophytic algae and seagrasses scattered over a sand bottom; and patch reefs throughout a coralgal bottom. Although composite substrates can occur in any marine or estuarine area in Florida, some combinations are common while others are extremely rare. Combinations of consolidated and unconsolidated substrate components offer the greatest opportunity for diversity, and should be high priority areas for protection. Management requirements are negligible providing the composite community is adequately protected (FNAI, 2010).

Native Species

The combination of mild subtropical climate, diverse vegetation, and variety of habitats present in this expansive region provide ideal conditions for high biodiversity and species richness. To date, nearly 2,000 native species have been located and identified within BBSAP and the adjacent coastal region. Among these are 879 native species of plants including six seagrass species, 292 bird species, 48 mammal species and 138 species of amphibians and reptiles. In the aquatic realm there are 202 native species of fish, 395 species of marine invertebrates and more than 20 species of algae. Species lists are updated as new species within BBSAP are documented. For a complete list of native species found in BBSAP see Appendix B.

Listed Species

There are a number of special interest marine animal species that rely in some way on the seagrass beds within BBSAP. These include some publicized endangered species such as the West Indian manatee and the Atlantic hawksbill and Kemp's ridley sea turtles that use seagrass as a food resource.

Threats to listed species are numerous. The main causes of manatee death are human-related such as watercraft collision, entanglement in flood gate or canal lock, habitat destruction and deaths caused from monofilament line, litter, vandalism, culverts and other man-made structures. Other causes of manatee death are natural causes such as cold water temperatures, red tide, disease and calving difficulties (Save the Manatee Club, 2010). Marine turtles face some of the same risks including entanglement in fishing gear and debris, environmental contamination, disease, and cold temperatures. However, direct destruction or degradation of resting grounds and forage habitat are the greatest risks to marine turtles in BBSAP (NOAA, 2010). The Suwannee River region supports Essential Fish Habitat and the most

viable population of the threatened Gulf sturgeon. The area's vast seagrass beds with mud and sand substrates are an important marine habitat to the sturgeon. Gulf sturgeon numbers initially declined due to overfishing and habitat loss exacerbated by the construction of water control structures, dredging, groundwater extraction, irrigation and flow alterations. Poor water quality and contaminants also contribute to population declines (NOAA, 2010).

In addition to marine species, this area provides habitat to a wide variety of listed sea and shore birds including pelicans, ospreys, wood storks and roseate spoonbills. Many of these species nest on Seahorse Key, located in the Cedar Keys National Wildlife Refuge. Established in 1929, it is the site of one of the largest colonial bird rookeries in north Florida (FWS, 1995). Seahorse Key is also the home of a large nesting colony of frigatebirds. Exposed oyster reefs in BBSAP, such as Corrigan's Reef in Cedar Key, are a popular roosting site for the American oystercatcher. In addition, there are terrestrial mammals of interest in the adjacent uplands, such as the endangered Florida panther. In total, there are 57 threatened or endangered species in BBSAP (FWC, 2007). For more information on listed species within BBSAP see below and Appendix B.4.1.

American oystercatcher (*Haematopus palliates*): The American oystercatcher is a shorebird species that is easily identified by its long, bright reddish-orange bill, yellow eyes, and distinct red eye ring. These features are a contrast to the deep black-colored head, brown and black backside, and white belly. The American oystercatcher inhabits beaches, sandbars, spoil islands, shell rakes, salt marsh, and oyster reefs. Exposed oyster reefs in BBSAP, such as Corrigan's Reef in Cedar Key, are a popular roosting site for the American oystercatcher. Coastal development and shoreline armoring have resulted in widespread habitat loss, leaving few suitable breeding sites (FWC, 2014).

Black skimmer (*Rynchops niger*): The black skimmer is a seabird with defining physical characteristics that make it easily distinguishable from others. The key physical feature of the skimmer is its large red and black bill. The black skimmer inhabits coastal areas in Florida such as estuaries, beaches, and sandbars. Habitat loss due to coastal development is the main threat to the species (FWC, 2014). The Black Skimmer can be observed year-round in the Big Bend Wildlife Management Area near Steinhatchee/Keaton Beach in Taylor County (Great Florida Birding and Wildlife Trail, 2014).

Brown pelican (*Pelecanus occidentalis*): The brown pelican is a large grayish-brown bird with a distinct pouched bill. Brown pelicans inhabit beaches, sandbars, docks, dredge spoil islands, estuarine islands, mangrove islands, sand spits, and islets. Today, the main threats are habitat degradation, sea level rise, pollution, and the destruction of coastal wetlands. Increased coastal development may increase the presence of predators that will feed on pelican young and eggs, including rats, raccoons, opossums, crows, feral hogs, and coyotes (FWC, 2014). Brown pelicans are widespread along the coast of the Big Bend and can be seen inland during the non-breeding season.

Least tern (*Sternula antillarum*): The least tern is the smallest tern in North America. The least tern inhabits areas along the coasts of Florida including estuaries and bays. Found throughout almost all coastal Florida, including the Keys; however, they do not nest in the Big Bend region of Gulf coast, which mostly consists of salt marsh (FNAI, 2001). The main threat to the least tern population is habitat loss (FWC, 2014). Nest monitoring for these species occurs annually within the Big Bend. However, due to the composition of the coastline, nesting habitat is limited [to small patches spread out over a large area].

Piping plover (*Charadrius melodus*): This species 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 mudflats along coastal areas. The main threat to piping plovers is habitat loss (FWC, 2014). Nest monitoring for these species occurs annually within the Big Bend. However, due to the composition of the coastline, nesting habitat is limited [to small patches spread out over a large area].

Roseate spoonbill (*Platalea ajaja*): The Roseate spoonbill is the only spoonbill endemic to the Western Hemisphere. It has pink wings and underparts (with some red on the tops of the wings) with a white neck and back, and pinkish legs and feet. While the species looks almost entirely pink in flight, they actually have no feathers at all on their heads. Mangrove islands and occasionally dredge-spoil islands are the preferred nesting habitat for the species. One historical threat to the roseate spoonbill was hunting for their feathers, though this practice is now illegal which has allowed the population to rebound. Another threat to the spoonbill is the availability of adequate food sources and habitat degradation (FWC, 2014). Rosette spoonbills can commonly be seen throughout the Big Bend feeing on the banks of its estuarine bays and rivers, particularly during the spring and fall months.

Wood stork (*Mycteria americana*): The wood stork is a large, long-legged wading bird that nest in mixed hardwood swamps, sloughs, mangroves, and cypress domes/strands in Florida. A major threat to wood

storks is the drainage of cypress stands; this prevents the wood stork from nesting, and promotes predation from raccoons (FWC, 2014). While nesting is not prevalent within the Big Bend, wood storks utilize the expansive salt marsh areas during migration throughout the winter months (FWS, 2014).

Gulf sturgeon (*Acipenser oxyrinchus desotoi*): Gulf sturgeons are considered homestream-spawners, which means they usually will return to the freshwater river that they were born in to spawn. Sturgeons spawn during the spring in freshwater rivers, when temperature, flow, and pH are optimum. Gulf sturgeon can be found from the Mississippi River in Louisiana, east to the Suwannee River in Florida where they inhabit both salt and fresh water habitats, annually cycling between the two (FWC 2014). The Suwannee River region supports Essential Fish Habitat and the most viable population of threatened Gulf sturgeon (FDEP 2006). The area's vast seagrass beds with mud and sand substrates are an important marine habitat to the sturgeon. Gulf sturgeon numbers initially declined due to overfishing and habitat loss exacerbated by the construction of water control structures, dredging, groundwater extraction, irrigation and flow alterations. Poor water quality and contaminants also contribute to population declines (NOAA, 2010). The main threat to Gulf sturgeon survival is the dams located on Gulf seaboard rivers, which prevent sturgeon from reaching historic spawning areas, therefore decreasing the spawning rate of the species. Habitat destruction is also a threat to the sturgeon population (FWC, 2014).

West Indian manatee (*Trichechus manatus*): The West Indian manatee is a large gray aquatic mammal that commonly reaches a body length of nine to ten feet and a weight of 1,000 pounds; however, it can grow to more than 13 feet and weight up to 3,500 pounds (FWC, 2014). The main causes of manatee death are human-related such as watercraft collision, entanglement in flood gate or canal lock, habitat destruction and deaths caused from monofilament line, litter, vandalism, culverts and other man-made structures. Other causes of manatee death are natural causes such as cold water temperatures, red tide, disease and calving difficulties (Save the Manatee Club, 2010).

Loggerhead (*Caretta caretta*), green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricate*), Kemps ridley (*Lepidochelys kempii*), and Leatherback (*Dermochelys coriacea*) sea turtles: The main threat to sea turtles at sea is entanglement in fishing gear such as longlines, monofilament fishing line, nets, and crab trap lines. On land, increased beach development is an ongoing threat for sea turtles as development can cause degradation of the habitat, and limit the amount of nesting sites available. Coastal development also increases artificial lighting which can cause hatchlings to migrate towards the lights instead of the ocean. Other threats include increased predation on eggs, hits by watercraft, and habitat degradation from contaminants and pollutants (ex. oil spills) (FWC, 2014). Sea turtle nesting occurs in all coastal counties except those in the Big Bend area of Florida. The Big Bend region's shoreline is dominated by coastal marsh and lacks the sea turtles' preferred nesting habitat.

Invasive Non-native Species

The combination of mild subtropical climate and diversity of habitat types also provides ideal conditions for invasive exotic plants and animals. To date, over 60 invasive non-native species have been located and identified within BBSAP and the adjacent coastal region (Gulf States Marine Fisheries Commission, 2008). Among these are 47 species of plants, including hydrilla *(Hydrilla verticillata)* and water hyacinth (*Eichornia crassipes*), which have a tendency to clog waterways, Brazilian pepper (*Schinus terebinthifolius)*, wild taro (*Colocasia esculenta),* and Australian pine (*Casuarina* spp.*)*. *Caulerpa taxifolia* is a potential invasive algae species that is monitored by staff during annual seagrass and algae surveys throughout BBSAP. Like many invasive species, it is a popular aquarium alga and could pose a threat to native algae if introduced. Other invasive non-natives include five bird species and five mammal species, including the domestic cat (*Felis silvestris*) and dog (*Canis familaris*). There are also exotic fish species, including the red lionfish (*Pterois volitans*), and six species of mollusks and crustaceans that are invasive non-natives. One species of concern is the Asian green mussel (*Perna viridis*). While the Big Bend region is out of the mussel's optimal temperature range, a few recruits have been found in the northern Gulf of Mexico, although no significant populations have yet been reported in that location (McGuire & Stevely, 2009). If this mussel were to establish itself in the Big Bend region, it could have a devastating ecological and economic effect on the commercial oyster and clam industry. Green porcelain crabs (*Petrolisthes armatus*) have also been documented in BBSAP. The impact of this non-indigenous crab on the local oyster reef ecosystems is inconclusive. Possible threats include feeding on native shellfish and crab larvae, competition with resident crabs for space on the reef, and food competition with other filter feeding natives (Hollebone, 2006). For a complete list of known invasive non-native species refer to Appendix B.4.2. Whether intentionally released or accidently introduced, understanding how the local and global spread of non-indigenous species affects marine and terrestrial ecosystems is critical to the protection of local habitats and native species in BBSAP.

Problem Species

There are some native species that are problematic in parts of BBSAP. For example, raccoons pose a problem for certain species of birds and turtles by foraging in nests for eggs. This is a particular problem in BBSAP for nesting diamondback terrapins. Other problem mammals include feral hogs (*Sus scrofa*) and coyotes (*Canis latrans)*. Extensive stands of common cane (*Phragmites australis*) have choked portions of some of the coastal rivers. *Phragmites* also causes problems for many other wetland plants by releasing toxins that target other plant species. Refer to Appendix B.4.3 for a comprehensive list of reported problem species.

Archaeological and Historical Resources

Archaeological evidence shows that Florida's native peoples have been dependent on a variety of aquatic, coastal and adjacent upland resources for more than 12,000 years in the Big Bend Region (see Appendix E.3 for a list of sites). As evidenced by the Page-Ladson site located along the Aucilla River in what is now Jefferson County, Paleoindian groups hunted now extinct Pleistocene megafauna, as well as trapping smaller game and collecting edible plants. This hunter/gatherer/fisher subsistence supported countless generations of Native Americans until the arrival of the Spanish in 1513. With sea levels as much as 100 meters (330 feet) lower than present, countless early sites containing the unique Paleoindian lanceolate stone spear points now lay submerged off-shore. Many Paleoindian and Archaic period sites within BBSAP are covered by water (Ellis et al., 2001).

Succeeding human inhabitants, including those of the Archaic Period (7,500 B.C - 500 B.C), Woodland Period (500 B.C - A.D. 900), and the Mississippian (Fort Walton) Period (A.D. 900 - European contact), added different styles of stone, shell, and bone tools, and eventually the use of fired clay ceramics to their lives. However, along the coastal strand, their basic hunter/gatherer/fisher lifestyle changed little over the millennia. Once sea levels stabilized around 5,000 year ago, shell middens, or the leftover remains of extensive shellfish exploitation, began to accumulate in appreciable amounts along the shoreline. Archaeological evidence suggests that a variety of coastal, estuarine, and near-shore freshwater swamp habitats were being utilized, with specific groups focusing on the collection of certain seasonally available resources. In addition to the larger coastal middens, small to medium size habitation sites, probably the homes of individual extended families or groups of closely-related families occur along rivers, creeks, and the coastal marsh edges (Gannon, 1996). BBSAP includes archaeological features from various regional cultures such as Deptford, Swift Creek in the north, and Weeden Island in the south.

Sponge beds had historic economic development impacts.

The Fort Walton Period (A.D. 900 - European contact) is marked by a shift in settlement focused around ceremonial centers, often containing one or more flat-topped platform (temple) mounds, burial mounds, plazas, and middens. Quartz crystal, copper, steatite, mica, and other non-native resources found at these sites suggest extensive trade networks existed throughout the eastern and central United States. The capture of large marine mammals, sharks, and various fishes available only off-shore indicate the use of large, sea-going canoes. The Fort Walton people were among the first of Florida's native peoples to have contact with the early Spanish explorers in the 16th century (Gannon, 1996).

Spanish Conquistador Panifilo de Narvaez arrived in St. Marks in 1528, followed by Hernando de Soto in 1539. On his journey to St. Marks, Hernando de Soto crossed the Steinhatchee River at Steinhatchee Falls, placing Deadman Bay on Spanish maps. A port was established in the town of St. Marks in 1639, and the Fort at San Marcos de Apalache was built there in 1679. The Florida territory was controlled mostly by the Spanish over the next 250 years, excluding the years between 1763 and 1783 when the territory was controlled by the British. Ultimately, European colonization of Florida, disease, adoption of the Spanish mission way of life, and struggles over New World empires decimated Florida's Native

American population. In the following years, Creek Indians from Alabama and Georgia moved south to occupy Florida (Gannon, 1996).

Three Seminole Wars, or the Florida Wars, took place between 1816 and 1858. In 1817, Andrew Jackson and his army left Tennessee and traveled to Old Town on the Suwannee River. Jackson used the Suwannee River to transport his wounded men back to St. Marks following the Battle for Billy Bowlegs. In 1821, Florida was ceded to the United States, three years after Jackson took control of San Marcos de Apalache. During to Second Seminole War, around 1838, General Zachary Taylor commanded the construction of several new forts in the Big Bend region. These include Fort Frank Brook on the Steinhatchee River, Fort Duval at the mouth of the Suwannee River, and Fort Number Four in the Cedar Keys (Gannon, 1996).

Civil War battles were limited in the Big Bend and the primary activities were blockading and blockade running. Civil War ships carried troops and supplies from the Gulf, up the rivers of Big Bend, to access Florida's interior. Steamboats began navigating the Suwannee River around 1834 and serviced some of the forts, turpentine camps, and sawmills along the river. The Battle of the Natural Bridge is the only major Civil War combat engagement in the Big Bend region. In 1861, Confederates took the San Marcos de Apalache and renamed it Fort Ward. Fort Williams was then constructed close to the St. Marks lighthouse to protect the salt works from the Union (Gannon, 1996). In 1862, Union troops from Key West occupied Cedar Key and seized three sloops and five schooners, burned down the railroad station, destroyed the wharf and boxcars of military supplies, demolished a turpentine storehouse and cut the telegraph wires (McCarthy, 2007).

St. Marks became an important sea port during the 1820s, and in 1828 the U.S. House of Representatives passed an act which authorized construction of a lighthouse at St. Marks, now the second oldest lighthouse in the state. By the 1840s, Cedar Key had also become a main shipping port. Products such as cedar, cypress, pine, rosin and turpentine were the major commodities shipped out of the port. Construction of the lighthouse on Seahorse Key was completed in 1855 and its fourth-order fixed light was approximately 75 feet above sea level and could be seen for 15 miles. Shipwrecks from the nineteenth century still remain submerged near the Withlacoochee River, Suwannee River, and Cedar Key (McCarthy, 2007).

Category	Pounds	Estimated Value
Total Finfish	971,668	$1,311,752
Blue Crab (Hard)	1,198,175	$1,461,774
Blue Crab (Soft)	16,108	$121,776
Stone Crab (Claws)	292,226	$1,919,925
Shrimp	126,785	$196,517
Hard Clams (Wild)	1,091	$8,335
Oysters	105,332	$254,903

Table 5 / Commercial landings in 2009 for counties within Big Bend Seagrasses Aquatic Preserve (FWC, 2010a).

In 1837, the Tallahassee to St. Marks railroad began moving commerce and passengers to and from the sea port, serving as an important transportation route for the cotton plantation economy. David Levy Yulee's first cross-Florida railroad was completed in 1861 and connected Fernandina and Cedar Key. The completion of the railroad shaped Cedar Key into a major port and made the long, dangerous trip down the Gulf Coast, around the Florida Keys, and up the Atlantic Coast unwarranted. By the end of the century, the Atlantic, Gulf and West India Transit Railroad connected Cedar Key to Gainesville and other parts of the state and the U.S. Passengers could connect in Cedar Key by steamship to Pensacola, New Orleans, Key West, and Havana (McCarthy, 2007). The railroad to Cedar Key ran until its closure in 1932. Around the same time, Florida Motor Lines, later to become Southeastern Greyhound Lines, began operating a bus service between Cedar Key and Gainesvillle (McCarthy, 2007). In addition to the sponge fishery, the Cedar Key region had a large green sea turtle fishery in the late 1800s until the early 1900s (Witzell, 1994).

Historically, silviculture has been an important resource for the Big Bend region. Red cedar, plentiful between the Suwannee and Withlacoochee rivers, was a very important export and was used to manufacture pencils. Two cedar mills were built in the late 1850s to supply pencil factories in New York. In 1873, native Florida pinelands were sold for about two dollars an acre and timbering land resulted in more dollar per acre than cotton or corn. After 1880, Big Bend became known as the principle source of old growth cypress, and the land is marked by a network of old haul and tram roads that travel deep into the wetlands (Ellis et al., 2001). By 1890, Cedar Key's economy was no longer dominated by the cedar industry, but by sponging and commercial fishing. In 1895, locals shipped out over three hundred thousand pounds of sponges and a million pounds of mullet (McCarthy, 2007).

During the late 19th century, Florida became a popular tourist destination as railroads expanded into the area. However, the sleepy fishing communities throughout this region have traditionally experienced slow

growth and minimal tourism. Today, the Big Bend region of Florida is known as the "Nature Coast" and is becoming a more tourist based economy. Condos, vacation homes and large scale resorts are growing in popularity throughout the coastal communities.

Other Associated Resources

The pristine natural resources of the Big Bend region are a major attraction for the nature based recreational enthusiast. Kayaking is becoming more prominent in the region, and the historic Big Bend Saltwater Paddling Trail is sure to entice more visitors to this area of Florida. The trail is part of the larger Florida Circumnavigational Saltwater Paddling Trail that passes through the waters of BBSAP. Segment 6, which begins in the lower Aucilla River and ends in Yankeetown, is one of the most remote segments of the Big Bend Saltwater Paddling Trail. Other paddling trails include the Aucilla River, Wakulla River and Suwannee River South. The West Florida Section of the Great Florida Birding Trail opened in November 2002 and consists of 117 sites in 21 counties, including those counties along the Big Bend coast. The eastern portion of the Big Bend Scenic Byway falls within BBSAP and includes a coastal trail of salt marshes, bays, sand dunes, beaches, and springs. This area also draws tourists to the pristine waters for fishing, boating and snorkeling. Big Bend is known as an angler's paradise for the flats and offshore fishing, and its lush seagrass meadows are a destination for tourists during the popular recreational scallop season. The dramatic vistas of the gulf and adjacent marshes provide outstanding opportunities for wildlife viewing, nature study, environmental education and photography.

*3.1.4 / **Values***

Natural Values

BBSAP is the largest aquatic preserve in Florida and remains one of the most pristine coastal areas in the state. BBSAP includes large stretches of coastline that are undeveloped, and has been described as one of the least polluted coastal regions in the continental United States (Livingston, 1990). Containing a diversity of habitats within its bounds, BBSAP is most notable for the extensive seagrass beds and salt marshes that provide critical structural habitat, and in which a large majority of commercially, recreationally, and ecologically important marine species spend some portion of their life cycles. In addition, seagrass beds improve coastal water quality by oxygenating the water column, stabilizing sediments, and recycling nutrients. They are considered essential to the ecological integrity and health of Florida's estuarine ecosystems, and can be used as an environmental indicator of overall water quality (Mattson et al., 2007). Big Bend is the second largest contiguous area of seagrass habitat in the eastern Gulf of Mexico, covering about 1,158 square miles, making it an important resource not only to Florida but nationally and internationally as well (Mattson, 2000). Due to the unique karst geology of the region, numerous sinks, springs, caverns and underground corridors are exclusive to the area. Among these, a number of first magnitude springs including: Wakulla, Manatee, and Fanning Springs, discharge directly into the waters of BBSAP.

The combination of subtropical climate, diverse vegetation, and variety of habitats present in this region provide ideal conditions for high biodiversity and species richness. In total, more than 800 species of plant and more than 1,000 species of animal have been documented within BBSAP. A number of special interest marine animal species rely in some way on the seagrass beds within BBSAP, including some endangered species such as the West Indian manatee and the Atlantic Hawksbill and Kemp's ridley sea turtles. The Suwannee River region supports Essential Fish Habitat and the most viable population of the threatened Gulf sturgeon. A wide variety of sea and shore birds including pelicans, ospreys, wood storks, roseate spoonbills and frigatebirds utilize habitats within BBSAP.

Economic Values

The waters of BBSAP are of great economic importance to Florida's commercial fisheries. FWC reported the annual commercial landings for the counties within BBSAP totaled 3,686,776 pounds of fish and shellfish in 2009, with an estimated value of over six million dollars. The shellfish industry of this region includes the harvest of crab, shrimp, hard clams, and eastern oysters (FWC, 2010a). Table 5 provides a more detailed look at the commercial landings for 2009. Blue crabs are largely dependent on the seagrass resources that are abundant within BBSAP (Orth & van Montfrans, 1987), and this region of the gulf accounts for between 25% and 33% of the total commercial blue crab landings in Florida (Mattson et al., 2007). In addition, the Cedar Key area is renowned for its thriving hard clam aquaculture industry. Commercially cultured hard clams have become the single most economically important food item grown by the Florida aquaculture industry. Hard clam grower revenues in the

northwest Florida and Big Bend regions totaled $17,897,643 in 2007. Clam processing also brought in $19,907,636 in revenue for this region, almost 75% of the total 2007 revenue for clam processors in all of Florida (Adams et al., 2009). Sponges are also harvested within the waters of BBSAP (FWC, 2010a).Recreationally this area draws tourists to the pristine waters for fishing, boating and snorkeling. Sport fishermen angle mainly for sea trout and redfish, but also tarpon, bull shark, Spanish mackerel, cobia, bluefish, jack crevalle and flounder (*Paralichthys* spp.). This region of the gulf also supports the largest recreational scallop fishery in the state (Mattson et al., 2007). Bay scallops are largely dependent on the seagrass resources that are abundant within BBSAP (Orth & van Montfrans, 1987). The numerous wildlife conservation areas and state parks located in or near BBSAP are popular destinations for nature lovers. The dramatic vistas of the gulf and adjacent marshes entice visitors and provide remarkable opportunities for wildlife viewing, nature study, environmental education, and photography. The Big Bend region of Florida is known as the "Nature Coast" and is moving toward a more tourist based economy. As a result, restaurants, hotels, condos, vacation homes, and large scale resorts are becoming more popular and are now a significant part of the local revenue in the coastal communities. Other ecotourism and activity based businesses such as tackle shops, outdoor outfitter shops, dive centers, canoe/kayak rental centers and boat tour services are also becoming integral to the regional economy.

Scientific Values

Big Bend has the second largest contiguous area of seagrass habitat in the eastern Gulf of Mexico, covering about 1,158 square miles (Matteson, 2000). The extent of these beds and the presence of six seagrass species provide abundant opportunities for the scientific study of seagrass habitat. The unique ecological processes and relationships within the seagrass and saltmarsh habitats provide invaluable information on a relatively undisturbed ecosystem. Some of the earliest seagrass ecology research was conducted in the Big Bend. For example, the existence of a distinct ichthyofauna in Cedar Key was first documented by G. K. Reid in 1954. In 1961, K. Strawn investigated patterns of seagrass zonation also in the Cedar Key area. Researchers at Florida State University studied seagrass faunal interactions in Apalachee Bay from the mid-1970s into the 1990s. Also during the mid- and late 1970s, Iverson and Bittaker conducted the first regionwide survey of seagrasses in the Big Bend (Matteson, Frazer, Hale, Blitch, & Ahijevych, 2007). Despite these past and current investigations, there are innumerable questions that could be answered utilizing this unique setting. Academic institutions' staff and students frequently contact BBSAP staff to request information on specific locations and associated resources within BBSAP. BBSAP staff reviews and comment on proposed projects, assists with ecological sampling efforts; provide site access; and supply data to facilitate scientific research within BBSAP on a regular basis.

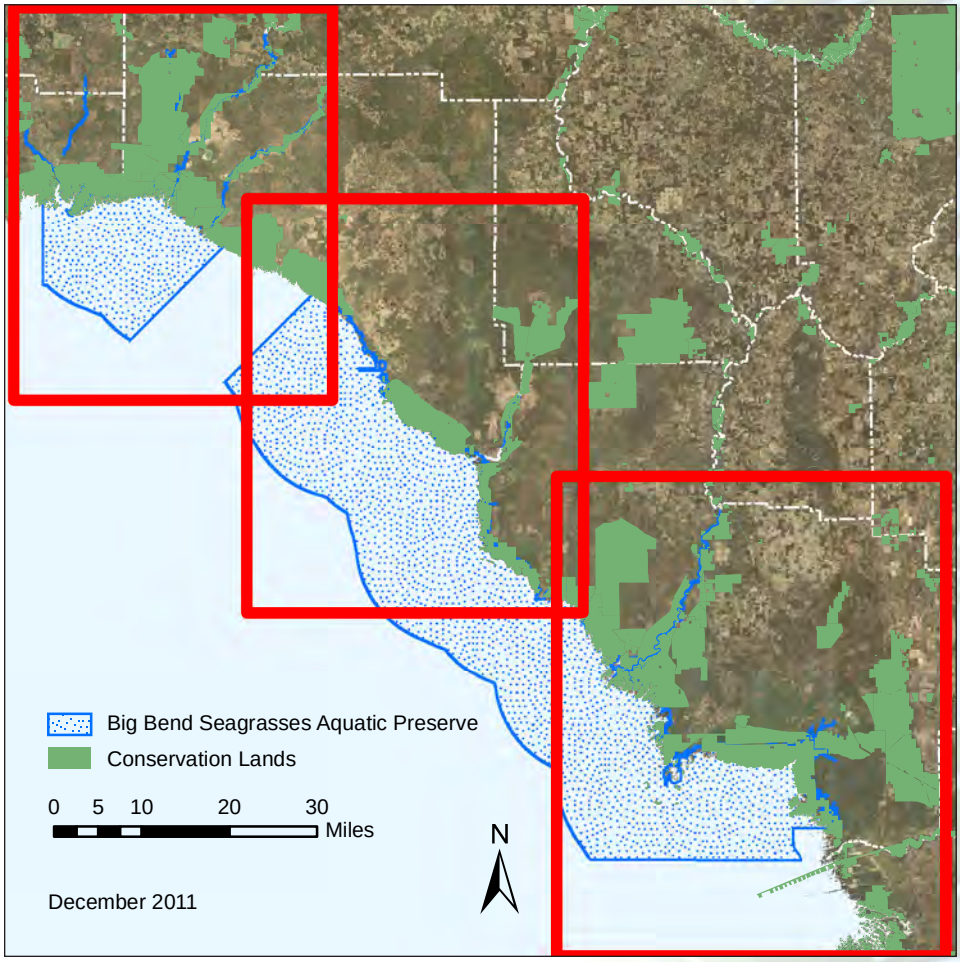
In addition to the research opportunities provided by the distinct ecology of the Big Bend region, biomedical research possibilities abound. Gulf Specimen Marine Laboratory, located in Panacea, Florida, does biomedical research for various institutions such as the National Cancer Institute, Howard Hughes Medical Institution, and U.S. Food and Drug Administration. Bryostatin, a compound found only in the bryozoan *Bugula neritina*, received clinical approval by 2003 for the treatment of esophageal cancer and was in the final stages for approval as a breast cancer drug. Lesser electric rays (*Narcine brasiliensis*) from the Gulf have been used for neurophysiological research on the biochemistry of the neurotransmitter acetylcholine. Horseshoe crabs blood is used to extract a protein called Limulus Amebocyte Lysate, which is used by pharmaceutical and medical device manufacturers to test their products for the presence of endotoxins (Gulf Specimen Marine Lab, 2010). Field studies funded by the U.S. Food and Drug Administration measured the impact of biomedical blood collection on long term survival of horseshoe crabs. The results were used to develop conservation protocols to insure that biomedical use would not reduce the populations of this species.

Social and Cultural Values

In 1867, naturalist John Muir arrived in Cedar Key while on his 'thousand mile walk to the Gulf.' It was during his time there that Muir first articulated his belief that nature was valuable for its own sake, not only because it was useful for humankind. He understood the intrinsic value of wilderness in that "everybody needs beauty as well as bread, places to play in and pray in, where nature may heal and give strength to body and soul." The pristine coastline unique to this area offers this sense of sacredness in its wildness. The scenic panoramas of vast coastal marsh and calm waters allow visitors a feeling of space and solitude. Whether participating in recreational activities on the water such as boating, fishing, kayaking and snorkeling, or on land hiking, picnicking, viewing wildlife, or simply communing, the fulfillment of being at one with nature provides an inner peace that is key to escaping the stresses of everyday life.

The coastal communities of the Big Bend have been largely dependent on the Gulf and its resources for ages. The kinship between these people and nature has great social value in that it brings people together through shared appreciation of their environment. All along the coast, various social events are organized throughout the year in celebration of the natural beauty and bountiful resources provided by this region. Local residents and tourists alike come to cultural events to rejoice in regional food and art inspired by nature. Such events include Cedar Key's Old Florida Celebration of the Arts, and Cedar Key Annual Seafood Festival, both of which have been occurring for over 40 years, as well as Clamerica in honor of clam aquaculture. The annual Wakulla Wildlife Festival began as a welcome back songbird festival and has grown into a two-day celebration of Wakulla Spring Basin's natural environment and rich heritage. Other notable events are the St. Marks Stone Crab Festival, the Steinhatchee Fiddler Crab Festival, and the Yankeetown Arts, Crafts and Seafood Festival.

The people of this region relish their relatively unchanged way of life and respect for their natural surroundings. Their bond with the sea and its resources fosters an innate desire for the preservation of local heritage. Museums honoring this rich natural and cultural heritage dot the area. For example, the Cedar Key Historical Society, established in 1977 by a group of citizens, dedicated a museum to preserving the fascinating history of Cedar Key. Wakulla Springs Archaeological and Historic District is significant as it represents relationships between human culture and natural resources from the settlement systems of the Paleoindian period to the recent historic past, a period of nearly 12,000 years. There are 55 recorded archaeological sites located on the property. Yankeetown is the future site of a three-story, 4,500 square foot educational resource center and nature museum which will have meeting rooms, educational displays and information on the unique coastal wetlands. Community revitalization projects, such as the Waterfronts Florida Partnership Program, also cultivate community pride. It was created by the Florida Coastal Management Program in 1997 to address the physical and economic decline of traditional working waterfront areas and preserve their local heritage. Programs such as these unite communities and empower the people to become stewards of the waters they cherish.



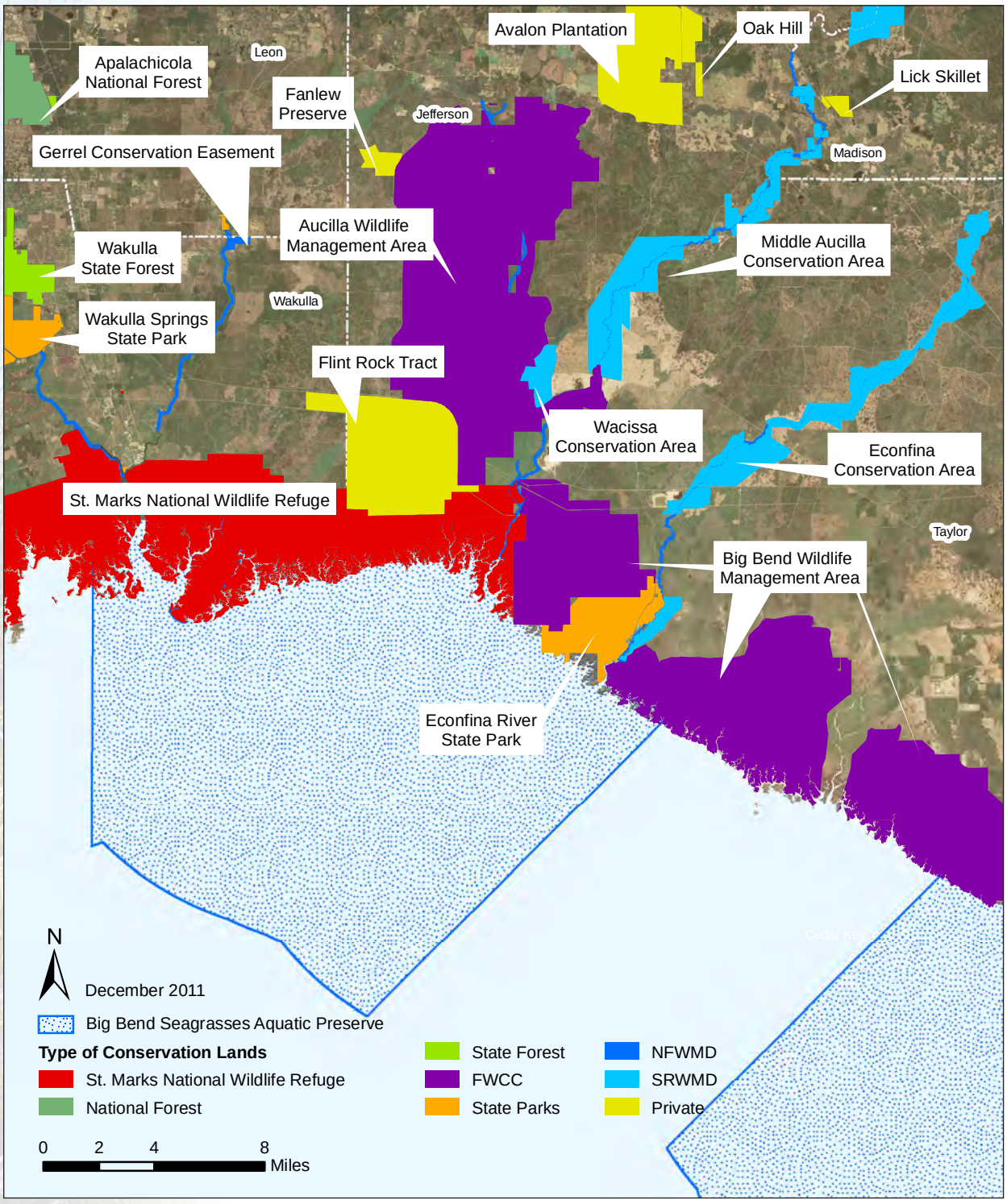
Map 14 / Conservation lands near Big Bend Seagrasses Aquatic Preserve.

*3.1.5 / **Citizen Support Organization***

The BBSAP does not currently have a "Friends Group" or Citizen Support Organization (CSO). However, the Friends of Crystal River Preserve State Park supports the BBSAP on occasion and has plans to include the BBSAP into the Articles of Incorporation. The Board is composed of neighbors, private business owners, artists, stakeholders, and government partners. The CSO provided funds for research, management, outreach efforts through fund raising activities. The CSO also serves as a means to accept donations of funds or equipment from individuals, corporations, or community organizations desiring to contribute to the restoration or management of public lands or waters.

3.1.6 / *Adjacent Public Lands and Designated Resources*

Federal and state agencies have put a great deal of emphasis on protecting and conserving lands in the Big Bend region. The network of managed conservation lands adjacent to BBSAP protects the water quality, habitats, and species from degradation. BBSAP staff regularly participates in land management reviews, land acquisition projects, and federal and state management planning. Conservation easements placed on large land tracts of commercial silviculture operations helps protect sensitive areas from future development practices. Frequently, Best Management Practices (BMP) are placed on easements such as requiring large buffers around wetlands and tributaries. BMPs help protect essential ecological functions by providing wildlife habitat and foraging grounds, filtering storm water runoff, trapping sediment, attenuating high flow, recharging groundwater, and absorbing nutrients. All of these functions benefit BBSAP and help to maintain current water quality and quantity and further protect BBSAP habitats.



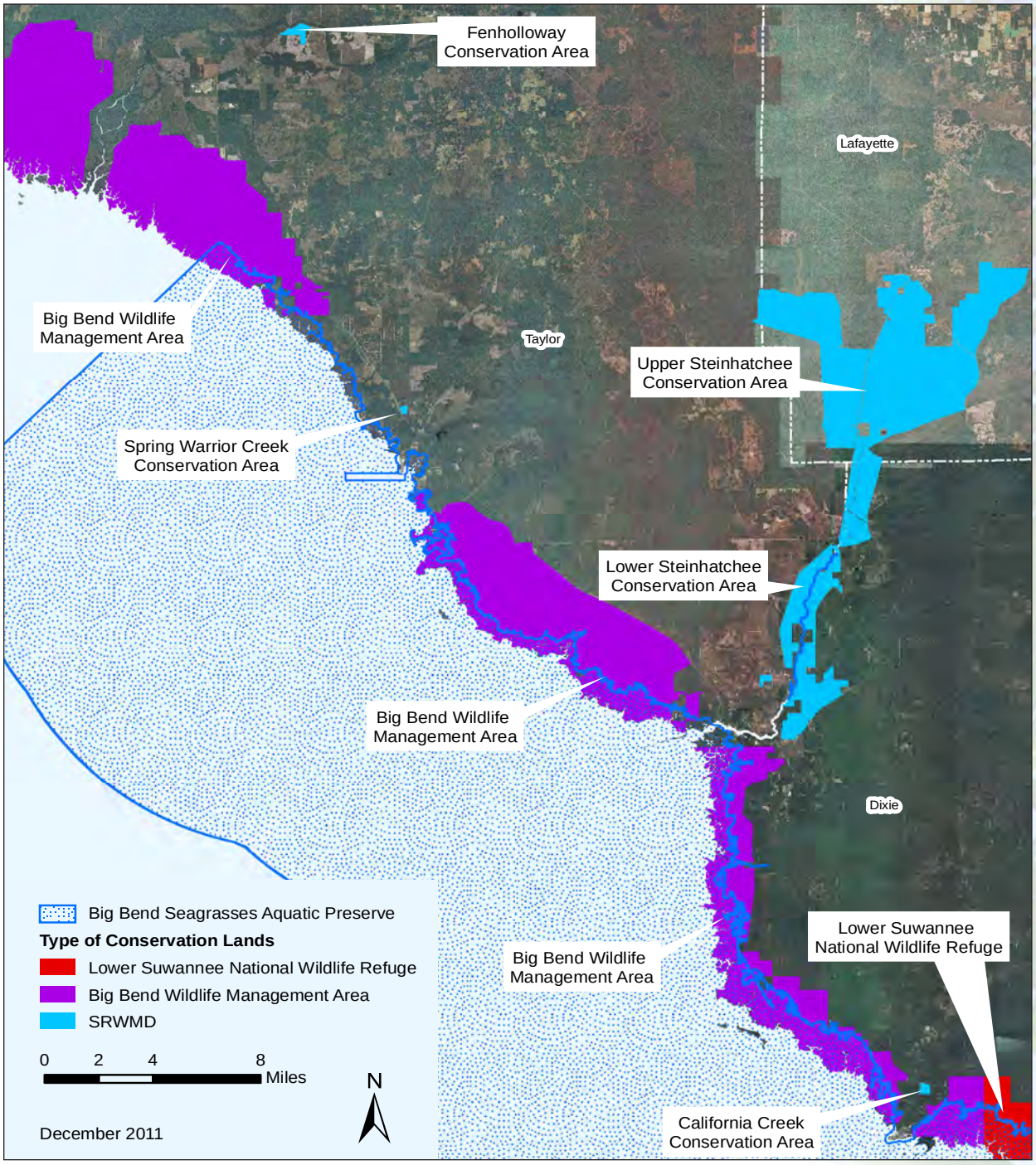
Map 15 / Conservation lands near the upper region of Big Bend Seagrasses Aquatic Preserve.

There are currently 16 Florida Forever Priority Projects that will further protect the water quality in BBSAP. These include five Critical Natural Lands Projects: Wacissa/Aucilla River Sinks, Upper St. Marks River Corridor, Pinhook Swamp, San Pedro Bay, Hixtown Swamp; three Climate Change Lands Projects: Caber Coastal Connector, St. Joe Timberland, Florida Springs Coastal Greenway; four Less-Than-Fee-Projects: Lower Suwannee and Gulf Watershed, Gulf Hammock, West Aucilla River Buffer, Suwannee County Preservation; four Partnerships and Regional Incentives Projects: Florida's First Magnitude Springs, Wakulla Springs Protection Zone, Green Swamp and Lafayette Forest.

Federal Managed Lands

Three National Wildlife Refuges are adjacent to BBSAP: St. Marks National Wildlife Refuge, Lower Suwannee National Wildlife Refuge and Cedar Keys National Wildlife Refuge.

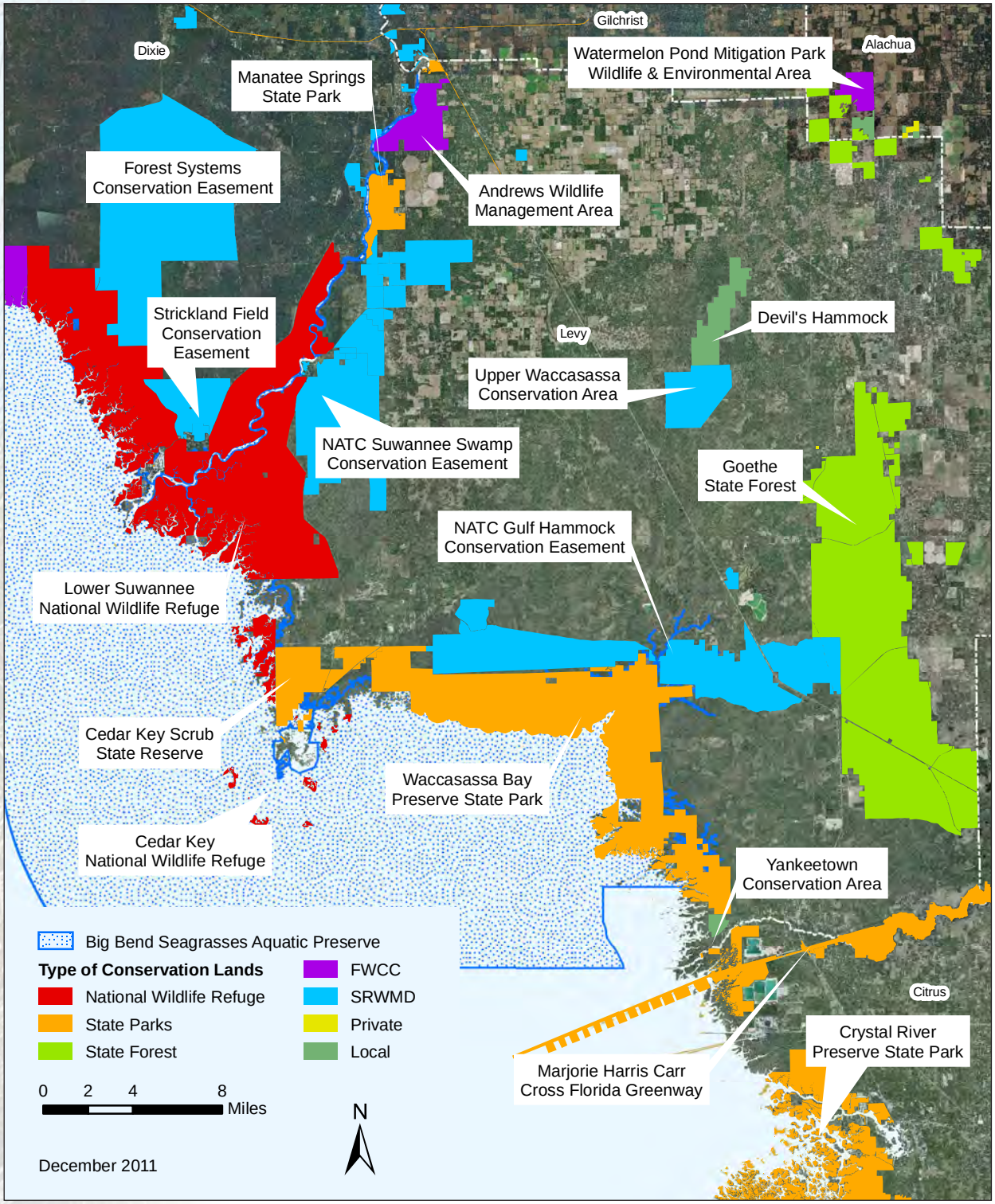
St. Marks National Wildlife Refuge - St. Marks National Wildlife Refuge is located in Wakulla, Jefferson and Taylor counties along the Gulf Coast of northwest Florida, about 25 miles south of Tallahassee. This unique refuge was established in 1931 to provide wintering habitat for migratory birds. It is one of the oldest



Map 16 | Conservation lands near the middle region of Big Bend Seagrasses Aquatic Preserve.

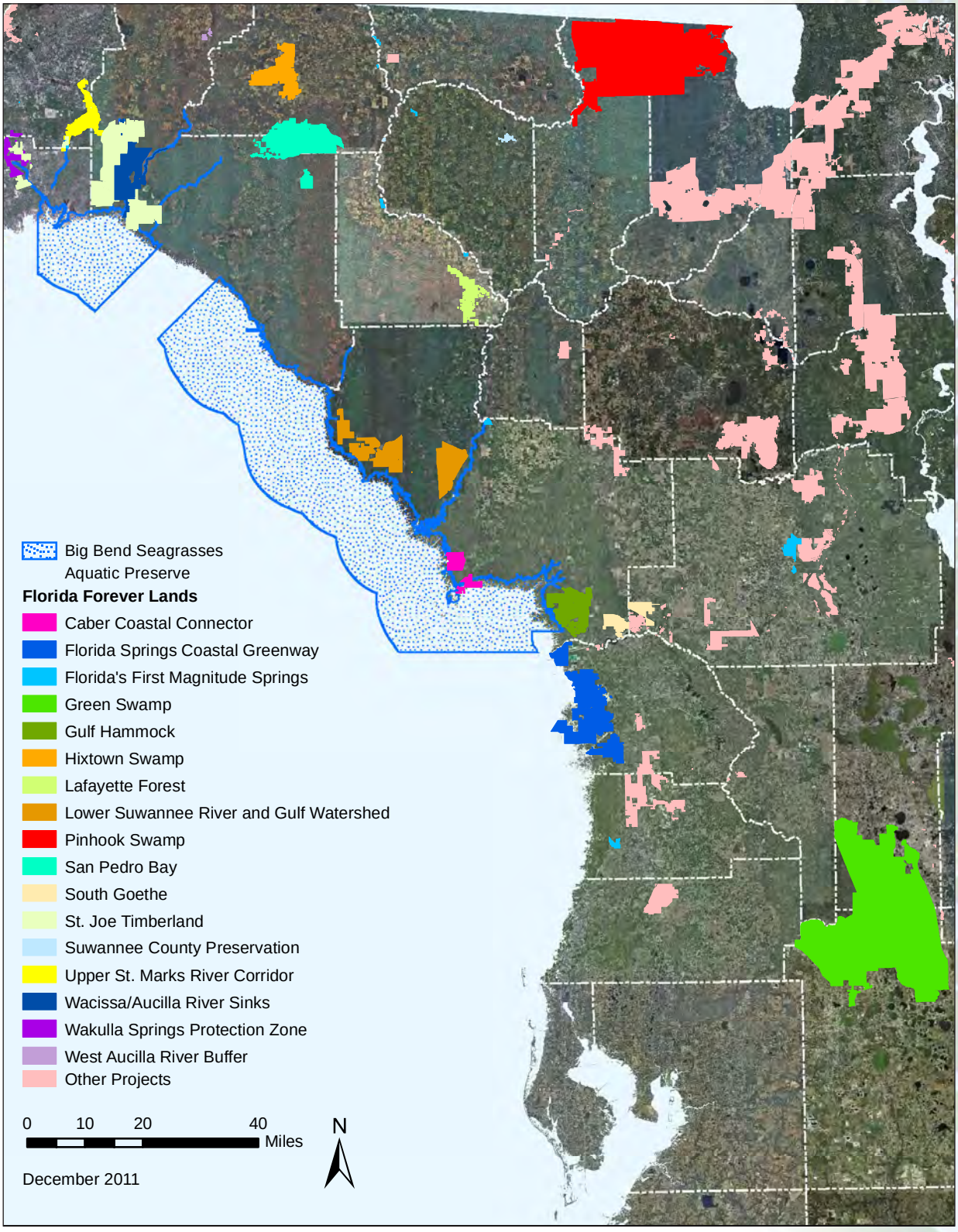
refuges in the National Wildlife Refuge System. The refuge includes coastal marshes, islands, tidal creeks and estuaries of seven north Florida rivers, and is home to a diverse community of plant and animal life. It currently covers about 69,155 acres with an approved acquisition boundary of 74,469 acres. The refuge staff also manages 947 acres of state land and 334 acres of USDA Forest Service land within the approved acquisition boundary. The primary purpose of the refuge is wildlife habitat conservation (FWS, 2010).

Lower Suwannee National Wildlife Refuge - Lower Suwannee National Wildlife Refuge is approximately 53,000 acres and was established in 1979 to protect one of the largest undeveloped river-delta estuarine systems in the United States. Natural salt marshes, tidal flats, bottomland hardwood swamps, and pine forests provide habitat for a myriad of wildlife species. The refuge offers recreational and educational activities for everyone and several boardwalks and observation towers to offer unique views (FWS, 2010).



Map 17 / Conservation lands near the lower region of Big Bend Seagrasses Aquatic Preserve.

Cedar Keys National Wildlife Refuge - Cedar Keys National Wildlife Refuge was established in 1929 and contains significant natural and cultural resources from pre-historic and historic times. Today, the refuge consists of 13 islands ranging in size from one to 120 acres, totaling 762 acres. Wading birds, shorebirds, fishes, manatees, bald eagles, crabs and even reptiles are some of the species of wildlife that find suitable habitat on the islands and marshes within the refuge. An historic lighthouse, now leased by the University of Florida as a Marine Science Lab, sits atop Seahorse Key, the site of one of the largest colonial bird rookeries in north Florida. On Atsena Otie Key, visitors will find a pier, time line information, restroom facility, and a walking trail to a 19th century cemetery (FWS, 2010).



Map 18 | Priority parcels for acquisition near Big Bend Seagrasses Aquatic Preserve.

State Managed Lands and Waters

The state managed public lands that are within close proximity to BBSAP are:

Big Bend Wildlife Management Area - In 1986, 55,480 acres of undeveloped land in the Big Bend was purchased by The Nature Conservancy. The state purchased this land from The Nature Conservancy in 1987 through the state's Conservation and Recreation Lands (CARL) program (now known as Florida Forever) and funds derived from the Save Our Coast (SOC) program. The majority of this land was purchased from Procter and Gamble and St. Joe Company. This conservation land is managed by FWC as the Big Bend WMA. This WMA is comprised of several units including: Jena, Tide Swamp, Hickory Mound, Spring Creek, and Snipe Island. Additional acquisitions have been made since 1986 including: 4,750 acres in 1998 and 10,689 acres in 2001. Big Bend WMA's total acreage is now 70,919 acres based on the mean high water line of the Gulf of Mexico. However, for management purposes the mean high water line has been defined as the *Juncus roemerianus* line thus actual managed acres, approximately 93,214 acres, are greater than those reported.

Aucilla Wildlife Management Area - In 1988, Florida obtained the core property (14,000 acres more-or-less) in Jefferson and Taylor counties. Since then other acquisitions were made in 2000 and 2003 from the St. Joe Company. Within the 47,622-acre Aucilla WMA are two rivers offering abundant recreational opportunities such as hunting, fishing, hiking, biking, camping and paddling. Boat ramps, picnic, and restroom facilities are located at Goose Pasture and the headwaters of the Wacissa, which is 15 miles from Tallahassee (FWC, 2010b).

Steinhatchee Springs Wildlife Management Area - Steinhatchee Springs WMA spans 20,909 acres of floodplain forest, cypress swamps, xeric hammocks, and pine plantations surrounding the Steinhatchee River in Lafayette, Dixie and Taylor counties. The area, owned and operated by Suwannee River Water Management District, is open for public use year-around. Recreational opportunities include hunting, fishing, wildlife viewing, horseback riding, hiking and biking (FWC, 2010b).

Fanning Springs State Park - Fanning Springs State Park is located on U.S. Highway 19/98 in the town of Fanning Springs. In 1993, the state purchased the land and in 1997, the Florida Park Service became the caretaker. Fanning Springs State Park features a number of activities including: camping, cabins, boating, paddling, swimming, snorkeling, scuba diving, hiking trails, picnicking and a pleasant boardwalk to view the river (Florida Park Service, 2010).

Andrews Wildlife Management Area - Andrews WMA consists of 3,582 acres in the lower Suwannee River region. Of the estimated 20,000 to 25,000 acres of upland hardwood forest that once existed along the lower Suwannee, the last large tract is located within the Andrews WMA. The state purchased the land in 1985 through the SOR and CARL programs. Recreational opportunities include hunting, fishing, hiking, biking and paddling (FWC, 2010b).

Cedar Key Scrub State Reserve - Cedar Key Scrub State Reserve is located on State Road 24 six miles east of Cedar Key. This land became a state reserve in 1978 (Florida Park Service, 2010). Cedar Key Scrub State Reserve consists of more than 5,000 acres of scrub, dominated by live oak, myrtle oak, Chapman's oak (*Quercus chapmanii*), rusty staggerbush (*Lyonia ferruginea*) and saw palmetto. The reserve is home to the Florida scrub jay (*Aphelocoma coerulescens coeruluescens*), southern bald eagle and other birds. The reserve features a number of activities including: fishing, hiking, picnicking, equestrian use and bicycling (Florida Park Service, 2010).

Waccasassa Bay Preserve State Park - Waccasassa Bay Preserve State Park extends along the coast between Cedar Key and Yankeetown. Expansive Waccasassa Bay Preserve State Park is 30,784 acres of salt marsh dotted by picturesque wooded islands interlaced by numerous tidal creeks (Bose, 2010). The uplands protect a remnant of the Gulf hammock that once spanned thousands of acres between the Suwannee and Withlacoochee rivers. Endangered and threatened species, including the West Indian manatee, American alligators, live or feed within the preserve. The preserve features a number of activities including: boating, fishing, paddling and primitive camping (Florida Park Service, 2010).

Manatee Springs State Park - Manatee Springs State Park is located at the end of State Road 320, off U.S. Highway 98, six miles west of Chiefland. Opened to the public in 1955, Manatee Springs State Park offers an array of recreational activities such as camping, boating, fishing, paddling, campfire circles, swimming, snorkeling, scuba diving, picnicking, and hiking (Florida Park Service, 2010). The most prominent natural feature in the 2,075-acre park is Manatee Spring itself, a first-magnitude spring, producing 81,280 gallons of crystal-clear water every minute or approximately 117 million gallons daily (Bose, 2010).

Other Adjacent Public Lands

Other public lands in the Big Bend region include the following: Miccosukee Canopy Road Greenway, R. Alford Open Space Preserve, Letchworth-Love Mounds Archaeological State Park, Upper Aucilla Conservation Area, Hixtown Swamp Conservation Area, L. Kirk Edwards Wildlife and Environmental Area, San Pedro Bay WMA, Econfina Conservation Area, Fenholloway Conservation Area, Forest Capital Museum State Park, Upper Steinhatchee Conservation Area, Steinhatchee Conservation Area, Lower Suwannee Conservation Area, Twin Rivers State Forest, Upper Alapaha Conservation Area, Suwannee Ridge Mitigation Park Wildlife and Environmental Area, Holton Creek Conservation Area, Woods Ferry Conservation Area, Charles Springs Conservation Area, Allen Mill Pond Conservation Area, Peacock Springs State Park, Peacock Springs Conservation Area, Troy Springs Conservation Area, Little River Conservation Area, Grady Conservation Area, Mallory Swamp Restoration Area, Hatchbend Conservation Area, Log Landing Conservation Area, Lower Coastal Creeks Conservation Area, Yellow Jacket Conservation Area, Fowlers Bluff Conservation Area, Santa Fe River Conservation Area and Nature Coast Trail State Park.

3.1.7 / Surrounding Land Use

BBSAP is bordered by five counties and include, from north to south, Wakulla, Jefferson, Taylor, Dixie, and Levy. The BBSAP drainage basin encompasses a total of 10 Hydrologic Unit Codes (HUC): St. Marks – HUC 0312001, Econfina/Fenholloway – HUC 03110102, Aucilla – HUC 03110103, Withlacoochee North – HUC 03110203, Alapaha River - HUC 03110202, Upper Suwannee – HUC 03110201, Lower Suwannee – HUC 03110205, Santa Fe – HUC 03110206, Waccasassa – HUC 03110101, and Withlacoochee – HUC 03100208. Five drainage basins cross state lines and include areas within Georgia: St. Marks, Aucilla, Withlacoochee North, Alapaha and Upper Suwannee. Land use within the BBSAP watershed was classified according to the following categories: commercial and residential, infrastructure, extraction, agricultural, natural, silviculture, and water and wetlands (See Map 19 and Table 6). Silviculture lands were specifically identified as a land use category since these lands are manipulated and managed for timber production and therefore not natural. The following section will discuss land use patterns in the BBSAP watershed and coastal areas.

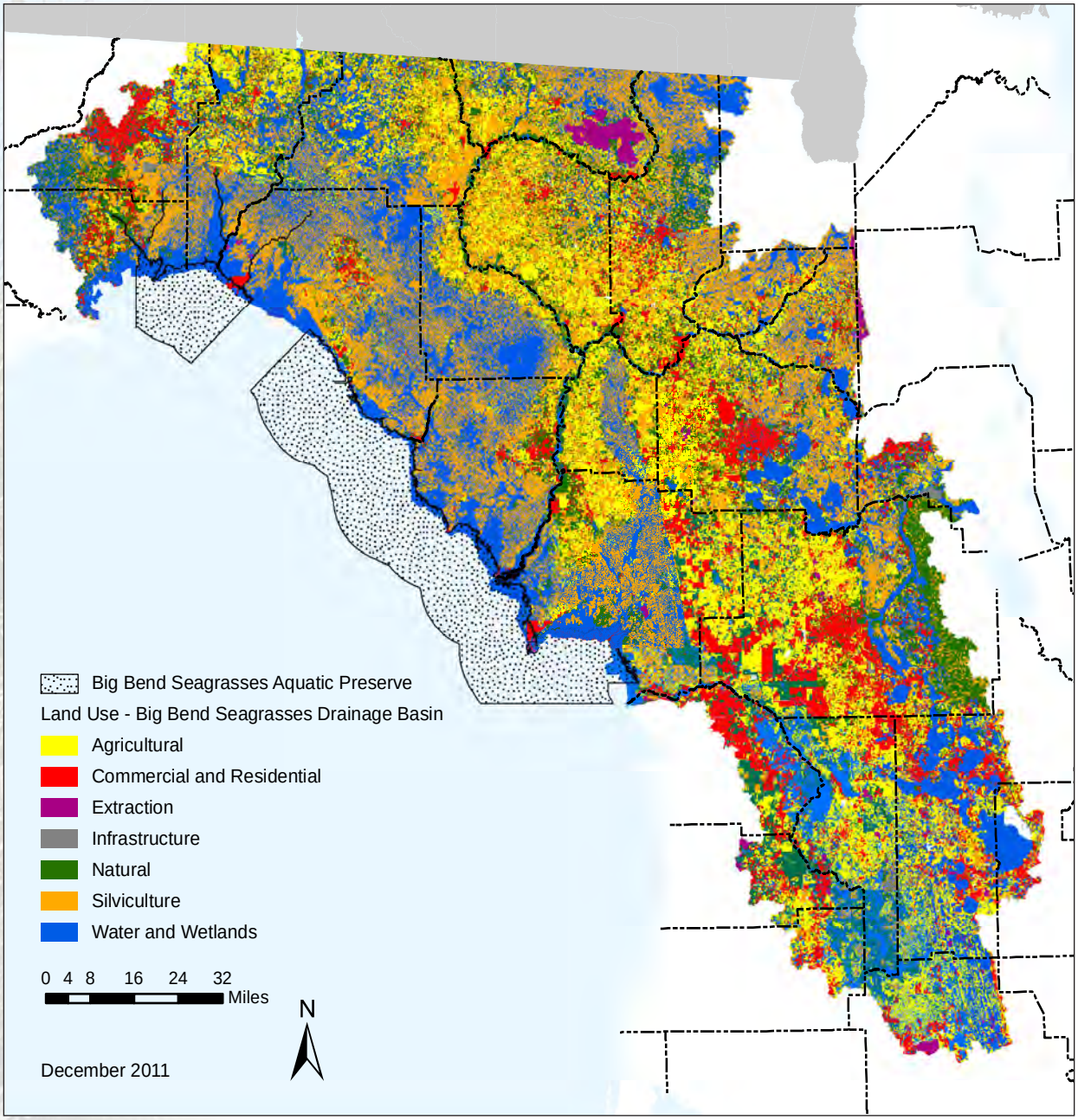
	Agriculture	Commercial & Residential	Extraction	Infrastructure	Natural	Silviculture	Water & Wetlands	Other
***St. Marks HUC 03120001**	13%	12%	<1%	1%	19%	25%	29%	<1%
Econfina / Fennholoway HUC 03110102	3%	2%	<1%	<1%	3%	40%	50%	<1%
***Aucilla HUC 03110103**	19%	2%	<1%	<1%	13%	26%	39%	<1%
***Withlacoochee North HUC 03110203**	31%	5%	0%	<1%	20%	33%	10%	<1%
***Alapaha River HUC 03110202**	21%	3%	<1%	1%	16%	39%	19%	<1%
***Upper Suwannee HUC 03110201**	11%	4%	7%	<1%	16%	32%	29%	<1%
Lower Suwannee HUC 03110205	28%	7%	<1%	<1%	16%	32%	16%	<1%
Santa Fe HUC 03110206	24%	9%	1%	<1%	14%	32%	19%	<1%
Waccasassa HUC 03110101	16%	6%	<1%	<1%	11%	30%	35%	<1%
Withlacoochee HUC 03100208	30%	19%	1%	<1%	19%	4%	26%	<1%

Table 6 / Land use percentages in the Big Bend Seagrasses Aquatic Preserve watershed.

(Florida basin and land use only. The percentages do not reflect the basin and associated land use for the state of Georgia.)*

The Florida Department of Agriculture and Consumer Services has been managing and maintaining oyster reefs (i.e., collecting, storing, handling and planting oyster and clam cultch, fossilized shell, or limestone rock) and managing the leasing of sovereign submerged lands for aquacultural purposes since 1913. From 1881 until 1969, leases were granted in-perpetuity. Subsequently, the state began granting shellfish aquaculture leases with 10 year terms in designated Aquaculture Use Zones. The terms and conditions for sovereign submerged leases were established by the Governor and Cabinet acting within their Constitutional capacity as the Board of Trustees for the Internal Public Improvement Trust. Shellfish farmers must abide by a variety of lease provisions that includes an annual performance audit, annually acquire an Aquaculture Certificate of Registration and implement environmentally-oriented aquaculture Best Management Practices. Currently, approximately 675 acres have been leased in the Big Bend region for clam farming (hard and sunray Venus clams).

Large urban commercial and residential centers are not directly adjacent to BBSAP, but are located further inland. The largest urban center within the St. Marks and Aucilla basins is the city of Tallahassee. The St. Marks River basin is the most developed basin within the BBSAP watershed. Perry and Cross City are the largest urban centers within the Econfina/Fenholloway river basin. The largest urban centers in the lower Suwannee River basin include Live Oak and Chiefland. Bronson is the largest city in the



Map 19 | Land use surrounding Big Bend Seagrasses Aquatic Preserve.

Waccasassa River basin. The Withlacoochee basin is the second most developed basin in the BBSAP watershed and the largest urban areas are Inverness and Wildwood.

Agricultural patterns in the Big Bend region are the densest in the upper and lower Suwannee, Santa Fe and Withlacoochee River basins. The main agricultural crops farmed in Big Bend include peanuts, corn, soybeans, vegetables, and tobacco. Traditional small farms of this area combine row crops and livestock production. Large corporate agricultural companies also have large irrigated row crop operations, chicken farms, and dairies throughout this region. The intense agricultural practices in the region contribute to excess nutrients in the ground and surfaces waters of the basin. The Suwannee River Partnership was formed in 1999 as a coalition of state, federal and regional agencies, local governments, and private industry representatives working together to reduce nitrate levels in the surface waters and groundwater within the basins, or watersheds of the Suwannee River Water Management District. The partnerships mission is to provide researched based solutions that protect and conserve the water resources within the Suwannee River Water Management District by emphasizing the implementation of voluntary or incentive-based programs.

The predominant agricultural practice throughout the Coastal Lowlands of the Big Bend region is silviculture and much of the hydrology has been altered. Companies such as Proctor and Gamble, Georgia Pacific, and St. Joe Company have converted the land into highly productive tree farms. Silvicultural practices have the potential to be deleterious to BBSAP. The natural hydrological pattern on much of the intensely farmed lands has been altered and as a result has impacted some of the rivers and estuaries. Construction of compact lime rock roads allowing access for heavy equipment has impacted hydrological flow and natural drainage patterns in some areas. Runoff from these lands also has the potential to increase sedimentation of BBSAP and its tributaries. Fertilizers, pesticides, and herbicides could enter the watershed, especially if applied aerially, where drift can occur. Tree removal along rivers and stream banks can increase water temperature and promote lower dissolved oxygen levels. BBSAP encourages the implementation of BMPs to prevent water quality degradation. These lands also have the potential to see dramatic land use and zoning changes, converting from intense agricultural land to commercial and residential land use types.

Coastal development in Big Bend is isolated to a few areas throughout the region. This is due to the fact that much of the coastal land is held in public trust and large segments of conservation lands are adjacent to BBSAP. Although, several areas have the potential to see intense and dense development such as Steinhatchee, Cedar Key, Keaton Beach, Dekle Beach, St. Marks and Horseshoe Beach. For the most part, land use patterns immediately upland surrounding the BBSAP boundaries is primarily conservation lands, rural agricultural, low density residential, with some commercial use. The small coastal towns of the Big Bend region were traditionally small commercial fishing communities. Today, the Big Bend region of Florida is known as the “Nature Coast” and has become a more tourist based economy. Condominiums and vacation homes are increasing in popularity throughout the coastal Big Bend communities.

Recently, Taylor County has experienced the most development pressure along the coastal zone in the Big Bend region. For example in 2005, a major development in Dekle Beach was proposed including: a new marina, new 100 foot wide two mile navigational channel through BBSAP, 264 condominium units, 874 hotel/motel units, and 280,000 square feet of commercial space. Due to the overwhelming environmental opposition to this proposed project the marina and navigational channel were removed from the project design and replaced with a golf course. Taylor County in partnership with Foley Land and Timber Company conducted a series of workshops with a diverse array of government representatives and the public to create the Vision 2060 Plan. This plan ultimately will guide Taylor County’s Comprehensive Land Use Plan Amendments. The Vision 2060 Plan creates a new corridor east of State Road 361 and connects Perry to Steinhatchee and the beaches coastal communities. Foley Timber and Land Company has proposed a Master Development of Regional Impact including 19 project areas to implement the Vision 2060 Plan. The total project includes: 2,927,300 square feet of retail/service space, 1,005,700 square feet of office space, 650,000 square feet of industrial space, 473,500 square feet for educational facilities, 900 hotel rooms, and 25,673 residential dwelling units. Taylor County has been designated a Rural County of Economic Concern and the goal of Vision 2060 is to stimulate Taylor County’s economy.

Rock outcroppings in Big Bend Seagrasses Aquatic Preserve provide habitat for many fish and invertebrates.

Part II

Management Programs and Issues

Chapter Four

The Florida Coastal Office's Management Programs

The work performed by the Florida Coastal Office (FCO) 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.

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 utilized 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 scientifically characterizing 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.

4.1.1 / Background of Ecosystem Science at Big Bend Seagrasses Aquatic Preserve

Until 1999, management of BBSAP and any associated ecosystem science activities such as aquatic mapping, modeling, monitoring and research was the responsibility of FCO (formerly the Division of Marine Resources). Much of the historical ecosystem science activities that have occurred in BBSAP were conducted by university staff or graduate students from Florida State University and the University of Florida and other various state and federal agencies. BBSAP did not conduct any ecosystem science activities until a designated position was established in 1994. The creation of this position marked the beginning of ecosystem science at BBSAP.

The remote Big Bend is one of the least populated regions of Florida. This has enabled the region to remain relatively pristine and wild in character. The region is an area of economic concern. Per capita income and the ad valorem tax base is one of the lowest in the state These factors contribute to a lack of capital that is needed to effectively manage and protect the area's aquatic resources. This contrasts to more urban areas of the state where the larger populations and the associated resource impacts have resulted in more political pressure and more resources needed to effectively manage aquatic resources. Relatively small amounts of ecosystem science activities have occurred in the region, when compared to the large body of scientific research, monitoring data, maps, and models that more urbanized areas of the state have compiled. The following section highlights some of the historical mapping, modeling, and monitoring and research that has been conducted in the Big Bend.

Mapping

IIn order to effectively manage resources within BBSAP, it is imperative to conduct routine mapping of these resources. This allows for the identification of areas within BBSAP where increased research, monitoring, and management emphasis is necessary. Habitat mapping within BBSAP has, for the most part, focused on seagrass habitat. Mapping efforts have suffered from a lack of consistency in methodologies that makes comparative analysis between mapping efforts difficult.

- In 1984, the Minerals Management Service contractors, Continental Shelf Associates, Inc. and Martel Laboratories, Inc. mapped 520,292 hectares of seagrass habitat in the Big Bend region. This effort also attempted to map the deepwater seagrasses of the region.
- In 1992, the U.S. Geological Survey (USGS) National Wetlands Research Center (NWRC) conducted a mapping study as part of the northeastern Gulf of Mexico seagrass mapping project.
- In 2001, the Suwannee River Water Management District (SRWMD) conducted a seagrass mapping effort that focused on the seagrass coverage from Horseshoe Beach south to Waccasassa Bay. This map was intended to serve as a baseline for any future trend analysis. This mapping effort was also the basis for assessing the extent of oyster reef habitat within the same study area. Better mapping of the oyster reefs in the entire BBSAP is also needed and should be regularly updated.
- In 2006, the Florida Department of Transportation collected imagery of the Big Bend region. SRWMD contracted FWC's Fish and Wildlife Research Institute (FWRI) to perform a seagrass coverage change analysis which was accomplished by using the 2001 and 2006 imagery data sets.

Modeling

Computational models support scientific analyses and provide scientist and resource managers better information, which ultimately supports management decisions and policies. Models increase the level of understanding about natural systems and the way in which they react to varying conditions.

- Dynamic Solutions, LLC produced a Hydrodynamic and Salinity Model of the Suwannee River and estuary using Environmental Fluid Dynamics Code_Explorer 3-D hydrodynamic and water quality model. The model was successfully calibrated to historical records of flow and salinity. The model grid included 15 miles of the Suwannee River, 28 miles of shoreline, and extended 18 miles offshore into the Gulf of Mexico and Suwannee Sound.
- SDII Global Corporation created a groundwater flow model for SRWMD in 2008. This model is called the North Florida Flow Model and was created for the use in the establishment of Minimum Flows and Levels within SRWMD. The model includes the area from west Tallahassee to the Atlantic Ocean and from north of Valdosta, Georgia, south to Levy and Marion counties. This includes areas outside of SRWMD boundaries where groundwater withdraws could affect groundwater levels within SRWMD.
- The Nature Conservancy used the Sea Level Affecting Marshes Model (SLAMM) to assess possible impacts to Florida's coastal ecosystems. SLAMM simulates the dominant processes involved in wetland conversions and shoreline modifications during sea level rise. The four processes that affect coastal wetlands in regard to sea level rise are inundation, erosion, over wash, and saturation.
- The University of South Florida's (USF) Ocean Circulation Group maintains a coordinated program of coastal ocean observing and modeling for the West Florida Continental Shelf. Modeling includes a West Florida Shelf version of Regional Ocean Model System (ROMS) nested in the Navy's

operational Hybrid Coordinate Ocean Model (HYCOM). They are also diagnosing model output from the Navy's HYCOM, from North Carolina State University's South Atlantic Bight and Gulf of Mexico Circulation Nowcast/Forecast ROMS, and also from the National Oceanic and Atmospheric Administration (NOAA) Real Time Ocean Forecasting System.

- Dr. Y. Peter Sheng developed a Curvilinear-grid Hydrodynamic 3D model (CH3D) at the Aeronautical Research Associates of Princeton Inc. Since 1989 Dr. Sheng's Advanced Coastal Environmental Simulations Lab at the University of Florida has enhanced processes, algorithms, and coding of the model through studies on shallow estuaries with complex shorelines and bathymetry. A fully integrated modeling system (IMS), CH3D-IMS has been developed and includes circulation (CH3D), wave, sediment transport (CH3D-SED3D), water quality (CH3D-WQ3D, light attenuation (CH3D-LA), and seagrass models (CH3D-SAV). Additional processes such as surface water ground water interaction, atmospheric processes, contaminant transport are being added to the model suite. Another integrated modeling system for storm surge and coastal inundation (CH3D-SSMS) has been developed and can produce high resolution inundation simulations.

Monitoring and Research

Considerable water quality and fisheries data has been collected in the Big Bend region over the last 30 years. Although, most water quality studies have been restricted to waters near the upstream extent of tidal influence. Below are some of the historical water quality and fishery studies that have been conducted in the Big Bend region.

- Water quality studies conducted as part of the DEP's watershed management approach for protecting water resources and addressing Total Maximum Daily Load (TMDL) requirements. These studies primarily have focused on freshwater portions of the region.
- Dr. Robert Livingston of Florida State University (FSU) conducted a long-term water quality and fisheries analysis in the Econfina/Fenholloway estuaries from 1970 to 2004.
- Hugh Putnam from the University of Florida (UF) studied the factors for primary production in a 1964 study of Waccasassa Bay.
- Dr. Tom Frazer of UF began a long term water quality monitoring study in 1997 to present in the Steinhatchee, Suwannee, Waccasassa and Withlacoochee estuaries.
- SRWMD has carried out a long term water quality monitoring program that assesses conditions of the rivers and streams, springs, and groundwater within SRWMD.
- The Environmental Protection Agency's (EPA) Ecological Assessment Branch conducted a nutrient study of the Econfina and Fenholloway systems for TMDL purposes in December 1998, March 1999, June 1999, and August-September 1999.
- The Department of Agriculture and Consumer Services (DACS) assesses microbiological conditions (fecal coliform and toxic marine plankton) of coastal waters to reduce the risk of shellfish-borne illness. Sanitary surveys are conducted to identify waters where contaminants may be present in amounts that present a human health hazard; hence, should not be open to harvest. DACS began monitoring the shellfish harvesting areas of Horseshoe Beach in 1980, Suwannee Sound and Cedar Key in 1981, and Waccasassa Bay and Withlacoochee Bay in 1983.
- The Florida Marine Research Institute (FMRI), now the FWRI, conducted an Inshore Marine Monitoring and Assessment Program that sampled Apalachee Bay in 2002, Suwannee Sound in 2000 and 2003, and Waccasassa Bay in 2001. These events were one time probabilistic sampling that provided a snapshot of the water quality within these systems.
- The management of Florida's marine and estuarine fisheries resources requires the collection of a variety of information on many species. To help provide that information, the Fisheries-Independent Monitoring (FIM) program established a survey project using stratified-random sampling, a technique used to describe and compare population trends. FIM is performed in Big Bend by FWRI staff from the Senator George Kirkpatrick Marine Field Laboratory.
- The Lake Watch Program, coordinated water quality sampling at nine sites in Apalachee Bay, and each site was sampled a total of three times: January, March, and May 2001.
- The NWFWMD conducted a resource characterization study in 2009 for the lower St. Marks River/ Wakulla River/Apalachee Bay. This included an analysis summary of existing water quality data sets found in the Florida STORET database.
- Barry A. Vittor & Associates, Inc initiated a water quality monitoring program in 2004-2009 to monitor the relationship between nutrient loading and the occurrence of phytoplankton blooms due to the Buckeye Pulp Mill discharge and to monitor chlorophyll *a* as a measure of impairment.
- Erin Quinlan conducted a series of research projects and monitoring which focused on phytoplankton and water quality from 1996-2002.

- Mote Marine Lab conducted a two year study of water quality at river and estuary stations of Waccasassa and Withlacoochee rivers in 1984-1985.
- USGS has a total of 188 historical river and stream flow gauging stations of which 125 of these stations are currently active within SRWMD.
- SRWMD has a total of 283 historical groundwater monitoring sites of which 77 are currently active.
- SRWMD has a total of 45 historical spring monitoring sites of which 28 are currently active.
- Franklin Percival, Florida Cooperative Fish and Wildlife Research Unit is conducting an ongoing salt marsh study in Suwannee River estuary.
- Ellen Raabe of the USGS Coastal and Marine Science Center in St. Petersburg has published a series of studies on the geology and hydrology of the Suwannee Sound coastline.
- Stephanie Gazda of the University of Massachusetts - Boston has been working on bottlenose dolphins (*Tursiops truncatus*) in Suwannee Sound since 2001.
- Jane Brockman from UF Biology Department has worked on horseshoe crabs on Seahorse Key from 1989 to present.
- Ken Sulak, USGS began a research project in 1991 that focuses on the fish communities of the Gulf of Mexico.
- Bill Pine- UF Fisheries Scientist has been studying sturgeon and other fish in BBSAP, sometimes in collaboration with Tom Frazer.

4.1.2 / Current Status of Ecosystem Science at Big Bend Seagrasses Aquatic Preserve

Research and monitoring are crucial components of resource and ecosystem management. Data obtained from monitoring programs provides staff with information to make effective resource management decisions. Monitoring efforts allow for the creation of baseline data as well as recognizing short and long term variation of environmental conditions. In the past, research and monitoring goals and objectives have included conducting the necessary research and monitoring activities to understand the ecological functioning of BBSAP so it can be managed and used in an ecologically sound and wise manner, and restored and maintained in its natural condition for future generations (DEP, 1997b). While these same goals continue to be relevant to the management of the BBSAP, the program has grown to include a more ecosystem-based management approach to protecting the biological and physical aspects of the ecosystem and focuses on the unique attributes and challenges of BBSAP. BBSAP's research and monitoring programs are developed and implemented based on current and potential impacts to the resources within the system.

Major management issues that BBSAP confronts include: health of seagrass beds, changes in water quality, land use changes, and critical/sensitive habitat protection. Florida is rapidly growing and development pressures on habitats are growing just as quickly. Therefore, sound resource management practices, public education and outreach, system-wide monitoring and research, and interagency and volunteer cooperation are integral in maintaining and protecting the natural resources within BBSAP. Current Ecosystem Science Programs within BBSAP and the future needs of the program are discussed in the following sections.

Big Bend Seagrasses Water Quality Monitoring

BBSAP's water quality program is comprised of several different programs, methods, and techniques used to monitor short and long term variation and trends within the waters of BBSAP. Staff works with a variety of partners to investigate water quality trends in estuaries throughout the Big Bend region. The partnerships pool resources together that allow important data to be collected and ultimately disseminated to other scientist and decision makers. The data collected by BBSAP and its partners has been used to help establish Minimum Flows and Levels and TMDLs. The following sections will discuss water quality monitoring programs conducted by BBSAP staff and other agencies that monitoring water quality parameters in BBSAP.

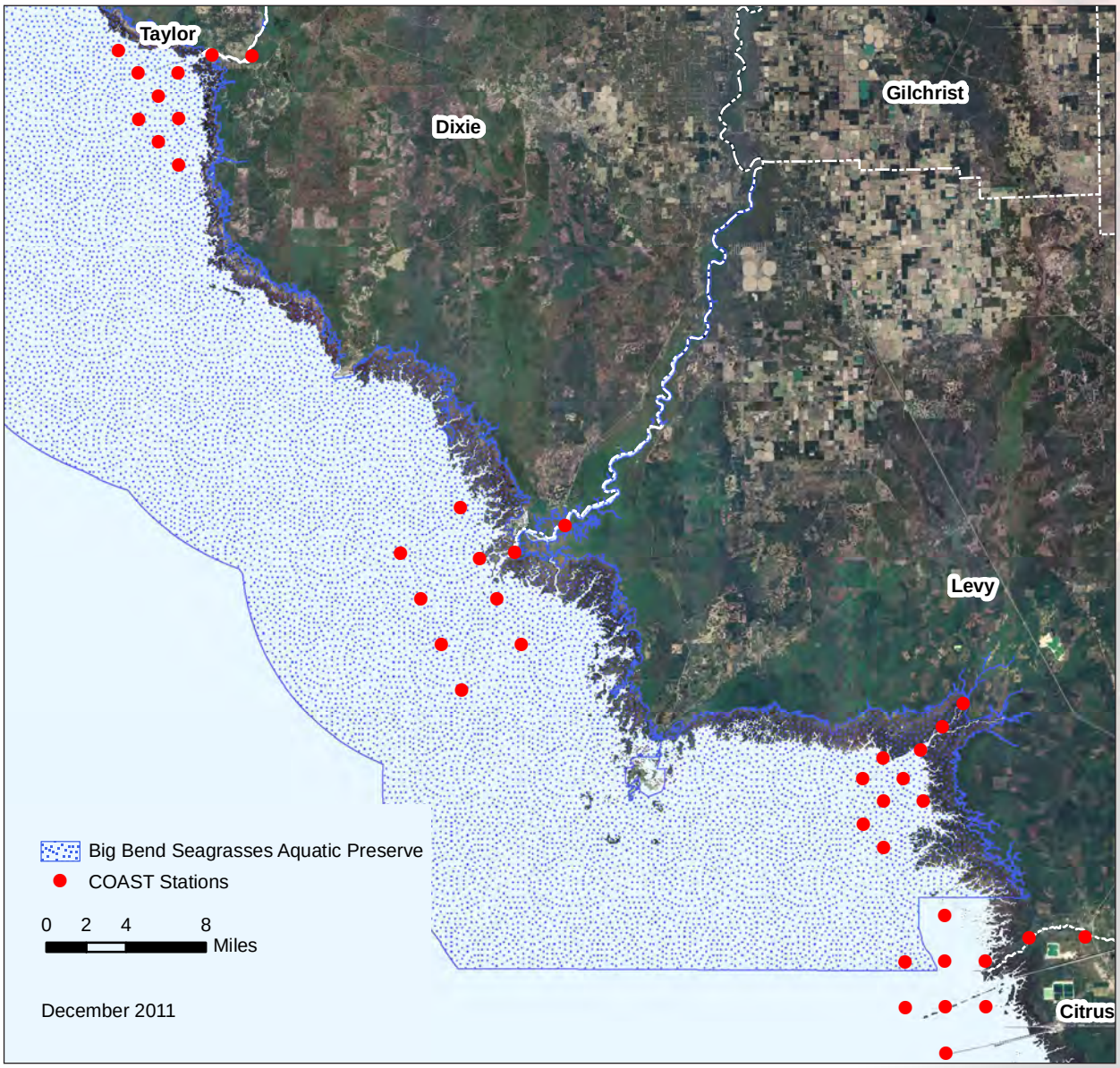
Project COAST

Since 1997, BBSAP has been a partner with UF's Project COAST program (COastal ASsessment Team) conducting an extensive water quality monitoring project in which data is collected in the following river systems within the Big Bend: Withlacoochee, Waccasassa, Suwannee, and Steinhatchee. Nutrient and other water quality data is taken monthly at 40 fixed stations throughout the Big Bend. Examples of data collected include light attenuation through the water column, temperature, salinity, pH, Secchi depth (measure of water clarity), and dissolved oxygen concentration. Water is filtered and processed for chlorophyll assessment, and samples are taken for phosphorous and nitrogen analysis. Data obtained from COAST is stored in an electronic database and has been made available to the public.

A baseline data set has been established which enables resource managers to effectively evaluate changes in nutrient concentrations and eutrophication, with a focus on changes in water quality that might negatively impact seagrass beds (Frazer, Notestein, Keller, & Jacoby, 2006). Staff will continue to work with UF's Project COAST program to determine natural nutrient background levels and short and long term trends in coastal water quality in the Big Bend. The data collected and subsequent findings are important in establishing ecologically protective water quality management programs.

Results indicate that total phosphorus and total nitrogen concentrations have slightly increased over the past nine years in the Withlacoochee and Suwannee River systems. Interestingly, from 1999-2005, chlorophyll concentrations increased consistently in the Withlacoochee; this has been attributed to increased total phosphorus concentrations within the system (Frazer et al., 2006). Total phosphorus has increased while total nitrogen has deceased in the Steinhatchee River system, and both total nitrogen and phosphorus concentrations have decreased in the Waccasassa system. In 1998, however, the presence of El Niño caused large scale increases in total nitrogen, total phosphorus, and chlorophyll in the Waccasassa system; water quality parameters returned to "normal" levels over a 6-8 month period (Frazer et al., 2006). It is important to continue this type of monitoring to distinguish short-term changes to climate and weather from long-term variation due to human activities within each river system.

In 2010, Project COAST and SRWMD data were analyzed by DEP; annual geometric means of total nitrogen (TN), total phosphorus (TP), and chlorophyll *a* (uncorrected) were determined for each system. A negative relationship between salinity and TN and between salinity and TP was observed in all systems;



Map 20 / Project COAST water quality monitoring sites.

however, in Cedar Key, the relationship between salinity and TN was not as pronounced due to a lack of direct freshwater inputs (DEP, 2010). Geometric mean TN ranged from 400 to 800 μg/L at from 0 to 10 parts per thousand (ppt) salinities and 250-500 μg/L at 25-35 ppt salinities in the Steinhatchee estuary; additionally, geometric mean TP ranged from 25 to 55 μg/L at 0-10 ppt salinities and 10-25 μg/L at 25-35 ppt salinities. In the Suwannee, geometric TN ranged from 400-800 μg/L in the nearshore sites and 250-400 μg/L in the offshore sites, and the geometric mean TP ranged from 40-80 μg/L nearshore and 20-40 μg/L offshore. Cedar Key sampling sites exhibited similar geometric means to those of the Suwannee estuary. The Waccasassa system had geometric means for TN ranging from 400-700 μg/L and 20-60 μg/L for TP; in the Withlacoochee system, TN geometric means ranged from 250-500 μg/L and 20-40 μg/L for TP.

Chlorophyll *a* concentrations in the Steinhatchee estuary reached maximum levels at 20 ppt salinity, as that is the region where phytoplankton are not limited by flow and tannins; however, sufficient nutrients exist to sustain higher chlorophyll *a* levels than in the open nearshore region. This phenomenon is exhibited in the Suwannee, Waccasassa, and Withlacoochee estuaries, and this "chlorophyll hump" is a crucial part of estuarine primary and secondary productivity (DEP, 2010).

Based on data an_alysis, DEP has determined that the aquatic life use in the Waccasassa and Withlacoochee systems is entirely supported, and the aquatic life use in the Suwannee system will be supported after the implementation of the nitrate TMDL (DEP, 2010). DEP recommends that numeric nutrient criteria be created to maintain the nutrient regime of the past 15 years, to protect healthy aquatic life use over that time period, including reductions of nitrate in the Suwannee that would be compatible with the implementation of the TMDL (DEP, 2010). It is recommended that assessment areas in these regions be delineated by salinity based on the observed robust relationship between salinity and nutrients.

HydroQual Inc. analyzed TN, TP, and flow data to assist DEP in the development of nutrient criteria in the Apalachee Bay area; nutrient data from the Econfina, Aucilla, St. Marks, and Steinhatchee rivers were used for this analysis. Nutrient data was acquired from the SRWMD website, Florida STOrage and RETrieval (STORET) and EPA STORET databases. Daily flow records were obtained from USGS.

Apalachee Bay

Apalachee Bay is currently biologically healthy and fully supports its designated use, except for a small area near the Fenholloway River, and nutrient criteria have been created to maintain overall health of the bay. Riverine inputs supply the principal source of nutrients to the bay, and these nutrient loads naturally vary as a function of rainfall. A TMDL has been completed and approved by the EPA for the Fenholloway River, and it is expected to be implemented within the next five years, resulting in the full restoration of the Fenholloway system. Except for the Fenholloway, maintaining the current nutrient regime is the recommended approach for the bay. Since the bay has been demonstrated to be healthy, maintaining the existing nutrient loads from the rivers will result in fully protective criteria (DEP, 2010).

Suwannee Estuary

Anthropogenic nitrate loading is excessive in the Suwannee River, and a TMDL has been established for nitrate and proposed nitrate limits to focus on the imbalances of flora that have occurred due to nitrate loading (Hallas and Magley, 2008). Although research has shown that high flow events have contributed to losses and changes in submerged aquatic vegetation (SAV) in Horseshoe Cove (Carlson et al., 2010) and Springs Coast seagrasses (Hale et al., 2004; Joliff et al., 2003), the Suwannee region possesses a healthy fishery with no dissolved oxygen impairments or harmful algal blooms. Current nutrient loading to the estuary is higher than previous observation; however, any long term negative impacts to the system have yet to be determined. DEP believes that the nutrient levels within the estuary will be completely protective of the designated aquatic life use once the TMDL is met (DEP, 2010).

Waccasassa Bay

Waccasassa Bay has the highest nutrient and chlorophyll *a* concentrations in the region despite relatively low anthropogenic loading. Research indicates that this is attributed to the high percentage of wetlands and the shallow, turbid nature of the estuary; however, evidence shows that the conditions have not shown significant variation since the 1960s, so it is logical that the existing condition protects the aquatic life use in the system (DEP, 2010).

Withlacoochee Estuary

The Withlacoochee region is characterized by an abundance of protected land, but the region has been subjected to some human development and hydrologic modifications by the Inglis Dam and the Cross Florida Barge Canal. TN and chlorophyll *a* concentrations have shown little variation since the mid-1980s which suggest that anthropogenic activities are not having any measureable effect on the system (DEP, 2010).

Continuous Water Quality Monitoring

BBSAP started using YSI 600 and 6600 data loggers to monitor water quality in 2004. BBSAP's monitoring plan was developed and modeled after the National Estuarine Research Reserve's (NERR's) System-Wide Monitoring Program (SWMP) that uses standardized methods to ensure accuracy and continuity of data collection. In 2004, three water quality stations were installed in the Big Bend region; however, two stations were relocated in 2007 and 2009 to broaden the monitoring effort. The positions of these stations allow for comparisons between relatively pristine versus more urbanized drainage basins as well as higher versus lower salinity regions of the estuary (See Table 7). The objective of this effort is to quantify the spatial/temporal variability and trends, both seasonally and as a function of tidal forcing, of selected abiotic parameters (e.g. establish baseline data) within BBSAP.

Site Name	ID Code	Lat./Long.	Description
Dekle Beach	DB	N29 48.836 W83 37.735	Seagrass/sand/rock bottom, located on Channel Marker #1
Seahorse Key	SK	N29 06.109 W83 04.588	Sand/seagrass bottom, NE corner of Seahorse Key
Suwannee River	SW	N29 17.269 W83 09.965	Mud bottom, at the mouth of the West Pass of the Suwannee River

Table 7 | Continuous water quality monitoring stations.

YSI 6600 EDS data loggers have been deployed to continuously monitor temperature, specific conductivity, salinity, pH, depth, dissolved oxygen (DO), and turbidity at 15-minute intervals (historically the sampling occurred at 30-minute intervals). Data is downloaded and edited using quality assurance and quality control protocols from the NERR's SWMP. Data is processed and edited, and monthly and yearly graphs are created in an effort to quantify the spatial/temporal variability and trends, both seasonally and as a function of tidal forcing, of the selected abiotic parameters (e.g. establish baseline data) within BBSAP. All data is stored on a local server and backup compact discs have been created. Currently, BBSAP does not have a data management office providing archival storage.

Average temperature and salinity plots for each site are available upon request to BBSAP. During the summer months (June-September), all three sites exhibit water temperatures on average of 30° +/-3° C, and during the winter months (November-February), all three sites have an average water temperature of 15° +/-5° C. Average salinity at the Suwannee River site is approximately 10 ppt; however, the range between maximum and minimum readings can be as large as 30 ppt. Additionally, nearly 60 percent of the daily minimum DO measurements were below the Class III marine criteria of 4 mg/L while approximately 35 percent of the daily averages were below the daily average Class III marine criteria of 5 mg/L (DEP, 2011). In Seahorse Key and Dekle Beach, the average salinities are approximately 25 +/- 5 ppt and 32 +/-5 ppt, respectively. The salinity range in Seahorse Key is approximately 15-35 ppt, while in Dekle Beach, salinity ranges from 20-35 ppt. Nearly 25 percent of the daily minimum DO measurements were below the Class III marine criteria of 4 mg/L while less than 25 percent of the daily averages were below the daily average Class III marine criteria of 5 mg/L in Dekle Beach (Magley, 2010). At the Seahorse Key site, approximately 35 percent of the daily minimum DO measurements were below the Class III marine criteria of 4 mg/L while less than 10 percent of the daily averages were below the daily average Class III marine criteria of 5 mg/L (Magley, 2010).

Harmful Algal Bloom Monitoring

The Florida Fish and Wildlife Conservation Commission (FWC) has documented harmful algal blooms (HABs) in Florida waters dating back 160 years to 1844; currently no clear trends exist in terms of frequency and duration of HABs (Geselbracht, 2007).

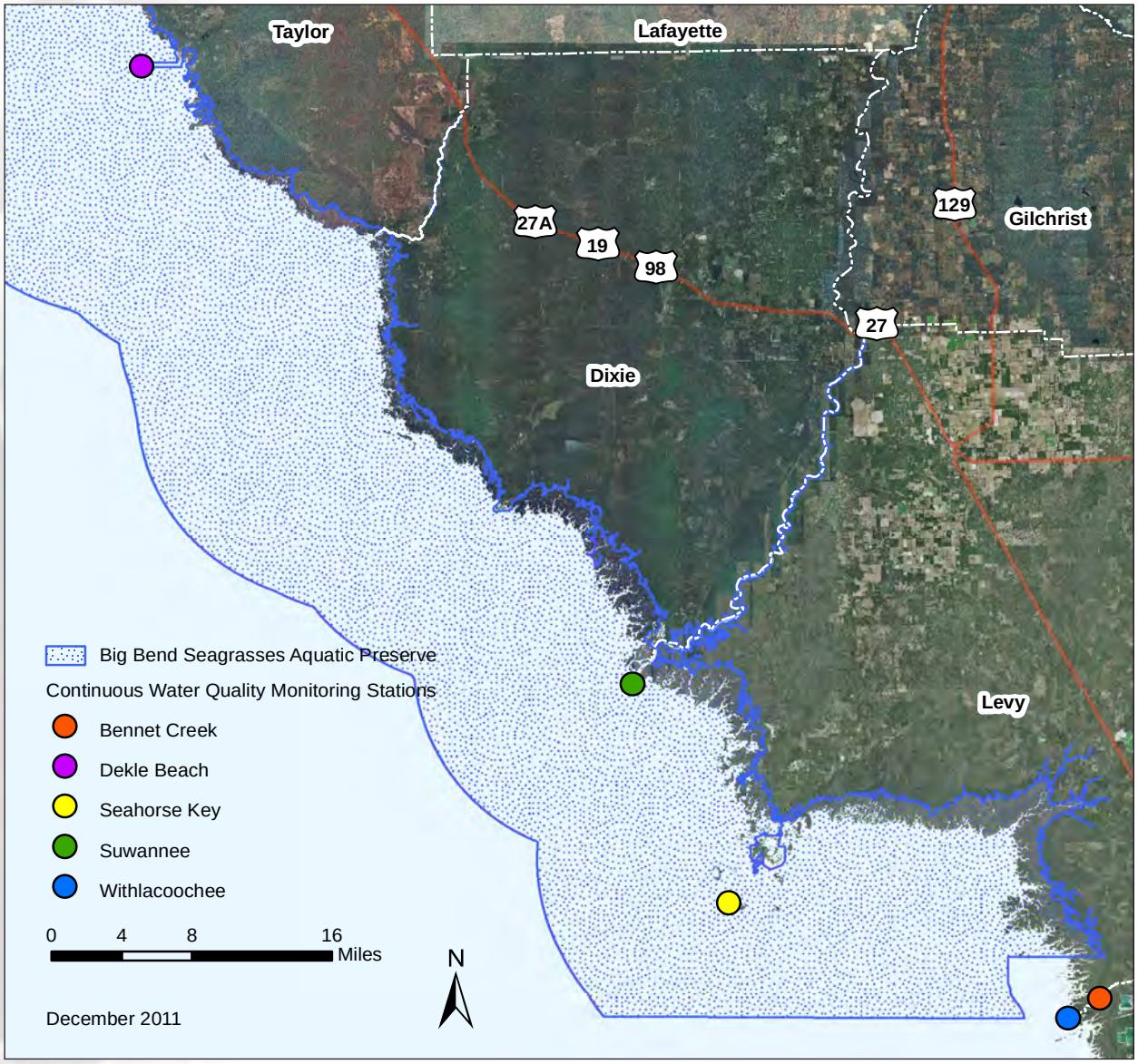
According to Geselbracht (2007), red tide blooms have only been observed in five to ten of the last 23 years in the Big Bend region. Two occurrences of red tide have been recorded in the Withlacoochee Bay. In December of 1979, harvesting areas were closed, and in June 1980, *Karenia brevis* levels were elevated, but the shellfish area was not closed (DeHaven, 2004b). Red tide has been reported in December 1979, June 1980, and September 2005 – January 2006 in Wacasassa Bay. Red tides resulting in closures have occurred in Cedar Key and Suwannee Sound during December 1979, June 1980, December 2003, and September 2005 – January 2006. Prevailing currents and a shallow coastal shelf typically hold harmful algal blooms offshore in the Big Bend (Kuhman, 2007). DACS follows the

Contingency Plan for Control of Shellfish Potentially Contaminated by Marine Biotoxins when red tides occur. Currently, BBSAP does not assist in any data collection or sampling associated with red tide outbreaks; however, staff are willing to participate in sampling within BBSAP.

Department of Agriculture and Consumer Services Water Quality Monitoring

It is important to monitor pollution sources, prevent habitat destruction, and sustain high water quality to maintain healthy shellfish harvesting areas. Bacteriological and environmental monitoring is important to the classification of coastal waters for shellfish harvesting. Surveys are conducted by DACS personnel of SEAS, Big Bend Gulf Coast District office. The following sections will discuss DACS' effort to identify pollution sources within shellfish harvesting areas in BBSAP.

- *Withlacoochee Bay Survey* - In March 2004, a shoreline survey was conducted to determine point and non-point sources of pollution in Withlacoochee Bay. Bacteriological and environmental data were collected at 40 stations during 133 sampling trips from July 1, 1993 to June 20, 2003, with fecal coliform levels varying from high to low. It was concluded that a major source, among others, of fecal coliform in the Withlacoochee Bay comes from discharge from the Withlacoochee River (DeHaven, 2004b).
- *Waccasassa Bay* - In April and May of 2002, a shoreline survey was conducted to determine point and non-point sources of pollution in Waccasassa Bay. Bacteriological and environmental data were collected at 31 stations during 115 sampling trips from July 1994 to June 2003, with fecal coliform levels varying from high to low. The Waccasassa River and several creeks are considered point sources of pollution for the Waccasassa Bay; river discharge introduces fecal coliform into the bay (DeHaven, 2004a).



Map 21 / Datalogger water quality monitoring stations.

- *Cedar Key* - In July and August of 2002, a shoreline survey was conducted to determine point and non-point sources of pollution in Cedar Key. Bacteriological and environmental data were collected at 44 stations during 116 sampling trips from January 1999 to December 2003, with fecal coliform levels ranging from low to moderately high. Surveys were conducted by DACS personnel of SEAS, Big Bend Gulf Coast District office. It was determined that rainfall runoff is a major source of fecal coliform in Cedar Key's coastal waters (DeHaven, 2004c).
- *Suwannee Sound* - In the Suwannee Sound region, point and non-point sources of pollution were identified in June and July of 2006. Bacteriological and environmental data were collected at 50 stations over the course of 68 sampling trips during winter harvesting seasons between January 1997 and October 2005, with fecal coliform levels ranging from moderate to high. Data was collected at 50 stations during 82 sampling trips during the spring/summer harvesting seasons between February 1997 and September 2005, excluding June, July, August – season is closed, with fecal coliform levels ranging from low to high. It was established that fecal coliform levels vary seasonally, with tidal fluctuations, and with rainfall. The rising level of the Suwannee River introduces fecal coliform into Suwannee Sound, and numerous creeks in the area have potential to introduce fecal coliform to the region (Kuhman, 2007). It is imperative to continue monitoring water quality in the Suwannee to determine future management needs and to ensure the success of the shellfish industry.
- *Steinhatchee* - From September 1992 to January 1993, bacteriological and environmental data were collected at 35 sites in the Steinhatchee River region. The Big Bend Gulf Coast District office and Department of Natural Resources, SEAS conducted these surveys to identify, record, and evaluate point and non-point pollution sources. Potential point and non-point pollution sources were identified, and it was determined that stormwater runoff pollution from urban and agricultural sources is likely in the Steinhatchee River (Smith, 1993). Septic tank discharge could also be a potential source of pollution (FDNR, 1989). Fecal coliform levels varied among the sampled locations, and statistical analyses showed significant associations between fecal coliform levels and rainfall (Smith, 1993).

Optical Water Quality Monitoring Using Remote Sensing

In 2010, BBSAP was subcontracted by FWC to collect optical water quality data and estimates of seagrass abundance and occurrence in the Big Bend region. This data will be used to validate remote sensing algorithms developed by USF to estimate water clarity, turbidity, chlorophyll *a* concentrations and absorption of colored dissolved organic matter from satellite Moderate Resolution Imaging Spectroradiometer (MODIS) imagery. The project will enhance protection of Big Bend seagrasses by developing tools to support the TMDL program for nutrients in the Suwannee River estuary. The project aims to support and assess the development of a numeric transparency criterion for Florida coasts by evaluating its effectiveness in the Big Bend region waters.

Seagrass Monitoring

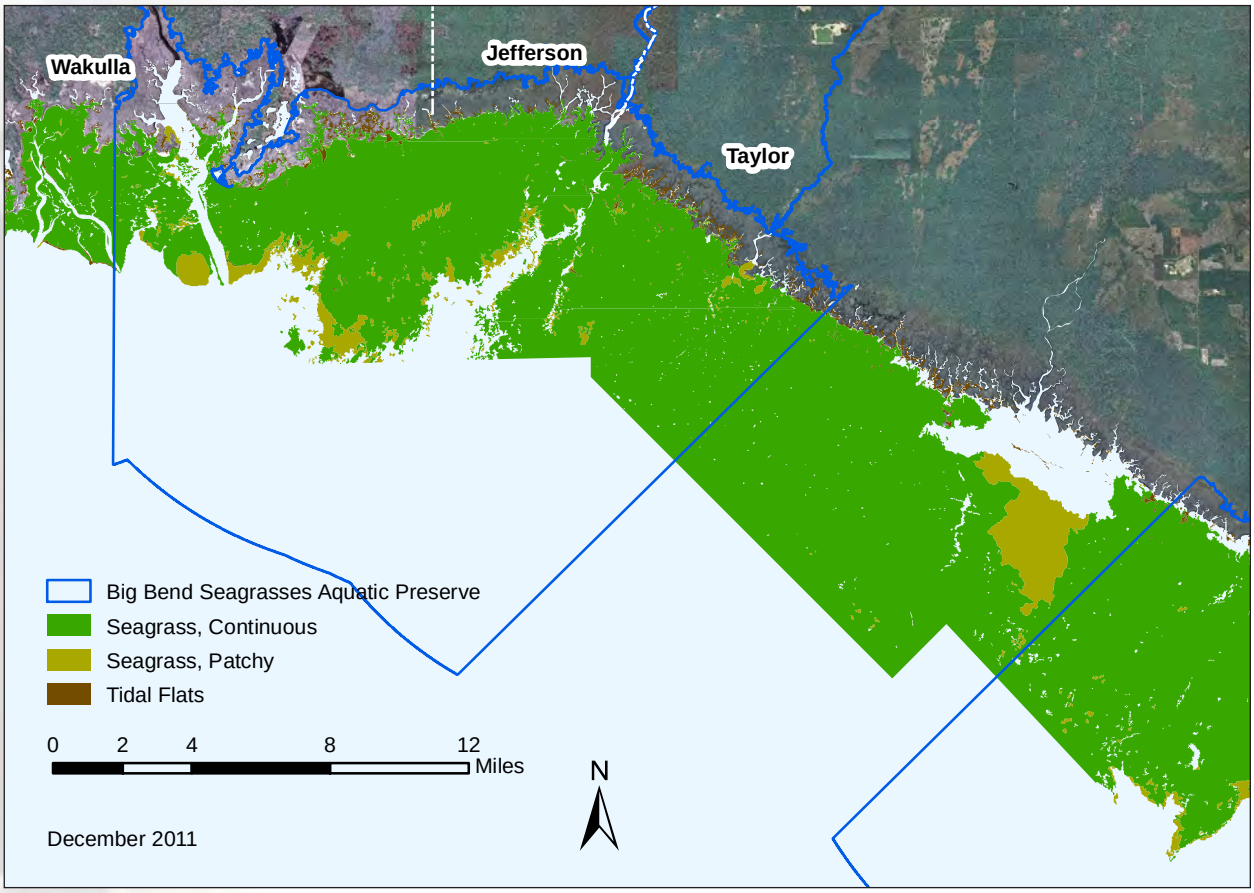
BBSAP is comprised of mostly rural and undeveloped coastal habitats. "The low wave energy and shallow depths combined with low sediment loads and generally high contributions of clear groundwater from the Floridan aquifer system in the rivers draining to the region, create a physical environment highly conductive to the survival and growth of seagrasses in the Big Bend" (Mattson, 2000). These pristine and relatively undisturbed waters make ideal habitat for seagrasses. Within BBSAP is one of the largest contiguous seagrass beds on the Gulf Coast. There are six different types of seagrasses found in BBSAP: shoal grass turtle grass, manatee grass, star grass (*Halophila engelmanni*), paddle-grass (*H. decipens*) and widgeon grass. Distribution of these grasses is largely dependent upon water clarity, water depth, and salinity. BBSAP boundaries span approximately 150 miles, from the Withlacoochee River in Levy County to the St. Marks River in Wakulla County. Seagrass beds are highly productive ecosystems that support an abundance of fish and invertebrate species. Seagrass meadows make an ideal nursery for many of these creatures by acting as a food source and providing cover from larger predators. The Big Bend region of Florida is especially important for commercial and recreational fisheries. The seagrass beds in this region provide vital habitat that is host to many sport fish such as redfish, speckled sea trout and grouper. Commercial usages include stone crab, blue crab, oysters, shrimp and mullet. "The Big Bend region accounts for between 25% and 33% of the total commercial blue crab landings in Florida and supports the largest recreational scallop fishery in the state" (Mattson, et al., 2007). "Approximately 2.2 million acres of seagrass have been mapped in estuarine and nearshore Florida waters, and they provide ecological services worth over 40 billion each year" (Carlson and Yarbro, 2009).

Coastal dredge and fill activities, shoreline and watershed development, drainage alterations, and changes in stream and river flow, and vessel propeller scarring contribute to seagrass distribution and composition changes and loss. When seagrass habitat loss occurs, there are also other resource impacts associated with the loss, such as decreased water quality and decreased refuge and the

availability of food. The ultimate consequence of seagrass habitat loss is alterations in the food chain which lower availability of commercial and recreational fish and shellfish which directly affects the general public. Most of the early losses of seagrasses in Florida were caused by dredge and fill activities. In Florida, 60,000 acres of estuarine habitat have been filled (Durako et al., 1985). Even if the fill is not placed directly on top of seagrass beds, mortality may result from increased water turbidity. Unconsolidated particles of fill may be continually re-suspended into the water column, inhibiting re-colonization by seagrasses. Excessive nutrients from point and non-point pollutants can cause phytoplankton blooms or dramatic epiphytic algal growth, which may shade seagrasses causing a reduction of productivity and eventual loss. Vessel propeller cuts directly reduce aerial coverage of seagrass beds. Since primary reproduction by seagrasses is via rhizomes, re-colonization of disturbed areas is relatively slow or nonexistent depending on the degree of impact.

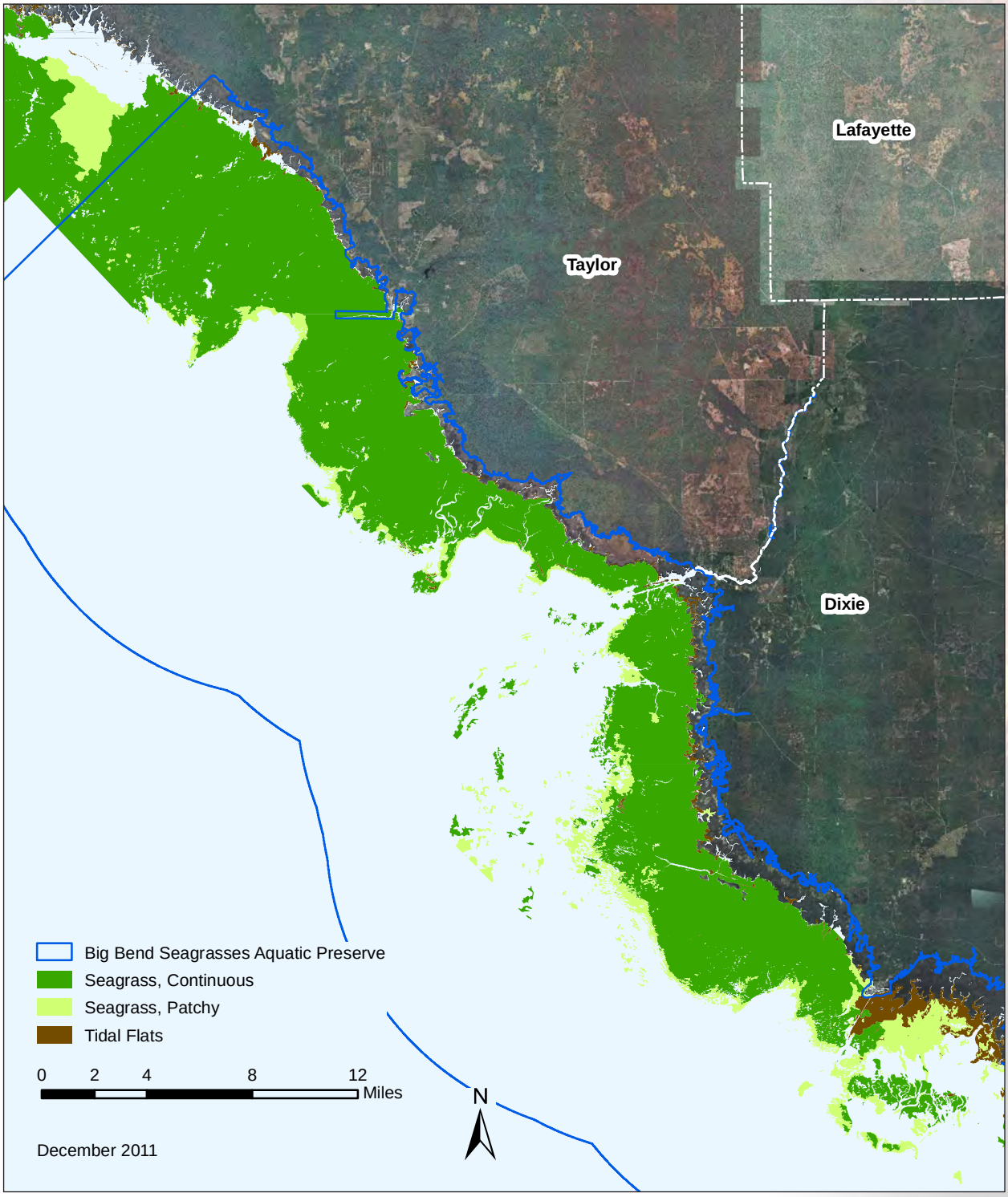
As BBSAP's shallow estuarine waters become impacted by development it is important to collect baseline conditions within BBSAP for post impact comparisons and to identify any habitat restoration or watershed management activities. BBSAP's seagrass and water quality data provides helpful information which can be used to help address management issues of the resource. In 2000, BBSAP began monitoring 25 seagrass sites in Steinhatchee. In conjunction with water quality monitoring, the data being collected can be used to determine the overall health of these highly diverse ecosystems. This information can also be used to determine species composition, abundance and distribution of seagrasses within a particular area. The Braun-Blanquet study method is used for measuring the submerged aquatic vegetation (SAV). This involves identifying all vegetative species represented and percent coverage within a one meter square "quadrat." Presence or absence of scallops and urchins, epiphyte densities, sediment type and sediment depths is also collected. Cores are taken at randomly selected sites to measure above and below ground biomass. The seagrass cores are processed in a lab to identify species, measure blade lengths and for weighing dry biomass. In 2006, BBSAP expanded its seagrass monitoring program to include the areas of Cedar Key and St. Marks, totaling 75 stations throughout the Big Bend. A seagrass sled has also been a useful tool for collecting video footage of transects up to two miles in length.

The majority of BBSAP has depths of 30 feet or less, so favorable habitats for the three prominent species - turtle grass or manatee grass and shoal grass exist. At 30 feet or so, two other species, star



Map 22 / Seagrass habitat in the upper region of Big Bend Seagrasses Aquatic Preserve.

grass and paddle-grass, become the dominant seagrasses. These species are especially adapted to the low light levels and are found down to at least 98 feet and 22 miles offshore, well outside of BBSAP boundaries (Woodward-Clyde Consultants and Continental Shelf Associates, Inc., 1985). *Turtle grass* is the largest, most dense and most abundant of the seagrasses in the Big Bend meadows. Its blades reach lengths up to 30 inches and widths of 0.5 inches. The rhizome growth can reach 0.4' in diameter and can grow six inches below surface sediments. The roots are intricate and form extensive networks which stabilize the sediments for further seagrass bed growth (Zieman & Zieman, in press). Manatee grass is second in size (30 inches by 0.08 inches), density, and abundance and has cylindrical leaves which are brittle and buoyant. These long, thin blades are readily broken off and exported to other areas by winds and currents adding to the detrital food base in other areas. Turtle grass and manatee grass, together make up the greatest coverage of submerged grasses in BBSAP (Zieman & Zieman, in press).

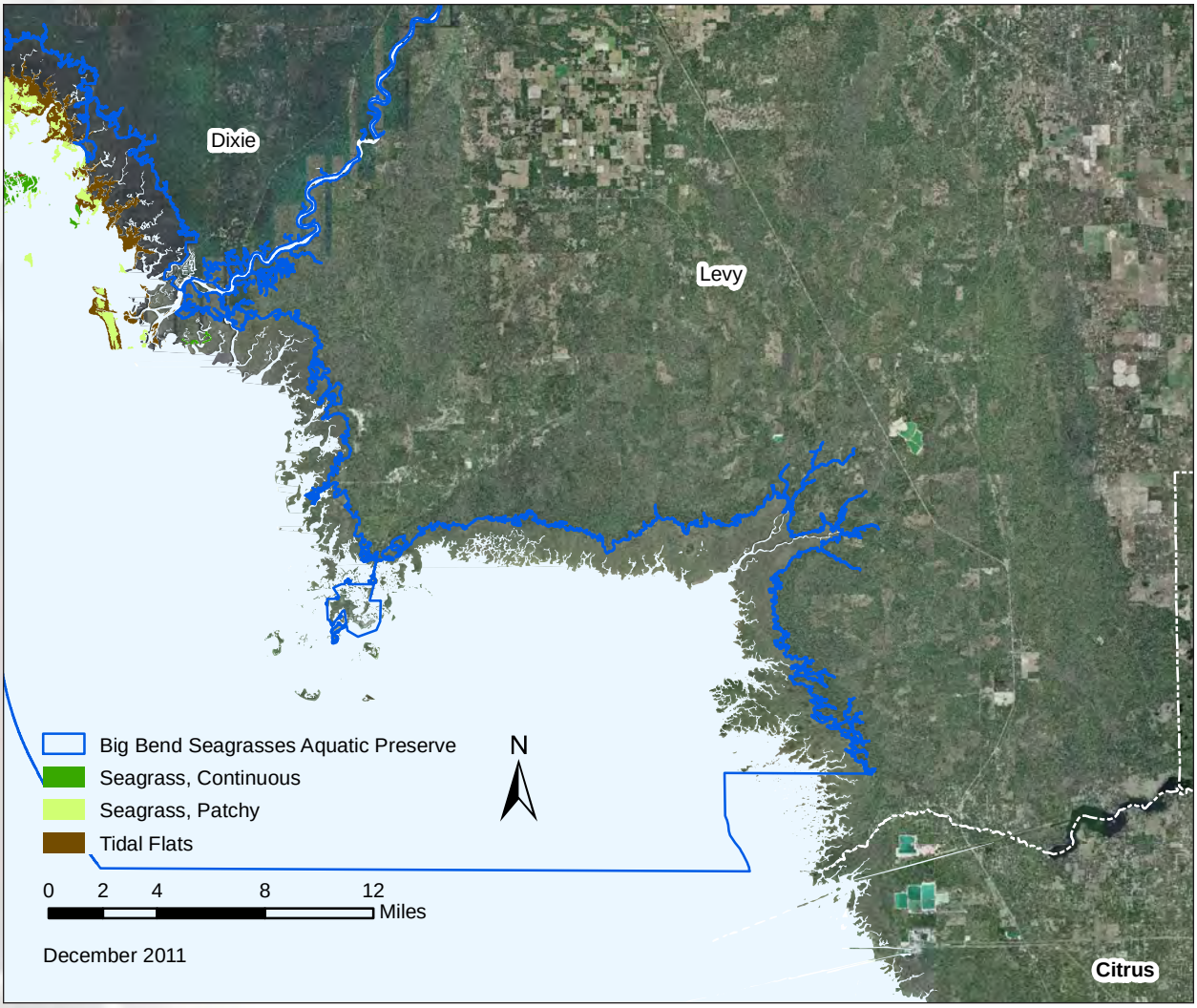


Map 23 | Seagrass habitat in the middle region of Big Bend Seagrasses Aquatic Preserve.

Shoal grass, which has narrow, short leaves (.04 inches by 6 inches) and shallow root system, is thought to be a pioneer species in succession in the development of grassbeds in the Gulf (Continental Shelf Associates, Inc., 1985). It is more tolerant of low salinity than both turtle grass and manatee grass. In the Big Bend area, shoal grass is the only species found in intertidal shallow waters where it is repeatedly exposed to the atmosphere during low tide. It is also dominant in the deeper regions where turtle grass and manatee grass are not abundant (Zieman & Zieman, in press). The sixth species of seagrass, widgeon grass, is a euryhaline freshwater angiosperm found in the Big Bend area and is confined to low salinity areas such as the river mouths of the Econfina and Suwannee rivers (Iverson & Bittaker, 1986). Since widgeon grass can be found in shallow estuarine waters, it is an important food source for many wading and migratory birds.

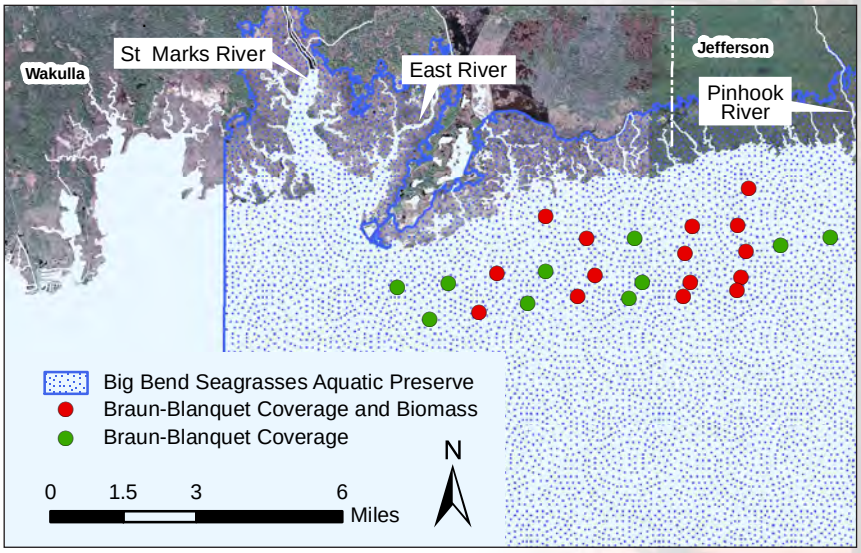
Although seagrass meadows can be found throughout the Big Bend region of Florida, species distribution, density and the overall health of the beds can be affected greatly by water quality and quantity. Seagrasses need sunlight in order for photosynthesis to occur. Particulate matter and high levels of chlorophyll *a* suspended in the water column can affect the amount of light attenuation in a particular area. The affects of color can be seen by comparing two different areas in the Big Bend. The waters around Cedar Key tend to be brownish in color and therefore do not transmit light as effectively as the waters around Steinhatchee, which tend to be very clear. Due to water clarity and water depth, the seagrasses around Cedar Key are predominantly sparse beds of shoal grass, which tend to be more tolerant of low light conditions than other seagrasses. Turtle grass beds can also be found in the waters around Cedar Key on shallow flats and shoals, where the light attenuation is less due to the shallow bathymetry. By comparison, the clear waters around Steinhatchee support dense turtle grass and manatee grass beds at much greater depths.

In collaboration with other state agencies, FWC collected data from existing monitoring inventories and mapping databases to create more accurate estimates on spatial coverage and species composition of seagrasses for the Seagrass Integrated Mapping and Monitoring (SIMM) program (http://myfwc.

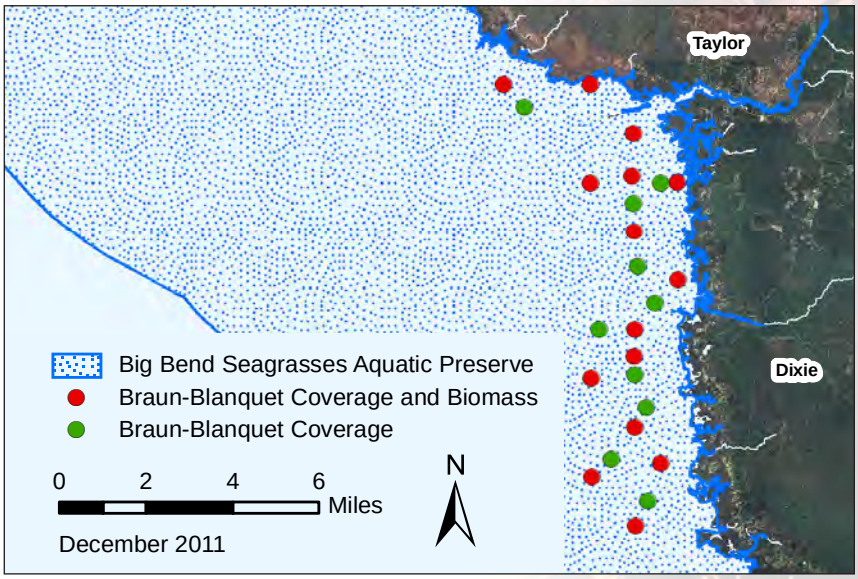


Map 24 / Seagrass habitat in the lower region of Big Bend Seagrasses Aquatic Preserve.

com/research/habitat/seagrasses/publications/simm-report-1/). This program aims to integrate seagrass mapping and monitoring across Florida. There are approximately 2.2 million acres of seagrasses that have been mapped in Florida's coastal waters (Carlson and Madely, 2007). The entire Big Bend region, which includes areas outside of BBSAP, contains approximately 612,064 acres of mapped seagrass habitat. This estimate does not include the deep water seagrass acreage, which is unknown due to the technical difficulty of mapping these optically deep areas. Big Bend has the potential to have approximately 3.5 million acres of seagrass. There is approximately 33,625 acres of seagrasses in the areas between Suwannee Sound, Cedar Key and Waccasassa Bay, 72% of this acreage occurs in Waccasassa Bay. Seagrass stressors include nutrients, phytoplankton, and turbidity. The hurricanes of 2004 and 2005 increased these stressors, but since that time they have diminished to background conditions. There are approximately 56,146 acres of seagrasses north of the Suwannee River up to the Steinhatchee River. Seagrass beds in this area are more continuous than Suwannee Sound, but total acreages have been in decline for over 25 years. Seagrass species composition appears to be declining, seagrass meadow texture is fragmenting, and there is an overall declining seagrass trend. Stressors include increase in nutrients, phytoplankton and turbidity. The losses between the 2001 and 2006 mapping efforts can be attributed to declining water clarity from Suwannee River discharges and hurricanes. Seagrass loss was greatest west of Horseshoe Beach. There is also localized propeller (prop) scarring in the area around Horseshoe Beach.



Map 25 / Seagrass monitoring sites in St. Marks.



Map 26 / Seagrass monitoring sites in Steinhatchee.

The northern region contains approximately 149,140 acres and extends north of the Steinhatchee River to the mouth of the Ochlocknee River in the west. Seagrass beds in this region appear to be stable, but seagrass bed fragmentation is a concern. There is localized prop scarring in St. Marks, Keaton Beach and Steinhatchee. Stressors include increased nutrients, phytoplankton, and turbidity. These stressors where elevated during hurricanes in 2004 and 2005, but have returned to background levels since these storm events. (Please refer to the link, http://myfwc.com/research/habitat/seagrasses/publications/simm-report-1/, for all SIMM reports for the state of Florida.)

In addition to the seagrass monitoring program, staff is working to educate the public on the importance of seagrasses and why this critical habitat needs protection. Kiosks containing information about BBSAP, seagrasses, and prop scarring, have been placed at boat ramps throughout BBSAP. The signs promote seagrass awareness and the importance of poling in shallow water to avoid prop scaring.

Mapping

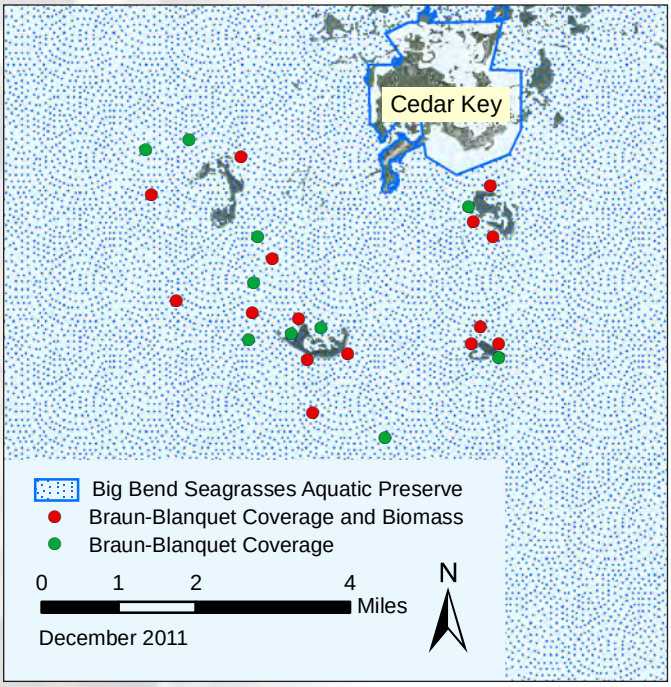
Geographical/Geospatial Information Systems (GIS) technology is a valuable tool that allows natural resource managers to better assess the resources they are responsible for managing. GIS technology provides managers with detailed information on the current extent, condition and management needs of

resources, which facilitates the protection of Florida's aquatic preserves. As natural resource managers, there is always a need for current and accurate GIS data layers and maps to effectively assess BBSAP resources. Mapping products allow for the identification of areas within BBSAP where increased management emphasis is necessary. The maps are not only to inform resource managers as to the coverage and extent of resources, such as seagrass beds, oyster reefs, etc., but also may be used by the regulatory, research, and recreational communities. Precise bathymetric and submerged resource maps also provide valuable information for regulatory decisions on dredging, filling and construction.

In 2010, BBSAP secured a Coastal Zone Management grant to map submerged resources in coastal Taylor County from just north of Dekle Beach south to Grassy Island. This area was chosen because of major comprehensive land use changes and large developments that are currently moving forward and proposed. The extensive shallow seagrass beds have the potential to be directly and indirectly impacted as a result. BBSAP should re-map this area using compatible methodologies once the land use changes have occurred.

4.2 / The Resource Management Program

The Resource Management Program addresses how FCO manages BBSAP and its resources. The primary concept of BBSAP 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 it has direct management responsibility, and by influencing the activities of others within and adjacent to its managed areas and within its watershed. Watershed and adjacent area management activities, and the resultant changes in environmental conditions, affect the condition and management of the resources within the boundaries. FCO managed areas are especially sensitive to upstream activities affecting water quality and quantity. FCO works to ensure that the most effective and efficient techniques used in management activities are utilized consistently within its sites, throughout its program, and when possible, throughout the state. The strongly integrated Ecosystem Science, Education and Outreach and Public Use 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. BBSAP also collaborates with these groups by reviewing various protected area management plans. The sound science provided by the Ecosystem Science Program is critical in the development of effective management projects and decisions. The nature and condition of natural and cultural resources within BBSAP are diverse. This section explains the history and current status of our resource management efforts.



Map 27 / Seagrass monitoring sites in Cedar Key.

4.2.1 / Background of Resource Management at Big Bend Seagrasses Aquatic Preserve

Over the past decade, BBSAP's Resource Management Program has grown and expanded due to an increase in staffing and funding. Water quality and seagrass monitoring programs were developed in house and in conjunction with other agencies and research entities to support resources management activities. Today, many of the resource management needs have remained the same and include evaluating and documenting any changes or impacts to resources and habitats of BBSAP. Resource management activities have focused on both the impacts of an individual action, as well as the cumulative impacts of all changes and actions on the natural system (DEP, 1997a). BBSAP staff have been responsible for reviewing and commenting on proposed environmental regulatory permits, Minimum Flows and Levels, TMDLs, land acquisition projects and adjacent state lands management reviews. Staff provides technical support to other land managers and regulatory authorities on a regular basis such as, conducting field assessments, making comments and recommendations to

appropriate agencies, ensuring consistency with all established rules and regulations, notifying the appropriate regulatory agencies of violations and illegal activities. Maintaining good communication between all local, state, and federal environmental regulatory agencies is essential to protecting the resources of BBSAP.

Protection of adjacent lands is one of the best ways to protect BBSAP resources. A tremendous effort has been made by state, federal, and other entities to purchase lands adjacent to BBSAP. Land managers and conservation groups continue to evaluate and purchase priority parcels adjacent to BBSAP.

4.2.2 / Current Status of Resource Management at Big Bend Seagrasses Aquatic Preserve

Staffing and Management Strategic Approach

Currently, BBSAP has one select exempt employee serving as manager, two full time equivalent (FTE) field positions, and one FTE administrative position. These four staff members manage BBSAP and St. Martins Marsh Aquatic Preserve that together total almost one million acres of submerged lands. Due to the extremely large acreage of BBSAP and limited program resources, preserve staff work with many different stakeholders to protect and restore resources of BBSAP. Staff often partners with other land managers, agencies, and researchers to accomplish many resource management goals within BBSAP. BBSAP strives to be efficient as possible and shares resources such as staff time, grant funding, vessels, and equipment to accomplish a common goal.

The management strategy for pristine areas like BBSAP is usually proactive and preventative rather than reactive. Currently, there is little restoration needed in BBSAP and the emphasis is placed on preventing new damage that may occur with increase development and resource use. The current status of resource management programs within BBSAP as well as future needs are described in the following sections.

Permitting, Enforcement, and Mitigation

BBSAP staff regularly provides technical support to many local, state, federal entities. These include: Northwest DEP, Northeast DEP, and Southwest DEP regulatory districts; DEP's Bureau of Mining and Minerals Regulation; DEP's Energy Siting Office; DEP's Bureau of Beaches and Coastal Systems; Northwest Florida Water Management District, SRWMD, and Southwest Florida Water Management District; FWC; EPA, and the Federal Energy Regulatory Commission.

BBSAP often assist regulatory agencies in the form of providing permit application review and comments, mitigation planning, and public interest project options. Since regulatory staff turnover is quite high and BBSAP spans many different districts, it is a challenge for BBSAP staff to maintain good communications and cooperative relationships with regulatory staff. BBSAP staff is often relied on as a source of information on submerged resources and the possible impacts to ecosystem function from a proposed project. Staff meets with environmental regulatory permitting staff on a quarterly basis and as needed for field site inspections and pre-application meetings. BBSAP along with other DEP training staff provides materials and training to regulatory staff which ensures consistent permitting and application of Chapter 18-20, Florida Administrative Code. BBSAP staff will continue to work with regulatory agencies and decision makers to ensure proper avoidance and minimization of impacts is conducted to protect water quality and resources of BBSAP.

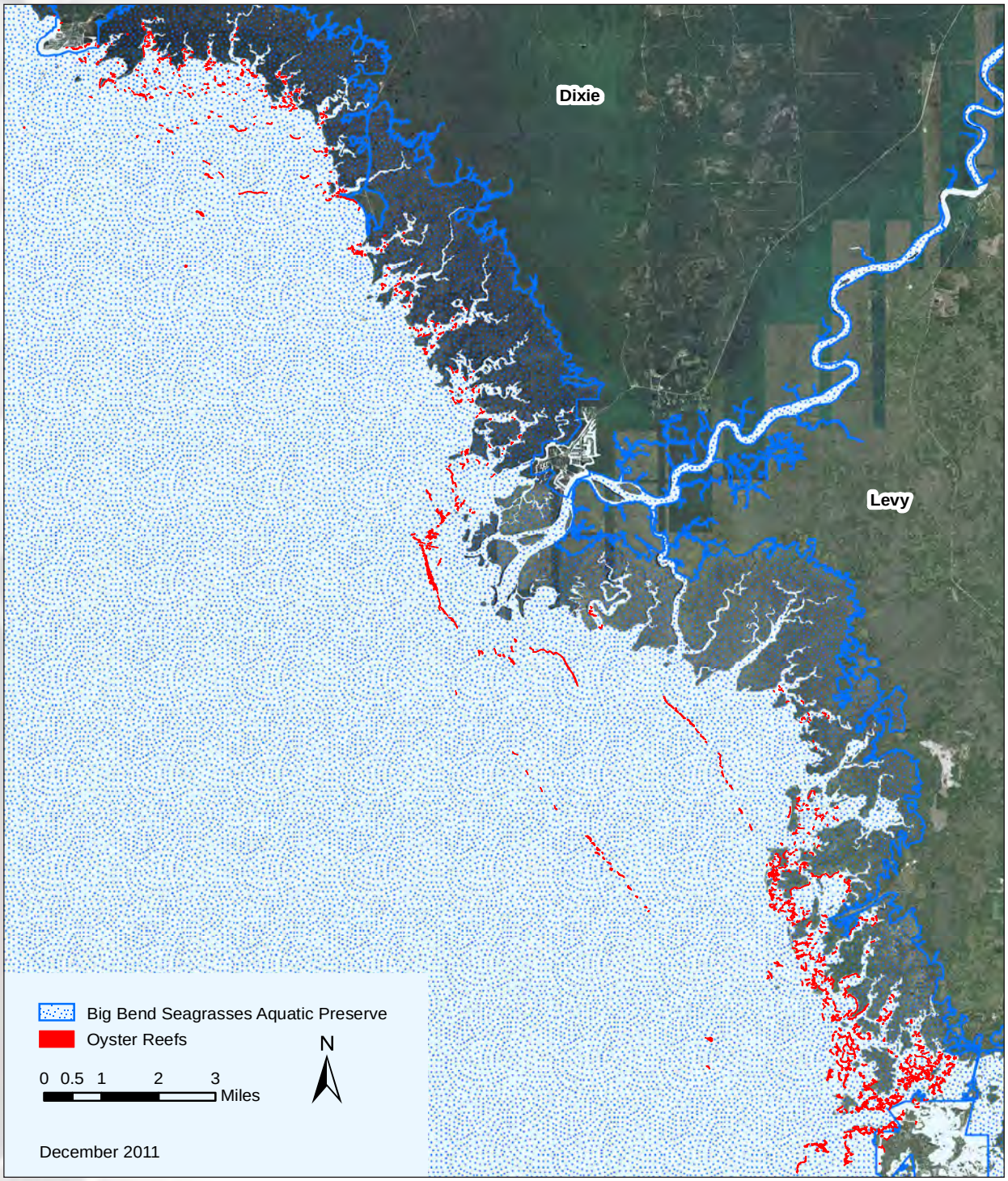
Habitat Restoration/ Enhancement

The Society for Ecological Restoration defines ecological restoration as an "intentional activity that initiates or accelerates the recovery of an ecosystem with respect to its health, integrity and sustainability." Restoration activities should reestablish the ecological integrity of degraded ecosystems including structure, composition, and the natural processes of biotic communities and the physical environmental. Ecosystems with integrity are self-sustaining and resilient natural systems that are able to accommodate stress and change. Restoration activities should be designed to achieve ecological integrity at the greatest extent that is practical under current environmental conditions and limitations. An important step in any restoration project is to identify the causes of degradation and eliminate or remediate those causes. Restoration efforts are likely to fail if the sources of degradation persist. Early in the planning stage, it is important to identify if the restoration project is scientifically, financially, socially, and ecologically feasible to ensure that limited fiduciary resources are used in the most appropriate manner and to increase the probability of success. Restoration projects must have clear, measurable and achievable goals to 1) help guide project implementation activities and 2) provide the standard for measuring project success. Each restoration project presents a unique set of environmental conditions, variables and project goals (EPA, 2012). Therefore, it is important to evaluate each project on a case by case basis.

Oyster Reef

DACS conducts shell or “cultch” planting, as well as oyster relaying and transplanting which are important resource management tools for maintaining and enhancing productive oyster habitat. Depositing processed oyster shell on depleted oyster reefs and suitable bay bottom areas has been a state managed habitat restoration practice since 1913. This practice provides resource managers within DACS the opportunity to mitigate resource losses, to enhance productivity, and to contribute direct economic benefit to the oyster fishery. Reef construction and enhancement activities are located in Florida’s historically productive estuaries. This program relies heavily on hard clam shell contributions from local shellfish processing plants.

Significant acreage of productive oyster reefs in the Big Bend region are located in waters where harvesting for direct-to-market sale is prohibited to prevent public health problems associated with



Map 28 / Oyster habitat in Big Bend Seagrasses Aquatic Preserve.

actual or potential pollution. Resource development projects called “relaying” take advantage of the oysters’ ability to cleanse itself of contaminates (depurate) and offer a practical means to use a previously debilitated resource, making them safe for human consumption. Additionally, there are abundant stocks of juvenile oysters that grow on intertidal oyster bars. These intertidal oyster reefs are exposed at low tides, often limiting their ability to grow to legal size. Oysters which are moved from the poor growing intertidal areas are able to recover and take advantage of less stressful growing conditions and grow to a legal and marketable quality size in a short time. When seed oysters are transplanted in the summer, harvesting may begin the following season and continue as oysters grow to market size. Relaying and transplanting activities are often conducted as cooperative management programs between DACS and local oystermen’s associations.

Shoreline Restoration

Extreme high tides, wave actions, strong currents, human impacts and storm events can all contribute to shoreline erosion. Storm surge and wave activity from hurricanes can have devastating erosive effects along beaches and sparsely vegetated shorelines. Also, human impacts such as bulkheads or seawalls can be poor dissipaters of wave energy. This can cause scouring of the bottom beneath seawalls and accelerated erosion, adjacent to seawalls. The use of environmentally friendly practices such as rip rap, vegetative planting and biologically manufactured logs have shown success in stabilizing eroding shorelines. Restoring and preserving shorelines is necessary for the protection of critical habitat that is home to much of Florida’s wildlife. Landowners and volunteers alike can all play a role in keeping Florida in its natural state. Planting natural vegetation along shorelines can help prevent erosion, improve water quality, and improve access to the water. Along with the aesthetic appeal, natural vegetation also creates habitat for animals like wading birds, migratory birds, fish, and crabs (NWFWMD, 2000). BBSAP is a supporter of “Living Shorelines Initiative” that is sponsored by the U.S. Fish and Wildlife Service (FWS) to help educate the public on ecologically beneficial shoreline restoration practices.

Seagrass Restoration

BBSAP is located in one of the most undeveloped parts of Florida and contains the second largest seagrass bed in the United States. In recent years the loss of seagrass in the Gulf of Mexico has become a serious concern to resource managers. Therefore, seagrass management and protection has been a primary focus of BBSAP’s management program. Seagrass declines due to stormwater, nutrification, sedimentation, shading, prop scarring, and dredging practices are potential factors that contribute to direct, secondary, and cumulative impacts in BBSAP. Recovery and restoration time is different for each seagrass species and depends on growth rate, hydrological/water quality conditions, and sediment characteristics. To date, BBSAP has not completed any seagrass restoration projects in Big Bend although staff have completed one prop scar restoration project on St. Martins Marsh Aquatic Preserve which will serve as a basis for future prop scar restoration efforts.

Invasive Exotic Removal and Treatment

Invasive plants degrade and diminish Florida’s conservation lands and waterways. Some invasive aquatic plants pose a significant threat to human welfare by impeding flood control and affecting recreational use of waterways and its associated surrounding economy. The FWC Invasive Plant Management Section is the lead agency in Florida responsible for coordinating and funding statewide programs controlling invasive aquatic and upland plants on public conservation lands and waterways throughout the state. The Section’s aquatic plant management program designs, funds, coordinates and contracts invasive non-native aquatic plant control efforts in Florida’s 1.25 million acres of public waters. Currently, the freshwater tributaries within BBSAP contain the most problematic aquatic invasive non-native species. BBSAP does not currently conduct regular treatments of aquatic exotic/invasive plant species, but supports appropriate permitted removal and treatment activities to protect and enhance the natural habitats found within BBSAP.

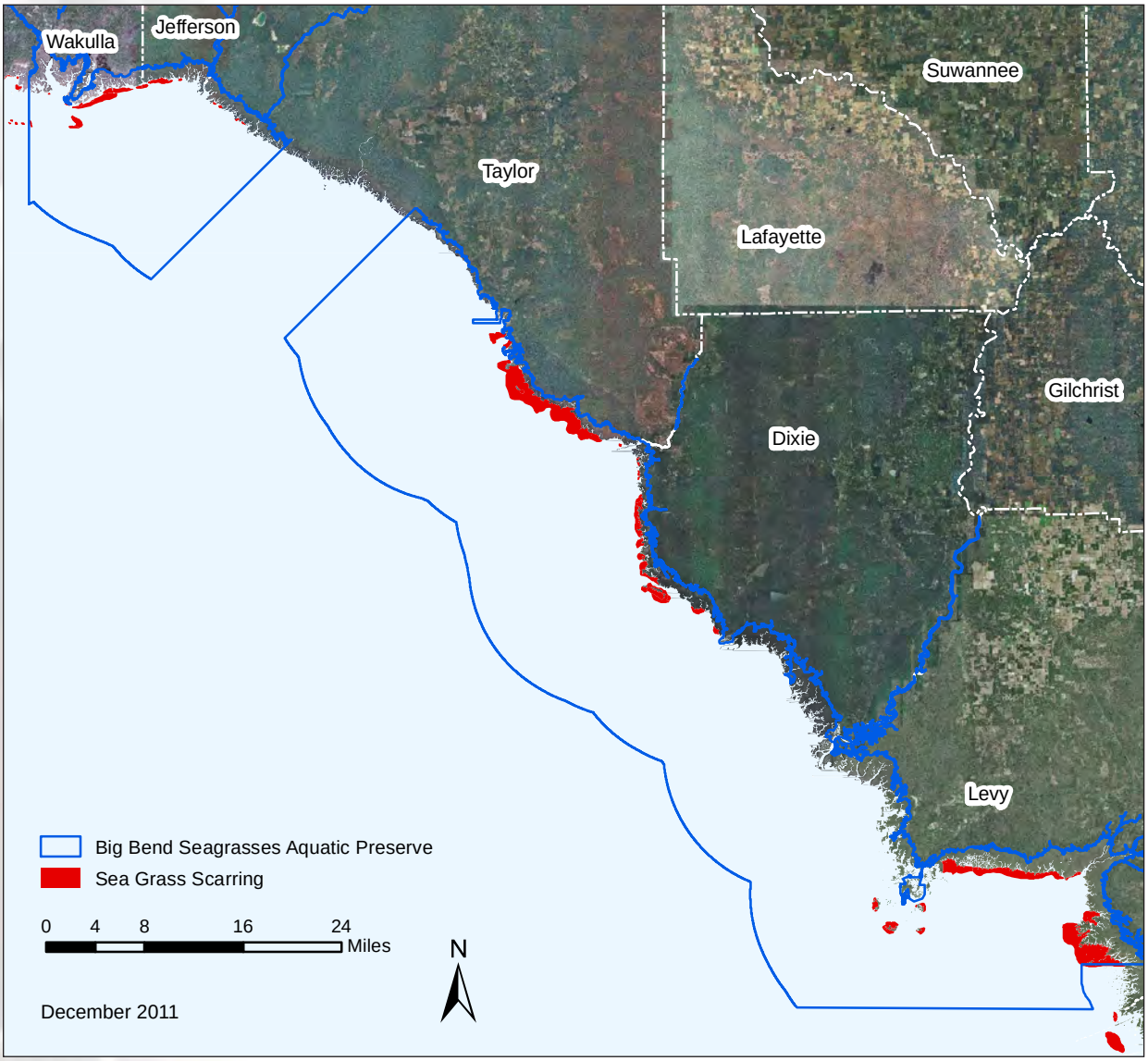
Marine Debris Removal

- In 2008 and 2009, BBSAP partnered with Levy County Soil and Water Conservation District, the Cedar Key Aquaculture Association, Sea Grant, and Suwannee River Partnership on a marine debris removal grant from NOAA titled, “Turning Marine Debris into Oyster Reef Building Blocks through Reclamation of Clam Aquaculture Leases in the Vicinity of Cedar Key, Florida.” Extreme environmental, meteorological, and hydrological conditions associated with an El Niño event in 1998 and hurricanes of 2004 and 2005 greatly impacted the clam aquaculture industry. The soft mesh bags used to grow clam in are placed on the seafloor and during these events the bags became buried and/or moved. This equipment was scattered on farmer’s leases and navigation corridors making the lease areas unusable and the navigation corridors a hazard. Approximately 3,000 derelict clam bags were removed from the leases.

- Lost and abandoned stone crab and blue crab traps have been identified as a problem in Florida's marine environment by various stakeholder groups. Traps that become lost or abandoned "ghost fish" (continue to trap marine organisms until traps degrade enough to allow escape), visually pollute, cause damage to sensitive habitats, and become hazards to navigation. Traps become derelict by several mechanisms including: shifting during storms, making them difficult to locate; they may be snagged by passing vessels and dragged to another area; or they are illegally abandoned by their owners for various reasons. The Big Bend region has blue crab trap closures July 20-29 in odd calendar years. BBSAP staff partner with regional, state and federal agencies to conduct annual blue crab trap cleanup events. The efforts from these partnerships have resulted in the removal of hundreds of derelict traps and thousands of pounds of marine debris from coastal waters.
- Abandoned vessels become derelict vessels quickly and then subject the boating public to safety issues, become locations for illegal activity, illegal housing, opportunities for theft and vandalism and ultimately cost the taxpayers to be removed by local, county or state authorities. Derelict vessels have the potential to discharge waste, gas and oil, and other potentially harmful substances. FWC is charged with the execution of abandoned and derelict vessel removal from pubic waters under 376.15, Florida Statute. BBSAP coordinate with FWC law enforcement to document and remove derelict vessels.

Historical and Cultural Management

According to Gulf Archaeology Research Institute (GARI), at present the greatest threats to coastal cultural resources within FCO's area of management fall into three areas: 1) Damage due to coastal dynamics from storms and hurricanes and surge conditions that overwhelm or disarticulate sites; 2) Looting and illegal

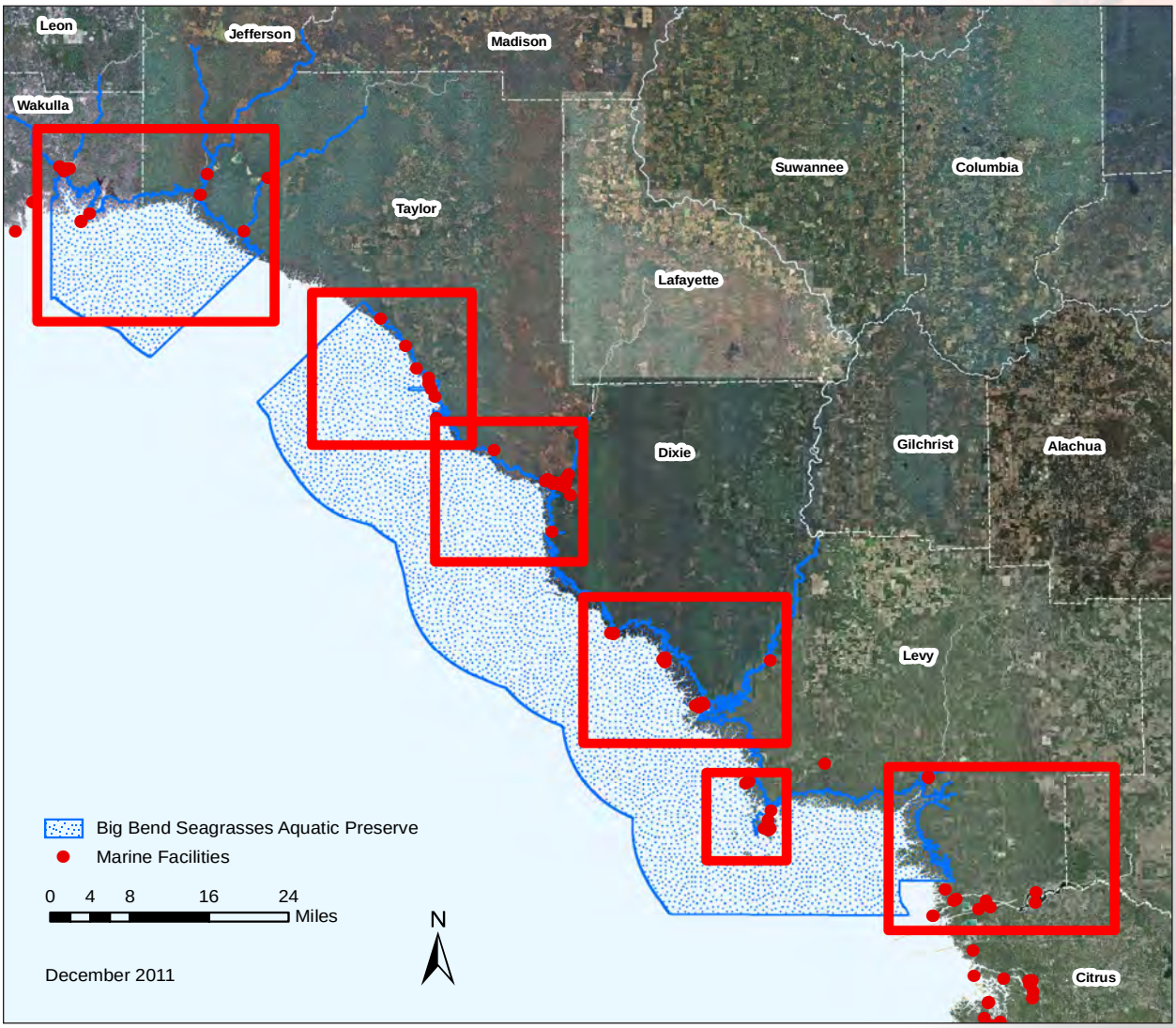


Map 29 / Seagrass scarring in Big Bend Seagrasses Aquatic Preserve.

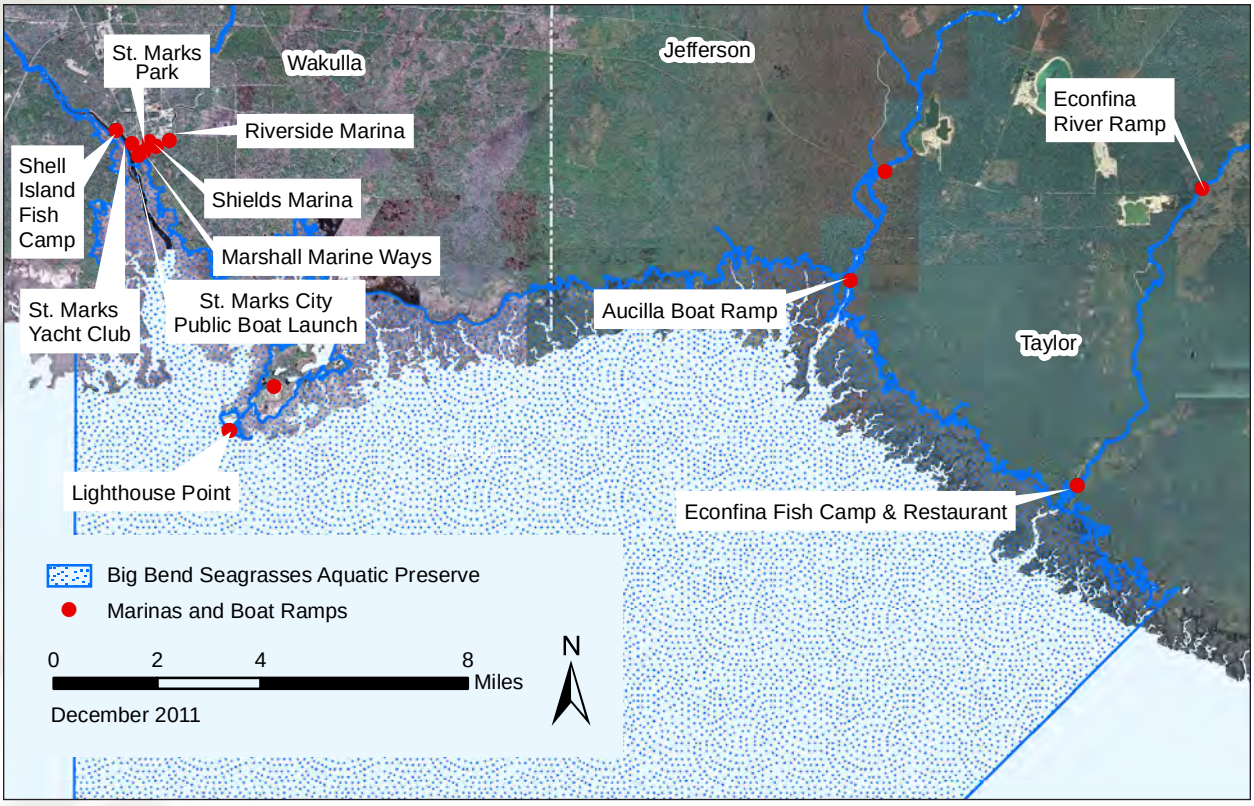
artifact hunting that destroy site contexts and weaken shore and bank lines and island structures; and 3) The affects from coastal oil spills that contaminate or corrupt sensitive archaeological and natural contexts. The west central Gulf Coast including the Big Bend is underlain by karst structures that will present unique problems in protecting and clean-up in the event of oil saturation (GARI, unpublished). The lands managed by BBSAP continue to be affected by sea level rise and the deleterious effects of storm and surge impacts. The dynamic nature of the coast and the fragile nature on the cultural resources inventory, particularly those located on near shore and estuarine contexts, indicates a need to continue the location, evaluation, and protection of prehistoric sites. There are a total of 154 known pre-historic and 13 historic sites within the boundaries of BBSAP. Staff will work with the Department of State's Division of Historical Resources, GARI and Florida Public Archeological Network to protect and identify cultural resources within BBSAP.

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 dissemination 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 Program allow BBSAP to build relationships and convey knowledge to the community, invaluable components to successful management.



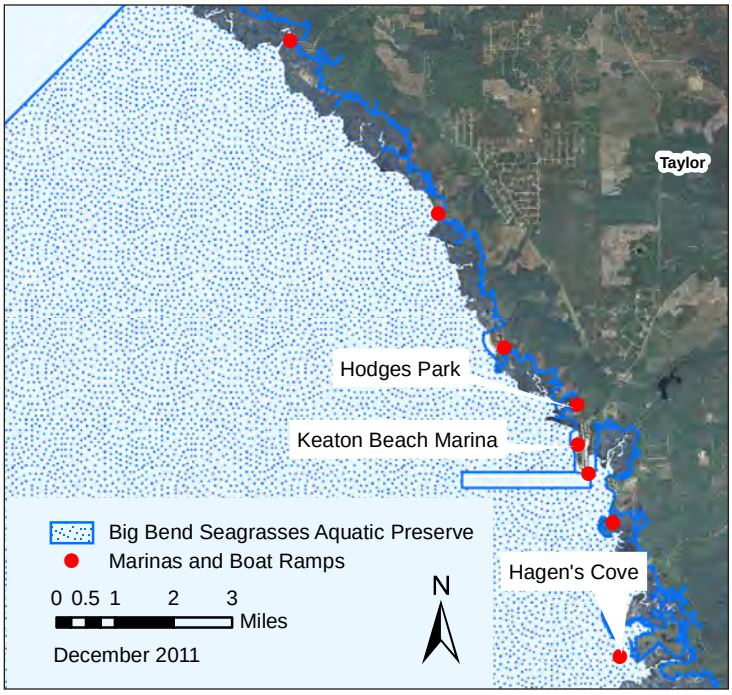
Map 30 / Public access points in Big Bend Seagrasses Aquatic Preserve.



Map 31 / Public access points near St. Marks.

*4.3.1 / **Background of Education and Outreach at Big Bend Seagrasses Aquatic Preserve***

Education and outreach programs conducted by BBSAP are designed to promote the goal of maintaining aquatic preserves at their current level of environmental quality for future generations. Coordinating and participating in education and outreach events proves difficult at times due to a lack of staff, budget, and the immense size of BBSAP. Common target audiences for education and outreach events include: landowners and developers, commercial and recreational resource users, students at all grade levels, organized groups, the general public, and local, regional, and state and federal government agencies. Specific examples of education and outreach activities include: coordinating volunteer networks; providing internships to local students at the Academy of Environmental Science; developing and distributing informational brochures, posters, kiosks, and signage; participating in local events and festivals; conducting lectures; organizing coastal marine debris removal programs, and participating in a variety of workshops and conferences. In the Big Bend region, public events and festivals, constructing kiosks, and publishing brochures, pamphlets and posters are the most effective methods to communicate information about coastal resources. Specific areas of volunteer involvement include, but are not limited to: assisting with field sampling, data entry, routine maintenance, kiosk

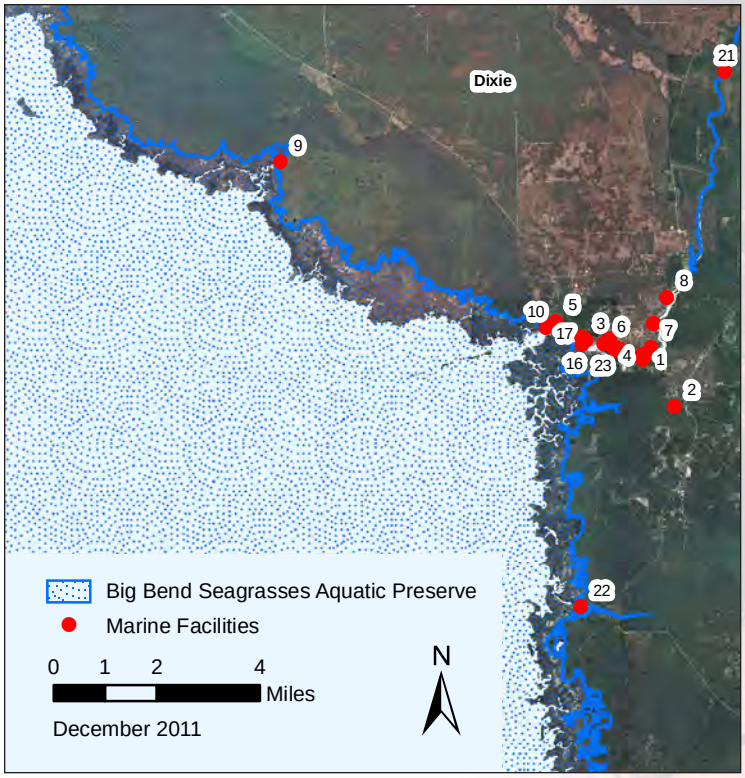


Map 32 / Public access points to Taylor County beaches.

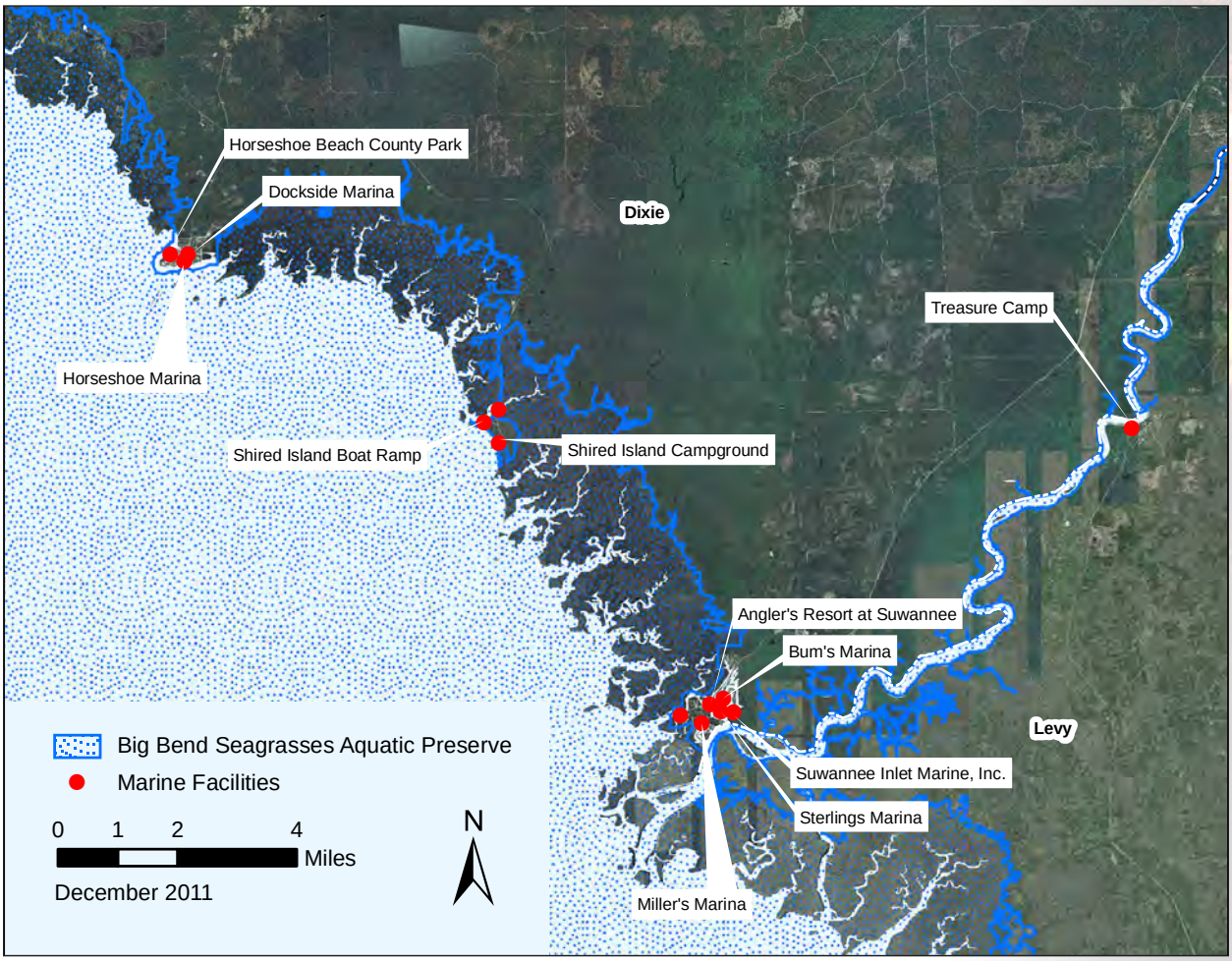
construction and providing support at outreach events.

*4.3.2 / **Current Status of Education and Outreach at Big Bend Seagrasses Aquatic Preserve***

BBSAP strives to provide accurate and comprehendible information about the natural resources within BBSAP to the stakeholders, the general public, and local, state, and federal agencies. As previously stated, the BBSAP office is located in the Crystal River Preserve State Park visitor center. In addition to the existing park exhibits in the visitor center, staff have created displays about BBSAP, provide and supply information relevant to BBSAP, and continually show a video, "Living Waters: Aquatic Preserves of Florida," that focuses on many important aspects of aquatic preserves in Florida. Staff distributes many informational brochures and flyers about BBSAP and FCO; furthermore, BBSAP utilizes brochures borrowed from other



Map 33 / Public access points near Steinhatchee.



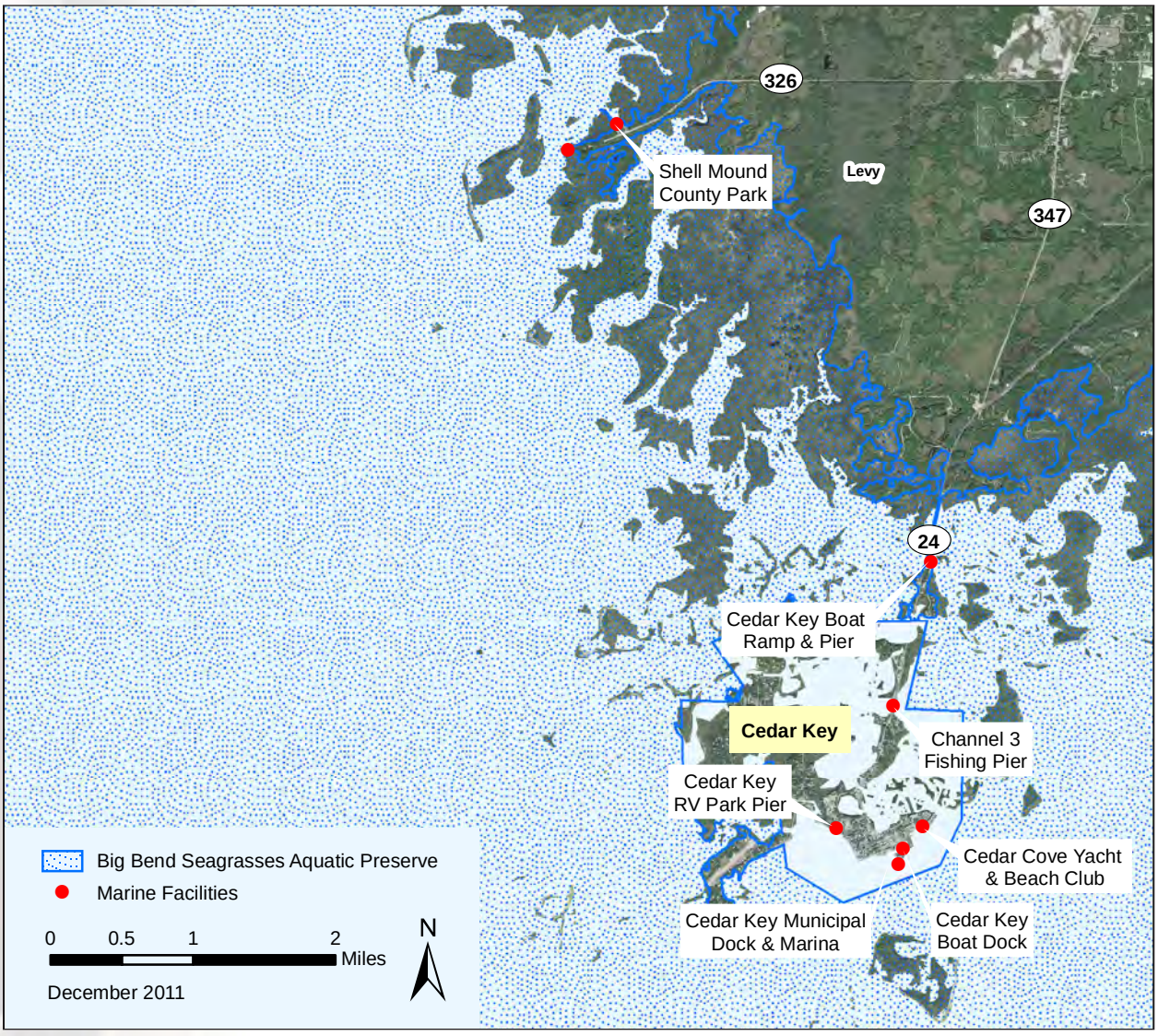
Map 34 / Public access points in Dixie County.

agencies (FWC, U.S. Coast Guard, etc.) to disseminate information about many of the organisms, habitats, and resources within BBSAP (ex. seagrasses, mangroves, etc.) at the visitor center and at regional events, workshops, and meetings. Due to the overwhelming size of the Big Bend region. BBSAP staff relies upon these documents to provide information to stakeholders locally and across the region.

In addition to informational pamphlets and brochures, staff has also installed informational kiosks throughout the Big Bend; more specifically, kiosks have been placed at the boat ramp at the mouth of the Withlacoochee River, the Keaton Beach boat ramp, the St. Marks Lighthouse boat ramp, and the Cedar Key Marina, with other locations being planned for the future. Staff has worked with other agencies and local governments to install signage in the Big Bend area, providing important information regarding BBSAP, boater safety, recreational issues, and protecting seagrasses and other habitats.

Staff attends local and regional meetings and working groups to present and disseminate relevant information, such as data trends in water quality, about BBSAP, focusing on the protection, preservation, and enhancement of the environment and encouraging sound decision-making regarding land use and natural resources. Additionally, staff participates in a variety of local events that promote environmental protection and resource conservation; these include, but are not limited to: Coastal Cleanup, Seagrass Awareness Month, Save Our Waters Week, Crystal River Preserve State Park's Earth Day Celebration, Crystal River Refuge Day, FWC's Kid's Fishing Clinic, and many others.

Each fall and spring, BBSAP offers internships to high school seniors at the Academy of Environmental Sciences, located in Crystal River. These students are given the opportunity to work alongside BBSAP staff, gaining experience and knowledge in the field of resource management. Interns are encouraged to become involved with as many projects as possible, including water quality monitoring, seagrass

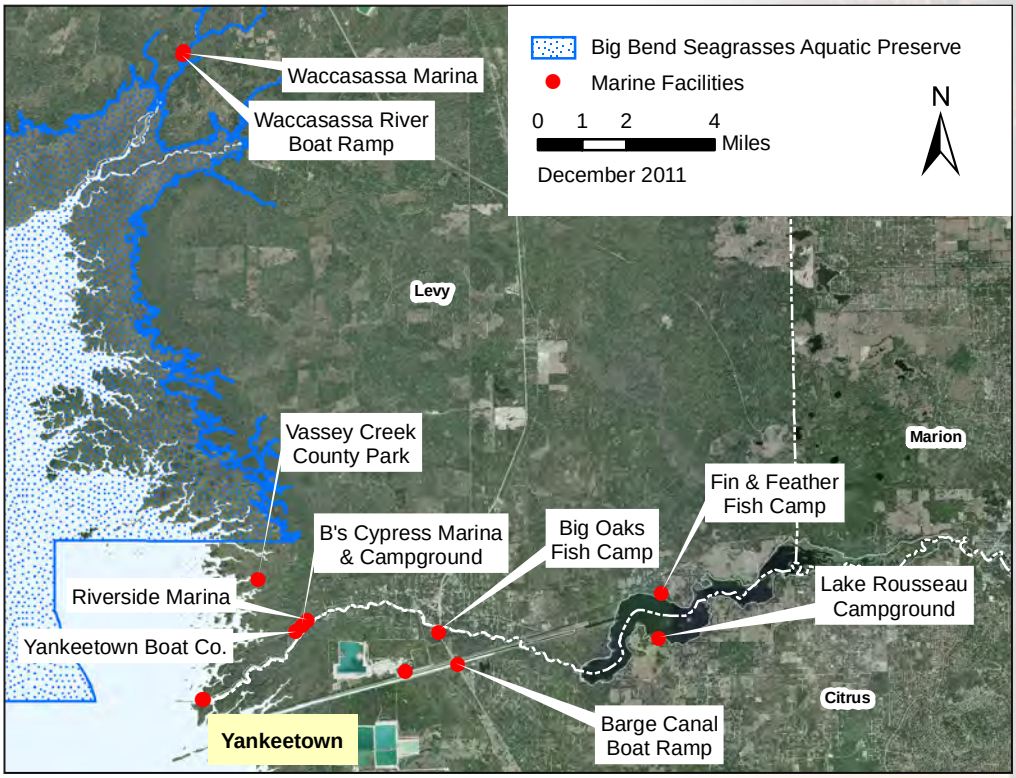


Map 35 / Public access points near Cedar Key.

monitoring, restoration projects, and many more.

In the future, BBSAP aims to maintain and continue current education and outreach efforts to continue educating the public, stakeholders, and local, state, and regional officials. Staff will continue to update and distribute informational handouts and brochures. Additionally, kiosks will be maintained, updated, or installed at new locations, as new and more pertinent information needs to be presented. Also, BBSAP staff will continue to attend local and regional meetings and conferences to obtain, discuss, and distribute vital information pertaining to the protection, conservation, and enhancement of resources within BBSAP.

BBSAP intends to continue the internship program with the Academy of Environmental Sciences in the future. This program has been successful at engaging today's youth in resource management activities and issues. Also, preserve staff hopes to continue participating in many outreach events and festivals to encourage sound resource management and the conservation and protection of BBSAP. Furthermore, expanding the volunteer network within BBSAP is a major goal. Volunteer support enables staff to more effectively complete field work and participate in many outreach events.



Map 36 / Public access points near Waccasassa and Withlacoochee.

BBSAP staff rely heavily on other agencies for volunteer coordination when participating in local events throughout the Big Bend; with such a small staff, maintaining current records of volunteers proves difficult in such a large area. The Crystal River Preserve State Park's Citizen Support Organization (CSO) promotes BBSAP to some extent, however, creating a "Friends Group" or CSO strictly for BBSAP would be more beneficial and productive. BBSAP aims to develop a more structured and sound volunteer program in the future.

Education and Outreach programs in BBSAP are critical to the protection, conservation, and enhancement of the aquatic and coastal resources.

4.4 / The Public Use Management Program

The Public Use Management program addresses the delivery and management of public use opportunities at BBSAP. 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 to the degree that is consistent with our goals for natural and cultural resource protection and supports the research, education, and stewardship mission of FCO.

While access by the general public has always been a priority, the conservation of FCO's sites is the primary management concern for 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 would include 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 Big Bend Seagrasses Aquatic Preserve***

The extensive size of BBSAP allows public access for consumptive and non-consumptive uses. Commercial fishing and shellfish harvesting industries rely on the optimal conditions in the Big Bend region. Species typically harvested in BBSAP are clams, oysters, crabs, scallops, and shrimp. BBSAP is also a recreational paradise and many people travel to the region for fishing, boating, sailing, canoeing, kayaking, and swimming on a yearly basis. Also, with such a rich species diversity, many people travel to the region to observe many different types of birds, especially during migrations.

Primary public use issues in the Big Bend include: boater safety, water quality, and development practices. The health of the seagrass beds is very important, and it is a major goal of BBSAP to maintain and improve seagrass health. Seagrass beds are vital habitat for many commercially important species. The shallow waters, unmarked sandbars and oyster bars, coupled with boater disregard pose a threat to seagrass beds and prop scarring is major issue in the region. As development pressures increase, potential negative impacts may affect water quality in the Big Bend. Staff is concerned that the coastal waters may not be able to handle increased development that may result in habitat degradation, species die-offs, and commercial fishery closures. Staff will continue to monitor seagrass health and water quality in the Big Bend to assess affects of commercial, recreational, and developmental pressures.

4.4.2 / ***Current Status of Public Use at Big Bend Seagrasses Aquatic Preserve***

BBSAP encourages sustainable use of natural resources while minimizing user impacts. Public support and participation are imperative to protecting natural resources. Strong citizen support is vital to the success of BBSAP's programs. Public participation in resource management enables them to understand the important ecological and economical issues of the system.

The major uses of the BBSAP include commercial fisheries and recreational activities. The flourishing seagrass beds support a wide variety of commercial and recreational fish species. Also, areas like Cedar Key use waters adjacent to BBSAP for one of the most successful clam harvesting operations in the country. Many other areas in the Big Bend are ideal for shellfish harvesting as well. Scallops are an important resource in the region, and people travel to the Big Bend region annually for the recreational scallop season.

Boat access to coastal waters is available at many locations throughout the Big Bend at public ramps. Staff continues to post informational signs and install kiosks to keep the public informed of pertinent issues and general information about BBSAP. Staff coordinates signage with other agencies in the region to effectively convey information.

The shoreline of the Big Bend region is dominated by coastal salt marshes.

Chapter Five

Issues

*5.1 / **Introduction to Issue-Based Management***

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 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, possibly, the aquatic preserve may not normally address.

This section will explore issues that impact the management of Big Bend Seagrasses Aquatic Preserve (BBSAP) directly, or are of significant local or regional importance that BBSAP's participation in them may

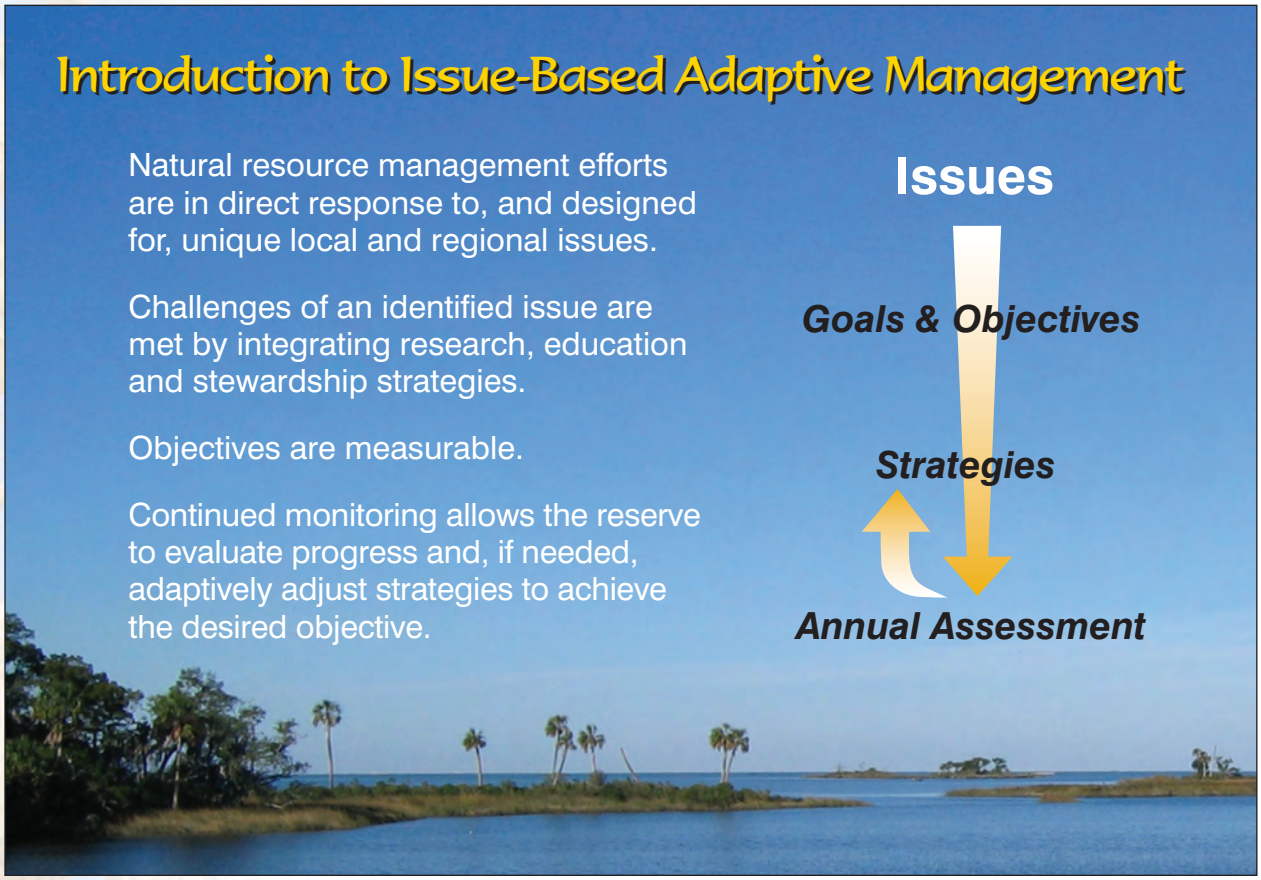


Figure 2 / Issue-based Adaptive Management.

prove beneficial. While an issue may be the same from aquatic preserve to aquatic 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 BBSAP 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.

Issues are listed in priority order and each issue will have goals, objectives and strategies associated with it. Goals are a broad statement 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.

*5.2 / **Issue One: Water Quality***

Water quality monitoring plays a major role in the BBSAP's understanding of natural and human impacts on coastal waters. Researchers use water quality data to document short and long term changes within the water column in an effort to quantify the spatial and temporal variability and trends. These are applied both seasonally and as a function of tidal forcing, of the selected abiotic parameters (e.g. establish baseline data) within BBSAP. Water quality affects humans and other parts of the environment; accordingly, it is essential to develop a proficient water quality monitoring program to recognize and prevent potential negative impacts to BBSAP.

A healthy water body contains a balanced amount of nutrients and normal fluctuations in salinity and temperature. It also has plenty of oxygen, which is a basic requirement for nearly all aquatic biota, and little suspended sediment, so that living aquatic resources can breathe or receive enough sunlight to grow. Nutrients, like nitrogen and phosphorus, occur naturally in water, soil and air. Just as nutrient fertilizers are used to promote plant growth on lawns and farm fields, nutrients in the water encourage the growth of aquatic plants and algae. Although nutrients are essential to all plant life within BBSAP, an excess of these nutrients can be harmful. This is called nutrient pollution. The two general sources

of adverse impacts on water quality are point and nonpoint source pollution. Point source pollution can be traced to a single identifiable source, such as a discharge pipe. Nonpoint source pollution comes from diffuse sources such as stormwater runoff that collects sediment, nutrients, bacteria, pesticides, fertilizers, animal or human waste, heavy metals, oil and grease. When these nutrient sources are not controlled, excess nutrients find their way into the groundwater, creeks, rivers, and eventually the Gulf of Mexico. Stormwater runoff is considered the primary water quality threat in most of the BBSAP watershed. It causes habitat degradation, fish kills and closure of shellfish beds and swimming areas.

BBSAP's current water quality monitoring project utilizes several methods to examine water column characteristics. Basic water quality parameters are monitored, and this data provides information to assess the condition of biological assemblages. To properly assess water quality conditions, long-term data sets are used to develop baseline data. While routine water quality monitoring detects effects of nutrient enrichment, it is not designed to detect trace levels of toxicants or contaminants. Biological assessments, coupled with habitat assessment, such as physical and chemical measurements, will aid in identifying probable causes of impairment not detected by physical and chemical water quality analyses alone, such as nonpoint source pollution and contamination, erosion, or poor land use practices (EPA, 2000). Current water quality trends throughout BBSAP indicate a slight increase in total nitrogen and phosphorous (supporting data is available upon request to BBSAP). Continued long-term water quality monitoring is therefore necessary and essential to protect the valuable natural resources in BBSAP.

Goal One: Further develop and improve the strategic, long-term water quality monitoring program within BBSAP that will assist with identifying and addressing issues pertaining to the natural resources.

Objective One: Analyze and interpret the status and trends of BBSAP's water quality throughout the Big Bend to identify potential impacts to natural resources and provide quality scientific data and recommendations to address such issues.

Integrated Strategy One: (Ecosystem Science) Maintain a strategic long-term water quality monitoring program that includes biotic and abiotic parameters, and compile analyzed data to evaluate water quality status and trends. This will be achieved through the use of dataloggers at priority locations and the collection of continuous in-situ measurements for the following water quality parameters: temperature, specific conductivity, salinity, dissolved oxygen, pH, turbidity, and depth. BBSAP staff were responsible for the implementation of this project, which began in 2004; currently one staff member is assigned to calibrate, deploy and retrieve, and maintain the dataloggers approximately every two weeks. Additionally, approximately 20 hours each month is dedicated to organizing, plotting, and analyzing the data.

Integrated Strategy Two: (Ecosystem Science) Continue to monitor nutrients and water clarity in BBSAP through a partnership with the University of Florida's (UF) COastal ASsessment Team (Project COAST) to determine total nitrogen and phosphorous, chlorophyll, and water clarity. This project requires UF staff to collect water samples and relevant data once a month at the designated sampling sites. Monitoring efforts began in 1997 and BBSAP staff are available to assist with sampling efforts as needed. Through coordination and cooperation with UF, natural background levels of nutrients will be determined from comparisons of current and historical data and the development of a total nitrogen load allocation strategy. This project will also remain a high priority over the next 10 years as coastal development continues to increase.

Integrated Strategy Three: (Ecosystem Science) Acquire additional dataloggers to expand water quality monitoring efforts with BBSAP.

Goal One, Objective One - Performance Measure: Develop an annual metadata report detailing scientific results and recommendations regarding the water quality within BBSAP.

Objective Two: Identify specific and emerging water quality issues related to nutrients, pollution, and environmental, contaminants, and with coordination from other agencies, develop a response strategy to these issues.

Integrated Strategy One: (Resource Management) Support the development of nutrient criteria. In a collaborative effort with other state agencies, staff contributes water quality data to assist in the development of nutrient criteria.

Integrated Strategy Two: (Resource Management) Support the development of total maximum daily load levels (TMDLs). Staff will contribute water quality data to assist in the development of an assessment report documenting scientific data, results, conclusions, and recommendations regarding TMDLs within BBSAP.

Integrated Strategy Three: (Ecosystem Science) Identify point and non-point sources of pollutants and turbidity.

Integrated Strategy Four: (Resource Management) Coordinate with the Florida Department of Agriculture and Consumer Services, Division of Aquaculture to assist in monitoring and maintaining approved Shellfish Harvesting Areas. Assist local government decision-making, land use, planning and zoning, or comprehensive planning entities to address pollution, source prevention, and rehabilitation.

Goal One, Objective Two - Performance Measures: In coordination with other state agencies, identify potential pollution threats and develop a strategy to address issues, including planning, action and prevention.

Water quality instruments are installed on navigational markers and must be maintained regularly by staff.

Objective Three: Ensure the sustainability of scallop, fish, salt marsh, seagrass habitat, and other concerned species through the development of a tiered approach to water quality monitoring that integrates biological assessments and multiple tools to define a core set of baseline indicators to possibly explain causes and/or sources of any impairment within BBSAP.

Integrated Strategy One: (Ecosystem Science) Continue to monitor the distribution and abundance of specific indicator species, including scallops and seagrass, to determine the ecological health of the bay system. As needed, staff will contribute and assist in the development of a technical report assessing the status of these resources, areas of concern, and recommendations. An annual bay scallop report that discusses the status and trends of bay scallop populations around the state is supplied by the Florida Fish and Wildlife Conservation Commission (FWC) Fish and Wildlife Research Institute (FWRI).

Integrated Strategy Two: (Ecosystem Science) Determine the biodiversity of BBSAP by establishing baseline data and broad scale characterizations of benthic communities which are sensible indicators of habitat quality in an aquatic environment. Acquire data and work in conjunction with other agencies to develop a biological assessment report.

Goal One, Objective Three - Performance Measures: Work with other state and federal agencies to develop a database of all concerned species, and use water quality data and other indicators to create an approach to protect/ensure sustainability.

Goal Two: Provide timely and accurate water quality data and information to the public and other entities/agencies.

Objective One: Acquire a repository to store water quality data in a centralized database that is user-friendly, provides quality assurance and quality control for the data collection effort, and can be accessed via the internet to provide site specific information, generate reports, graphs, tables and metadata for review by the public and other entities/agencies.

Integrated Strategy: (Partnering) Work with other entities and agencies to develop a centralized water quality storage database and website. This would involve compiling a list of all water quality monitoring efforts throughout Florida, establishing a storage database and website that provides data to the public in a timely manner, and increase data sharing throughout the water quality monitoring network.

Goal Two, Objective One - Performance Measures: Work with DEP and the three National Estuarine Research Reserves to develop a storage database to ensure data is available to the public.

Objective Two: Utilize a variety of methods to inform the public and other entities regarding water quality conditions, the importance of water quality, and suggestions to improve water quality within BBSAP.

Integrated Strategy One: (Education and Outreach) Utilize educational signage at strategic access points to BBSAP to educate the public on the ecological significance of the bay and how the public can assist in conserving natural resources.

Integrate Strategy Two: (Education and Outreach) Coordinate and participate in public lectures and other events where staff can address water quality issues and discuss methods for improving water quality.

Integrated Strategy Three: (Education and Outreach) Provide and/or create opportunities for the public to volunteer to assist with monitoring efforts and unique events (i.e. Earth Day).

Goal Two, Objective Two - Performance Measures

Performance Measure One: Create and revise informational brochures to disseminate to the public. Maintain and update as necessary all of BBSAP's kiosks throughout the Big Bend.

Performance Measure Two: Track number of people that attend public lectures on water quality or Earth Day events.

5.3 / Issue Two: Management and Protection of Seagrasses

Seagrass beds are one of the most productive habitats found in the world. The rich biodiversity that make up seagrass habitats plays a critical ecological and environmental role to Florida's coastal communities. Seagrasses improve water clarity by stabilizing bottom sediments and absorbing nutrients from the water column. They reduce coastal erosion by helping to diffuse wave energy during storm events. Economically, seagrass beds are of critical importance to Florida's commercial and recreational fisheries. Florida's juvenile fish and invertebrates (redfish, shrimp, bay scallops, seatrout, mullet and stone crabs) depend on these rich nurseries for food and protection. Manatees, wading birds, and sea turtles also utilize these areas for foraging.

BBSAP is the second largest contiguous area of seagrass habitat in the eastern Gulf of Mexico. Seagrass monitoring is an integral part of mapping the total acreage of Florida's seagrasses. According to FWC's 2011 Seagrass Integrated Mapping and Monitoring (SIMM) report for the State of Florida, there are approximately 240,000 acres of seagrass coverage in the Big Bend region and 2.5 million acres in Florida's coastal waters. The five species of seagrass found in BBSAP include Cuban shoal grass, manatee grass, turtle grass, widgeon grass, and star grass. Destruction of seagrass in aquatic preserves is a violation of Florida Law (Section 253.04(3)(a), Florida Statute) and carries a penalty of up to $1,000. One of the major threats to seagrasses in the state is from prop scarring. Repetitive scouring of prop scars prevents re-colonization of new grass and often requires restoration. Another threat to seagrass is nutrient loading from rivers which can decrease water clarity and shade out sunlight that grasses need for photosynthesis. Natural threats, like hurricanes, can cause fragmentation of seagrass beds that can take years to heal.

Goal One: Manage seagrass communities through research and monitoring, education and outreach efforts, continued resource management and collaborative mapping efforts with other state agencies to effectively protect and maintain this habitat as a valuable, natural resource throughout BBSAP.

Objective One: Monitor the status and trends of seagrass distribution within BBSAP to determine the overall health and identify potential threats to the habitat.

Integrated Strategy One: (Ecosystem Science) Develop and implement a Seagrass Monitoring Plan for BBSAP that maintains a strategic, long-term seagrass monitoring project to include water quality indicators, percent coverage of seagrass and algae species, algae identification, density, epiphyte load, and sediment depths.

Integrated Strategy Two: (Ecosystem Science) Continue to collaborating with FWC and other state agencies on the SIMM report to produce a resource for seagrass monitoring, mapping and data sharing.

Integrated Strategy Three: (Ecosystem Science) Utilize advanced Geographic Information System (GIS) technology and hyperspectral imagery to identify severely scarred areas to determine restoration needs, assess management options and develop a seagrass restoration plan for BBSAP.

Integrated Strategy Four: (Resource Management) Utilize advanced GIS technology and hyperspectral imagery to quantify gains or losses to seagrass acreages. BBSAP staff partnered with FWC on a National Aeronautics and Space Administration (NASA) grant to create a remote sensing tool to support the TMDL program for nutrients in the Suwannee estuary. The Moderate Resolution Imaging Spectroradiometer (MODIS)-based tool will be used for ongoing measurements of phytoplankton biomass, color, dissolved organic matter and turbidity levels in the Suwannee estuary and responses to watershed management actions.

Integrated Strategy Five: (Resource Management) Establish and maintain close communication with all federal, state, and local land managers that are responsible for making resource management decisions that could affect water quality or seagrass habitat in BBSAP. Work with DEP district's and water management district's (WMD) permitting and regulatory offices for input on proposed projects, site inspections, assessing potential impacts and participating in quarterly DEP Environmental Resource Permit meetings.

Integrated Strategy Six: (Resource Management) Coordinate with adjacent resource managers and law enforcement to support clean up efforts to address derelict vessels and/or illegal fisheries gear that could impact seagrass habitat.

Goal One, Objective One – Performance Measures: Development of a BBSAP Seagrass Monitoring Technical Report in FY 2013-2014. This report will include information on the project's background, status of the resources, goals, data collection methods, sampling results, areas of concern, recommendations, and conclusions on the effectiveness of the project. This report will be updated every five years.

Objective Two: Promote the importance of seagrass habitats by generating a variety of informational outlets that target recreational, commercial, and scientific user groups operating in BBSAP.

Integrated Strategy One: (Education and Outreach) Update the current BBSAP brochures to include additional information on the importance of seagrass habitat, water quality, and sound user practices that can be used to prevent destruction of seagrasses.

Integrated Strategy Two: (Education and Outreach) Repair, replace, or install education signage pertaining to resource protection at public and private boat ramps and marinas throughout BBSAP. Provide educational and informational materials, such as boater's guides and brochures to local businesses, marinas, and tour operators.

Integrated Strategy Three: (Education and Outreach) Continue to participate in education and outreach events throughout BBSAP to promote the importance of seagrass and other estuarine habitats.

Goal One, Objective Two – Performance Measures:

Performance Measure One: Produce and acquire brochures and signage informing users of BBSAP's research, good boating practices and general information on the importance of seagrasses.

Performance Measure Two: Track number of signs that are repaired or installed.

Performance Measure Three: Track quantity of brochures distributed.

5.4 / Issue Three: Public Access and Use

BBSAP encourages sustainable use of natural resources while minimizing user impacts. With approximately 150 miles of coastline consisting of relatively undeveloped, rural landscapes, the Big Bend region provides many opportunities for the public to enjoy BBSAP's natural resources. Popular recreational activities include, but are not limited to: boating, fishing, kayaking, birding and hiking. Commercial fishing and shellfish harvesting industries rely on the optimal conditions in the Big Bend region. Public support and interagency participation are imperative to protecting natural resources. Public participation in resource management enables them to understand the important ecological and economical issues of the system.

Goal One: Maintain a safe and natural environment for Big Bend's wildlife, habitats and user groups.

Objective One: Facilitate research to identify human use conflicts with natural resources.

Integrated Strategy One: (Resource Management) Work with regulatory agencies, law enforcement, and other resource management entities to identify and address uses in BBSAP that are not water-dependent, potentially illegal, or harmful to natural resources.

The clam aquaculture industry is very important to the local economy of Cedar Key.

Integrated Strategy Two: (Education and Outreach and Partnering) Partner with other agencies to develop and distribute information identifying potential use conflicts and methods of prevention.

Goal One, Objective One – Performance Measures:

Performance Measure One: Maintain relationships with local law enforcement to understand, prevent, and deter any potential threats to the resources.

Performance Measure Two: Continue to attend quarterly meetings with regulatory staff and SRWMD's staff to provide updates and discuss relevant issues within BBSAP.

Performance Measure Three: Provide timely and accurate technical information to the appropriate agencies or offices.

Objective Two: Reduce the amount of debris, contaminants, and other resource damages associated with user group activities.

Integrated Strategy One: (Ecosystem Science) Understand and address consumptive use impacts from fisheries, such as shrimping, crabbing, scalloping, and aquaculture, and others that utilize gear and methods that can be harmful to natural resources in BBSAP, while recognizing their importance to local economies.

Integrated Strategy Two: (Education and Outreach) Promote awareness of proper boating practices to reduce propeller scarring in seagrasses and benthic communities. This includes, but is not limited to, increasing or replacing regulatory signage and buoys so they are correct, legible and enforceable.

Integrated Strategy Three: (Resource Management) Coordinate and participate in projects that remove or make use of debris within BBSAP (i.e. crab trap clean-up).

Integrated Strategy Four: (Education and Outreach) Develop informational brochures and/or participate in local meetings to educate user groups of potential impacts to the natural resources associated with user activities.

Goal One, Objective Two – Performance Measures

Performance Measure One: Continue to produce informational signage to address issues. Track number and content of signs produced.

Performance Measure Two: Partner with local citizens, state agencies and federal agencies to complete at least one marine debris removal project annually.

Staff conducting seagrass monitoring in Cedar Key.

Goal Two: Promote low-impact, sustainable recreational opportunities.

Objective One: Increase awareness of non-consumptive use opportunities such as paddle boarding, sailing, kayaking, canoeing, swimming and snorkeling.

Integrated Strategy One: (Resource Management) Identify appropriate locations for paddling launch sites and desirable destinations to access BBSAP via kayak or canoe. FWC recommends that BBSAP staff coordinate with FWC's Office of Public Access and Wildlife Viewing Services staff which has worked closely with paddling organizations in developing paddling information, trails and wildlife viewing opportunities in Florida.

Integrated Strategy Two: (Education and Outreach and Partnering) Work with other resource agencies and local vendors to educate users of the unique recreational opportunities in BBSAP. This includes providing informational kiosks and guides on historical locations, birding and hiking trails, and kayak and canoeing trails (i.e. the Big Bend Saltwater Paddling Trail).

Goal Two, Objective One – Performance Measures

Performance Measure One: Provide literature to local guides, eco-tour operators, and marinas to help educate and encourage responsible use of the resources within BBSAP.

Performance Measure Two: Track quantity of literature provided.

Performance Measure Three: Work with adjacent land managers and government agencies to promote expansion of non-consumptive activities (e.g., kayaking, nature viewing), but stress that current BBSAP access and uses will not be further restricted due to the importance to the local economies.

5.5 / Issue Four: Obstacles in Natural Resource Management

BBSAP spans a vast area of coastal resources and habitats; it is imperative these areas be managed in the most effective manner. Having a baseline level of presence and distribution of habitats, composition and abundance of species that depend on those habitats (including salinity and

temperature ranges), and updated maps to graphically represent these parameters and how they change over time are all essential tools needed to effectively manage BBSAP. Addressing issues such as marine debris is important in assessing the overall health of BBSAP. Marine debris presents a real and chronic threat to wildlife and public safety; entanglement, ingestion, and the release of toxins into the environment are issues related to debris. Additionally, the presence of debris detracts from the aesthetic value of natural landscapes. Marine debris can include paper and plastic products, construction debris, derelict vessels, and derelict aquaculture and fisheries gear. Significant change events such as sea level rise and climate change may drastically alter the status of the Big Bend's benthic community and may have a regional impacts. Catastrophic events, such as hurricanes, oil disasters, and harmful algal blooms, are also major issues that could affect the health of BBSAP's natural resources.

Goal One: Document the natural resources in BBSAP.

Objective One: Establish and/or continue to develop a baseline of the current location, composition, and abundance of the various habitat types and associated fauna.

Integrated Strategy One: (Resource Management and Partnering) Because of limited staff, large coverage area, and travel restrictions, continue and develop partnerships with resource agencies and non-governmental organizations to assist monitoring efforts within the BBSAP.

Integrated Strategy Two: (Ecosystem Science and Partnering) Continue partnerships with other natural resource agencies (i.e. Florida Environmental Research Institute, WMDs, etc.) to reduce the cost of including BBSAP in aerial photography captured to develop a geo-database of digitized layers of benthic and shoreline habitats.

Integrated Strategy Three: (Exotic Plant Control and Partnering) Work to identify areas of concern for where exotics species need to be treated. When possible, assist other state and federal land managers in the Big Bend with shoreline cleanups and exotic plant control.

Integrated Strategy Four: (Resource Management and Partnering) Work with other state and federal resource managers throughout the Big Bend region to document the condition and extent of the natural communities in the preserve.

Goal One, Objective One – Performance Measures: Establish baseline data collection of water and habitat characteristics in partnership with federal and other state agencies to monitor changes associated with major events.

Objective Two: Develop and implement restoration goals for impacted areas or areas of concern.

Integrated Strategy One: (Resource Management and Partnering) Work with law enforcement to ensure implementation of the seagrass law prohibiting destruction of seagrasses in BBSAP.

Integrated Strategy Two: (Resource Management and Partnering) Coordinate with other resource agencies and law enforcement to support efforts to address derelict and/or illegal fisheries gear and harvesting activities.

Integrated Strategy Three: (Ecosystem Science and Partnering) Partner with other agencies to develop habitat restoration projects involving the use of marine debris.

Integrated Strategy Four: (Resource Management and Education and Outreach) Partner with other agencies and enlist public participation to assist in the removal of derelict and/or illegal fisheries gear from BBSAP.

Integrated Strategy Five: Develop partnerships with other agencies and non-governmental organizations to secure funding and conduct marine habitat restoration projects within BBSAP.

Goal One, Objective Two – Performance Measures: Partner with local citizens, state agencies and federal agencies to complete at least one marine debris removal project annually in areas of concern to protect and restore resources.

Goal Two: Educate the public about the importance of BBSAP's history, natural resources and cultural resources.

Objective One: Partner with other agencies and/or non-governmental organizations to promote greater understanding and interpretation of resources.

Integrated Strategy One: (Education and Outreach and Partnering) In conjunction with other natural resource agencies, develop and install kiosks or signage informing the public on how to avoid impacting seagrass habitat.

Integrated Strategy Two: (Education and Outreach) Repair, replace, or install up to date signage and kiosks to inform the public about BBSAP and its resources.

Integrated Strategy Three: (Education and Outreach) Develop an informational brochure on the current efforts employed by BBSAP's water quality, seagrass, and resource management programs. This will be distributed at local festivals, workshops, and events. BBSAP staff is responsible for updating information as needed

Goal Two, Objective One – Performance Measures: Develop, distribute and track quantity of educational materials to other government entities, eco-tourism businesses and the public. These will be updated every five years.

Objective Two: Partner with state, county and municipal parks to incorporate information about BBSAP history and resources into guided tours, signage, staff training, and promotional materials.

Integrated Strategy One: (Education and Outreach) Provide interpretive training for tour guides on natural and cultural resources.

Integrated Strategy Two: (Education and Outreach) Provide training for staff of local parks and other destinations.

Goal Two, Objective Two – Performance Measures: Disseminate BBSAP information to appropriate outlets. This will be based on or controlled by the amount of brochures distributed annually. Track location, number and content of brochures distributed.

Seagrass cores are processed in the Big Bend Seagrasses Aquatic Preserve's laboratory by staff.

Part III

Additional Plans

Chapter Six

Administrative Plans

The success of the Big Bend Seagrasses Aquatic Preserve's (BBSAP) research, education, and resource management programs depends upon effective administrative strategies. The objectives of BBSAP's administrative plan include:

1) to supervise and administer programs and maintain facilities;
2) to comply with all legal rules, contracts, agreements and regulations;
3) to maintain all records needed for operating, budgeting, planning and purchasing; and
4) to communicate and coordinate with all entities involved in research, education, commercial, and recreational utilization or management within BBSAP.

Staffing

BBSAP staff consists of four permanent positions: one select exempt service (SES), and three full-time equivalent (FTE) positions.

Preserve Manager (SES) - The position supervises three staff members and is responsible for insuring that work assignments and reviews are completed satisfactorily and on time. The supervisor directs project management, administration, budget, operations and facilitates visiting investigators.

Environmental Specialist II (FTE) - Collects and analyzes biological and other resource data in the BBSAP and St. Martins Marsh Aquatic Preserve. Develops resource inventories and implements resource management activities related to the enhancement of the environment and preservation of natural resources.

Environmental Specialist I (FTE) - Plans and implements resource monitoring activities including seagrass, water quality, and restoration activities. Enters, analyzes, and interprets all data collected during monitoring activities.

Administrative Assistant I (FTE) - Submits all purchase orders and invoices, tracks budget through QuickBooks and reconciles to Florida Accounting Information Resource, enters monthly reports to FLEET management system and OCULUS™ (for both fuel and purchasing cards (p-cards)), reviews p-card transactions for staff, maintains files, answers the telephone and provides visitor services.

Staff are active in education outreach programs to area schools.

Each of these positions is state funded. In order to run an effective program and accomplish the goals set out in this plan, adequate staffing is critical. Given the sheer size of BBSAP, managing almost one million acres of conservation land, and the increasing development along its coast, additional staff may be necessary to continue adequate research and monitoring efforts within BBSAP.

Projected Staffing Needs

Spanning more than 980,000 acres, BBSAP is the largest aquatic preserve and contains the second largest contiguous seagrass bed in the eastern Gulf of Mexico. Over the next 10 years as development increases throughout the BBSAP's coast, additional staff will be critical to insure the quality of current and future restoration projects and research and monitoring efforts. Two and sometimes three staff members are required aboard vessels when water-based monitoring activities are initiated in the on-going management of BBSAP to comply with proper safety procedures. As funds become available, these positions will be needed:

Environmental Specialist II (FTE) - Perform all grant administration activities including locating vendors, processing payments to vendors, and coordinating staff for restoration projects within BBSAP. The position would work with other state, local and federal agencies on restoration projects in BBSAP and adjacent conservation lands.

Environmental Scientist I (Other Personal Services) - Full time position which would be dedicated to field operations. The position would be assisting current staff when conducting research and monitoring activities, as well as any other mission critical or necessary task.

Education and Outreach Specialist II (FTE) - Organize and conduct natural and cultural history interpretive talks and education programs, perform speaking engagements promoting preservation of BBSAP and public awareness of the program's objectives.

Aerial view of the Suwannee River marsh and tidal creek complex.

Chapter Seven

Facilities Plans

Facilities

The Big Bend Seagrasses Aquatic Preserve (BBSAP) office is housed within the Crystal River Preserve State Park facility located on the north side of the city of Crystal River at 3266 North Sailboat Avenue, Crystal River, Florida, 34428. The facility includes a visitor center, conference room, staff office space and laboratory space totaling 5,300 square feet. The complex also includes a 1,250 square foot pole barn under which vessels are stored, and a small storage shed. The facility has a boat ramp on the Crystal River for agency and staff use only.

Upon the occasion of a hurricane or major storm event, all vehicles and vessels of BBSAP will follow the procedures outlined in the BBSAP Hurricane Plan, which is updated annually.

Vehicles

BBSAP acquired two Chevy Silverado Hybrids in 2005. The current mileage on each of the trucks is over 78,000 miles. Future needs will include increased funding for fuel costs.

Vessels

18’ Airboat - In 1998, BBSAP acquired an 18 foot airboat and trailer that are utilized to accomplish program management goals, such as monitoring seagrass habitat in shallow areas. This vessel is

maintained through monthly inspections performed by staff. Since its purchase, the engine has been replaced three times and the cage was replaced in 2010. Future expenses over the next 10 years may include replacing the boat and/or trailer. Future expenses also include vessel and trailer maintenance, as well as fuel costs, at approximately $3,000 per year pending an increase in fuel prices.

Boat and equipment storage at Big Bend Seagrasses Aquatic Preserve.

22' Panga - In 2005, BBSAP acquired a 22 foot Panga and trailer, also utilized to accomplish program management goals. This vessel is maintained through monthly inspections performed by staff. Future expenses also include vessel and trailer maintenance, as well as fuel costs, at approximately $3,000 per year pending an increase in fuel prices.

Kayaks - BBSAP acquired several kayaks that are stored in BBSAP's pole barn area.

List of Appendices

Appendix A

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 o 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***

Florida Statutes, Chapter 253: State Lands
http://www.leg.state.fl.us/Statutes/index.cfm?App_mode=Display_Statute&URL=0200-0299/0253/0253.html

Florida Statutes, Chapter 258: State Parks and Preserves
http://www.leg.state.fl.us/Statutes/index.cfm?App_mode=Display_Statute&URL=0200-0299/0258/0258.html

Part II (Aquatic Preserves):
http://www.leg.state.fl.us/Statutes/index.cfm?App_mode=Display_Statute&Search_String=&URL=0200-0299/0258/0258PARTIIContentsIndex.html

Florida Statutes, Chapter 259: Land Acquisitions for Conservation or Recreation
http://www.leg.state.fl.us/Statutes/index.cfm?App_mode=Display_Statute&URL=0200-0299/0259/0259.html

Florida Statutes, Chapter 379: Fish and Wildlife Conservation
http://www.leg.state.fl.us/statutes/index.cfm?App_mode=Display_Statute&URL=0300-0399/0379/0379.html

Florida Statutes, Chapter 403: Environmental Control
(Statute authorizing DEP to create Outstanding Florida Waters is at 403.061(27))
http://www.leg.state.fl.us/Statutes/index.cfm?App_mode=Display_Statute&URL=0400-0499/0403/0403.html

Florida Statutes, Chapter 597: Aquaculture
http://www.leg.state.fl.us/Statutes/index.cfm?App_mode=Display_Statute&URL=0500-0599/0597/0597.html

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

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

Florida Administrative Code, Chapter 18-21: Sovereignty Submerged Lands Management
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)
http://www.dep.state.fl.us/legal/Rules/shared/62-302/62-302.pdf

*A.4 / **Agreements***

Big Bend Seagrasses Aquatic Preserve hosts aquaculture lease sites for hard clam farming operations. Lease sites may include multiple lease holders. These lease sites are current as of May 1, 2012:

Pelican's Reef Lease Site
Corrigan's Reef Lease Site
Dog Island Lease Site
Gulf Jackson Lease Site
Horseshoe Lease Site
Long Bar Lease Site
Shired Reef Lease Site
Pine Island Lease Site
Derrick Lease Site
Big Reef Lease Site

Lease numbers and lease holder information is available from the Florida Department of Agriculture and Consumer Services, Division of Aquaculture.

Appendix B

Resource Data

B.1 / Acronym List

Abbreviation	Description	Abbreviation	Description
AP	Aquatic Preserve	**IMS**	integrated modeling system
ARC	Acquisition and Restoration Council	**LIDAR**	Light Detection and Ranging
BBSAP	Big Bend Seagrasses Aquatic Preserve	**LIFE**	Learning in Florida's Environment
BMP	Best Management Practice	**MOA**	Memorandum of Agreement
BTIITF	Board of Trustees of the Internal Improvement Trust Fund	**MODIS**	Moderate Resolution Imaging Spectroradiometer
CARL	Conservation and Recreation Lands	**MOU**	Memorandum of Understanding
cfs	cubic feet per second	**NC**	Natural Communities
CH3D	Curvilinear-grid Hydrodynamic 3D Model	**NERR**	National Estuarine Research Reserve
CSO	Citizen Support Organization	**NOAA**	National Oceanic and Atmospheric Administration
DACS	Department of Agriculture and Consumer Services	**NWFWMD**	Northwest Florida Water Management District
DEP	Florida Department of Environmental Protection	**OFW**	Outstanding Florida Water
DNR	Department of Natural Resources (now DEP)	**OGT**	Office of Greenways and Trails
DO	dissolved oxygen	**OPS**	other personal services
EPA	Environmental Protection Agency	**OYSTER**	Offer Your Shell to Enhance Restoration
F.A.C.	Florida Administrative Code	**ROMS**	Regional Ocean Model System
F.A.W.	Florida Administrative Weekly	**S**	State
FCO	Florida Coastal Office	**SAS**	State Assessment and Standards
FIM	Fisheries-Independent Monitoring	**SAV**	submerged aquatic vegetation
FLUCCS	Florida Land Use Cover and Forms Classification System	**SEAS**	Shellfish Environmental Assessment Section
FNAI	Florida Natural Areas Inventory	**SES**	select exempt service
F.S.	Florida Statutes	**SIMM**	Seagrass Integrated Mapping and Monitoring
FSU	Florida State University	**SLAMM**	Sea Level Affecting Marshes Model
FTE	full time equivalent	**SOC**	Save Our Coast
FWC	Florida Fish and Wildlife Conservation Commission	**SRWMD**	Suwannee River Water Management District
FWRI	Fish and Wildlife Research Institute	**SWMP**	System-wide Monitoring Program
FWS	U.S. Fish and Wildlife Service	**TMDL**	Total Maximum Daily Load
G	Global	**TN**	total nitrogen
GARI	Gulf Archaeology Research Institute	**TP**	total phosphorus
GEMS	Gulf Ecological Management Sites	**UF**	University of Florida
GIS	geographic information system	**USDA**	United States Department of Agriculture
GSMFC	Gulf States Marine Fisheries Commission	**USF**	University of South Florida
HAB	harmful algal bloom	**USGS**	United States Geological Survey
HYCOM	Hybrid Coordinate Ocean Model	**WMA**	Wildlife Management Area

References to these definitions can be found at the end of this list and in Appendix B.3.

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)

anticlinal - sloping downward in opposite directions.

aquaculture - the cultivation of aquatic organisms. (597.0015(1) Florida Statute)

bryozoans- any of a phylum (Bryozoa) of aquatic mostly marine invertebrate animals that reproduce by budding and usually form permanently attached branched or mossy colonies. (Neufeldt & Sparks,1990)

calcitic- a mineral CaCO3 consisting of calcium carbonate crystallized in hexagonal form and including common limestone, chalk, and marble. (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], 2005)

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

euryhaline - used of organisms that are tolerant of a wide range of salinity. (Lincoln et al., 2003)

euthrophication - over-enrichment of a body of water with nutrients, resulting in excessive growth of organisms and depletion of oxygen concentration. (Lincoln et al., 2003)

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)

foram - foraminifer, any of an order (Foraminifera) of large chiefly marine rhizopod protozoans usually having calcareous shells that often are perforated with minute holes for protrusion of slender pseudopodia and form the bulk of chalk and nummulitic limestone. (Neufeldt & Sparks,1990)

fossiliferous - used of a rock, sediment or horizon containing fossils. (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)

histosol - major classification in the classification of soil types; soil rich in organic matter such as peat and bog soil; further divided according to moisture content and extent of decomposition of organic matter. (Lincoln et al., 2003)

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

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

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

karstic - pertaining to irregular limestone strata permeated by streams, typically with sinks, caves and other subterranean passages. (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, 2005)

lithophyte - a plant growing on rocks or stones. (Lincoln et al., 2003)

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)

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

palustrine - pertaining to wet or marshy habitats. (Lincoln et al., 2003)

peryphyton - a community of plants, animals and associated detritus adhering to and forming a surface coating on stones, plants and other submerged objects. (Lincoln et al., 2003)

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)

relictual (relict species) - persistent remnants of formerly widespread fauna or flora existing in certain isolated areas or habitats; relic. (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)

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. “Imperiled species” is another general term for listed as well as unlisted species that are declining. (FWS, 2005)

spodosol - major category in the classification of soil types; sandy soil having a subsurface accumulation of organic matter and oxides of aluminium; mostly found under coniferous forest of higher latitudes. (Lincoln et al., 2003)

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, 2005)

stratigraphic (range) - the distribution of a taxon through geologic time, determined by its distribution in strata of known geological age. (Lincoln et al., 2003)

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, 2005)

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)

*B.3 / **References***

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B.4 / ***Species Lists***

B.4.1 / ***Comprehensive Species List***

Common Name	Species Name	Status	
		State	Federal
Legend: T = Threatened • E = Endangered • SSC = Species of Special Concern			
Plants			
Slender threeseed mercury	*Acalphya gracilens*		
Boxelder	*Acer negundo*		
Red maple	*Acer rubrum*		
Florida maple	*Acer saccharumfloridanum*		
Creeping spotflower	*Acmella oppositifolia*		
Giant leather fern	*Acrostichum danaeifolium*		
Indian jointvetch	*Aeschynomene viscidula*		
Red buckeye	*Aesculus pavia*		
Scaleleaf false foxglove	*Agalinis aphylla*		
Pineland false foxglove	*Agalinis divaricata*		
Tenlobe false foxglove	*Agalinis obtusifolia*		
Saltmarsh false foxglove	*Agalinis maritima*		
Purple false foxglove	*Agalinis purpurea*		
Threadleaf false foxglove	*Agalinis setacea*		
Lesser snakeroot	*Ageratina aromatica*		
Golden coilroot	*Aletris aurea*		
Yellow coilroot	*Aletris lutea*		
Southern colicroot	*Aletris obovata*		
Hazel alder	*Alnus serrulata*		
Common ragweed	*Ambrosia artemisifolia*		
Cuman ragweed	*Ambrosia psilostachya*		
Fly poison	*Amianthium muscitoxicum*		
False indigobush	*Amorpha fruticosa*		
Peppervine	*Ampelopsis arborea*		
Stiff bluestar	*Amsonia rigida*		
Eastern bluestar	*Amsonia tabernaemontana*		
Pinewoods bluestem	*Andropogon arctatus*	T	
Purpose bluestem	*Andropogon glomeratus glaucopsis*		
Bushy bluestem	*Andropogon glomeratus glomeratus*		
Bushy bluestem	*Andropogon glomeratus pumilus*		
Elliott's bluestem	*Andropogon gyrans gyrans*		
Elliott's bluestem	*Andropogon gyrans stenophyllus*		
Hairy bluestem	*Andropogon longiberbis*		
Bluestem, no common name	*Andropogon leibmanii pungensis*		

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Splitbeard bluestem	*Andropogon ternarius*		
Tracy's bluestem	*Andropogon tracyi*		
Broomsedge bluestem	*Andropogon virginicus decipiens*		
Chalky bluestem	*Andropogon virginicus glaucus*		
Broomsedge bluestem	*Andropogon virginicus virginicus*		
Coastplain angelica	*Angelica dentata*		
Purple silkscale	*Anthaenantia rufa*		
Green silkscale	*Anthaenantia villosa*		
Devils' walking stick	*Aralia spinosa*		
Greendragon	*Arisaema dracontium*		
Jack-in-the-pulpit	*Arisaema triphyllum*		
Wiregrass	*Aristida beyrichiana*		
Big threeawn	*Aristida condensata*		
Slimspike threeawn	*Aristida longispica longispica*		
Longleaf threeawn	*Aristida palustris*		
Tall threeawn	*Aristida patula*		
Hillsboro threeawn	*Aristida purpurascens tenuispica*		
Arrowfeather threeawn	*Aristida purpurascens virgata*		
Southern threeawn	*Aristida simpliciflora*		
Bottlebrush threeawn	*Aristida spiciformis*		
Seaside threeawn	*Aristida tuberculosa*		
Virginia snakeroot	*Aristolochia serpentaria*		
Florida indian plantain	*Arnoglossum floridanum*		
Switchcane	*Arundinaria gigantea*		
Clasping milkweed	*Asclepias amplexicaulis*		
Carolina milkweed	*Asclepias cinerea*		
Largeflower milkweed	*Asclepias connivens*		
Pinewoods milkweed	*Asclepias humistrata*		
Swamp milkweed	*Asclepias incarnata*		
Few-flower milkweed	*Asclepias lanceolata*		
Longleaf milkweed	*Asclepias longifolia*		
Michaux's milkweed	*Asclepias michauxii*		
Swamp milkweed	*Asclepias perennis*		
Velvetleaf milkweed	*Asclepias tomentosa*		
Butterfly milkweed, butterflyweed	*Asclepias tubersoa*		
Whorled milkweed	*Asclepias verticillata*		
Slimleaf pawpaw, narrowleaf pawpaw	*Asimina angustifolia*		
Slimleaf pawpaw	*Asimina longifolia*		
Small-flower pawpaw	*Asimina parviflora*		
Dwarf pawpaw	*Asimina pygmaea*		
Netted pawpaw	*Asimina reticulata*		
Ebony spleenwort	*Asplenium platyneuron*		
Climbing aster	*Aster carolinianus*		
Rice button aster	*Aster dumosus*		
Thistleleaf aster	*Aster eryngiifolius*		
Flaxleaf aster	*Aster linariifolius*		
Pinebarren aster	*Aster reticulatus*		
Dixie aster	*Aster tortifolius*		
Florida milkvetch	*Astragalus obcordatus*		
Smooth yellow false foxglove	*Aureolaria flava*		
Fernleaf yellow false foxglove	*Aureolaria pedicularia*		
Black mangrove	*Avicennia germinans*		

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Common carpetgrass	*Axonopus fissifolius*		
Big carpetgrass	*Axonopus furcatus*		
Saltwater false willow	*Baccharis angustifolia*		
Silverling	*Baccharis glomulerifolia*		
Sea myrtle, eastern baccharis	*Baccharis halimifolia*		
Blue waterhyssop	*Bacopa caroliniana*		
Herb-of-grace	*Bacopa monnieri*		
Oneflower honeycombhead	*Baldunia uniflora*		
Largeleaf wild indigo	*Baptisia alba macrophylla*		
Gopherweed	*Baptisia lanceolata*		
Pineland wild indigo	*Baptisia lecontii*		
Scareweed	*Baptisia simplicifolia*	T	
White screwstem	*Bartonia verna*		
Saltwort	*Batis maritima*		
Tarflower	*Bejaria racemosa*		
Rattan vine, supplejack	*Berchemia scandens*		
Soft greeneyes	*Berlandiera pumila*		
Florida greeneyes	*Berlandiera subacaulis*		
River birch	*Betula nigra*		
Beggartricks, spanish needles	*Bidens alba*		
Spanish needles	*Bidens bipinnata*		
Smallfruit beggarticks	*Bidens mitis*		
Pineland rayless goldenrod	*Bigelowia nudata*		
Crossvine	*Bignonia capreolata*		
False nettle	*Boehmeria cylindrica*		
Florida lady's nightcap	*Bonamia grandiflora*	E	T
Seaside oxeye daisy	*Borrichia frutescens*		
Rattlesnake fern	*Botrychium virginianum*		
American bluehearts	*Buchnera americana*		
Capillary hairsedge	*Bulbostylis ciliatifolia*		
Sandy field hairsedge	*Bulbostylis stenophylla*		
Gum bully	*Bumelia lanuginosa*		
Scarlet calamint	*Calamintha coccinea*		
American beautyberry	*Callicarpa americana*		
Piedmont roseling	*Callisia rosea*		
Bearded grasspink	*Calopogon barbatus*		
Grasspink	*Calopogon multiflorus*	T	
Pale grasspink	*Calopogon pallidus*		
Tuberous grasspink	*Calopogon tuberosus*		
Hedge false bindweed	*Calystegia sepium*		
Florida bellflower	*Campanula floridana*		
Trumpet creeper, trumpet vine	*Campsis radicans*		
Coastplain sedge	*Carex crebriflora*		
Sandywoods sedge	*Carex dasycarpa*		
Clustered sedge	*Carex glaucescens*		
Florida paintbrush	*Carphephorus corymbosus*		
Vanillaleaf, vanilla plant	*Carphephorus odoratissimus*		
Hairy chaffhead	*Carphephorus paniculatus*		
Bristleleaf chaffhead	*Carphephorus pseudoliatris*		
American hornbeam	*Carpinus caroliniana*		
Mockernut hickory	*Carya alba*		
Water hickory	*Carya aquatica*		

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Pignut hickory	*Carya glabra*		
Chinquapin	*Castanea pumila*		
Southern catalpa	*Catalpa bignonioides*		
New Jersey tea, redroot	*Ceanothus americanus*		
Sugarberry	*Celtis laevigata*		
Slender sandbur	*Cenchrus gracillimus*		
Coastal sandbur	*Cenchrus incertus*		
Spadeleaf	*Centella asiatica*		
Spurred butterfly pea	*Centrosema virginianum*		
Common buttonbush	*Cephalanthus occidentalis*		
Coontail	*Ceratophyllum demersum*		
Eastern redbud	*Cercis canadensis*		
Partridge pea	*Chamaecrista fasciculata*		
Sensitive pea	*Chamaecrista nictitans*		
Wooly sunbonnets	*Chaptalia tomentosa*		
Longleaf chasmanthium	*Chasmanthium laxum*		
Shiny woodoats	*Chasmanthium nitidum*		
Snowberry, milkberry	*Chiococca alba*		
Fringetree	*Chionanthus virginicus*		
Cottony golden aster	*Chrysopsis gossypina gossypina*		
Cottony golden aster	*Chrysopsis gossypina hyssopifolia*		
Maryland golden aster	*Chrysopsis mariana*		
Scrubland golden aster	*Chrysopsis subulata*		
Leconte's thistle	*Cirsium lecontei*		
Nuttall's thistle	*Cirsium nuttallii*		
Citrus	*Citrus* spp.		
Sawgrass	*Cladium jamaicense*		
Rosebud orchid, spreading pogonia	*Cleistes divaricata*	E	
Pine hyacinth	*Clematis baldwinii*		
Swamp leather-flower	*Clematis crispa*		
Netleaf leather-flower	*Clematis reticulata*		
Coastal sweetpepperbrush	*Clethra alnifolia*		
Black titi	*Cliftonia monophylla*		
Butterfly pea	*Clitoria mariana*		
Tread-softly	*Cnidoscolus stimulosus*		
Whitemouth dayflower	*Commelina erecta*		
Blue mistflower, ageratum	*Conoclinium coelestinum*		
American squawroot	*Conopholis americana*		
Canadian horseweed	*Conzya canadensis*		
Florida tickseed	*Coreopsis floridana*		
Leavenworth's tickseed	*Coreopsis leavenworthii*		
Texas tickseed	*Coreopsis linifolia*		
Roughleaf dogwood	*Cornus asperifolia*		
Flowering dogwood	*Cornus florida*		
Swamp dogwood	*Cornus foemina*		
Cockspur hawthorne	*Crataegus crus-galli*		
Yellowlead hawthorne	*Crataegus flava*		
Parsley hawthorne	*Crataegus marshallii*		
May haw, Michaux's hawthorne	*Crataegus michauxii*		
Green hawthorne	*Crataegus viridis*		
String-lily, seven-sisters	*Crinum americanum*		
Slender scratchdaisy	*Croptilon divaricatum*		

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Pursh's rattlebox	*Crotalaria purshii*		
Rabbitbells	*Crotalaria rotundifolia*		
Showy rattlebox	*Crotalaria spectabilis*		
Silver croton	*Croton argyranthemus*		
Hogwort	*Croton capitatus*		
Rushfoil, michaux's croton	*Croton michauxii*		
Rushfoil, michaux's croton	*Crotonopsis linearis*		
Toothache grass	*Ctenium aromaticum*		
Columbian waxweed	*Cuphea carthagenensis*		
American dodder	*Cuscata americana*		
Compact dodder	*Cuscata compacta*		
Bigseed alfalfa dodder	*Cuscata indecora*		
Lax hornpod	*Cynoctonum mitreola*		
Bermudagrass	*Cynodon dactylon*		
Baldwin's flatsedge	*Cyperus crocerus*		
Wiry flatsedge	*Cyperus filiculmis*		
Plukenet's flatsedge	*Cyperus plukenetii*		
Pinebarren flatsedge	*Cyperus retrorsus*		
Titi	*Cyrilla racemiflora*		
Whitetassels	*Dalea carnea albida*		
Whitetassels	*Dalea carnea gracilis*		
Cowitch vine	*Decumaria barbara*		
Hairy small-leaf ticktrefoil	*Desmodium ciliare*		
Florida ticktrefoil	*Desmodium floridanum*		
Sand ticktrefoil	*Desmodium lineatum*		
Nuttall's ticktrefoil	*Desmodium nuttallii*		
Panicledleaf ticktrefoil	*Desmodium paniculatum*		
Pinebarren ticktrefoil	*Desmodium strictum*		
Slimleaf ticktrefoil	*Desmodium tenuifolium*		
Dixie ticktrefoil	*Desmodium tortuosum*		
Coastalplain balm	*Dicerandra linearifolia*		
Needleleaf witchgrass	*Dichanthelium aciculare*		
Tapered witchgrass	*Dichanthelium acuminatum*		
Deertongue witchgrass	*Dichanthelium clandestinum*		
Variable witchgrass	*Dichanthelium commutatum*		
Cypress witchgrass	*Dichanthelium ensifolium ensifolium*		
Cypress witchgrass	*Dichanthelium ensifolium unciphyllum*		
Erectleaf witchgrass	*Dichanthelium erectifolium*		
Rough witchgrass	*Dichanthelium leucothrix*		
Heller's witchgrass	*Dichanthelium oligosanthes*		
Eggleaf witchgrass	*Dichanthelium ovale*		
Hemlock witchgrass	*Dichanthelium portoricense*		
Ravenel's witchgrass	*Dichanthelium ravenelii*		
Roundseed witchgrass	*Dichanthelium sphaerocarpon*		
Roughhair witchgrass	*Dichanthelium strigosum*		
Roughhair witchgrass	*Dichanthelium strigosum leucoblepharis*		
Carolina ponysfoot	*Dichondra caroliniensis*		
Slender crabgrass	*Digitaria filiformis*		
Poor joe	*Diodia teres*		
Virginia buttonweed	*Diodia virginiana*		
Florida yam	*Dioscorea floridana*		
Common persimmon	*Diospyros virginiana*		

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Salt grass	*Distichlis spicata*		
Dwarf sundew	*Drosera brevifolia*		
Pink sundew	*Drosera capillaris*		
Tracy's sundew	*Drosera tracyi*	E	
Oblong twinflower	*Dyschoriste oblongifolia*		
Burrhead	*Echinodorus* spp.		
Baldwin's spikerush	*Eleocharis baldwinii*		
Gulf coast spikerush	*Elocharis cellulosa*		
Tall elephantsfoot	*Elephantopus elatus*		
Smooth elephantsfoot	*Elephantopus nudatus*		
Elephantsfoot	*Elephantopus spp.*		
Florida tasselflower	*Emilia fosbergii*		
Green-fly orchid	*Epidendrum conopseum*	C	
Elliott's lovegrass	*Eragrostis elliottii*		
Purple lovegrass	*Eragrostis spectabilis*		
Coastal lovegrass	*Eragrostis virginica*		
Burnweed	*Erectites hieracifolia*		
Plumegrass	*Erianthus spp.*		
Oakleaf fleabane	*Erigeron quercifolius*		
Early whitetop fleabane	*Erigeron vernus*		
Pipewort	*Eriocaulon compressum*		
Tenangle pipewort	*Eriocaulon decangulare*		
Wild buckwheat	*Eriogonum tomentosum*		
Rattlesnakemaster	*Eryngium aquaticum*		
Baldwin's eryngo	*Eryngium baldwinii*		
Blueflower eryngo	*Eryngium integrifolium*		
Rattlesnakemaster, button eryngo	*Eryngium yuccifolium*		
Coralbean	*Erythrina herbacea*		
American strawberrybush	*Euonymus americanus*		
White thoroughwort	*Eupatorium album*		
Dogfennel	*Eupatorium capillifolium*		
Yankeeweed	*Eupatorium compositifolium*		
Wasy thoroughwort	*Eupatorium cuneifolium*		
False fennel	*Eupatorium leptophyllum*		
Justiceweed	*Eupatorium leucolepis*		
Semaphore thoroughwort	*Eupatorium milkanoides*		
Mohr's thoroughwort	*Eupatorium mohrii*		
Common boneset	*Eupatorium perfoliatum*		
Rough boneset	*Eupatorium pilosum*		
False hoarhound	*Eupatorium rotundifolium*		
Curtis' spurge	*Euphorbia curtsii*		
Coastal sand spurge	*Euphorbia exserta*		
Florida pineland spurge	*Euphorbia inundata*		
Saltmarsh fingergrass	*Eustachys glauca*		
Seaside gentian	*Eustoma exaltatum*		
Flat-topped goldenrod, slender goldenrod	*Euthamia caroliniana*		
Flattop goldenrod	*Euthamia graminifolia*		
Slender flattop goldenrod	*Euthamia minor*		
Silver dwarf morningglory	*Evolvulus sericeus*		
American beech	*Fagus grandifolia*		
Marsh frimby	*Fimbristylis castanea*		
Hariy frimby	*Fimbristylis puberula*		

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Narrowleaf yellowtops	*Flaveria linearis*		
Eastern swampprivet	*Forestiera acuminate*		
Florida privet, Florida swampprivet	*Forestiera segregata*		
White ash	*Fraxinus americana*		
Carolina ash	*Fraxinus caroliniana*		
Swamp white ash	*Fraxinus pauciflora*		
Green ash, pumpkin ash	*Fraxinus pennsylvanica*		
Southern umbrellasedge	*Fuirena scirpoidea*		
Lanceleaf blanketflower	*Gaillardia aestivalis*		
Elliott's milkpea	*Galactia elliottii*		
Erect milkpea	*Galactia erecta*		
Florida milkpea	*Galactia floridana*		
Soft milkpea	*Galactia mollis*		
Eastern milkpea	*Galactia regularis*		
Downy milkpea	*Galactia volubilis*		
Coastal bedstraw	*Galium hipidulum*		
Hairy bedstraw	*Galium pilosum*		
Stiff marsh bedstraw	*Galium tinctorium*		
Southern beeblossum	*Gaura angustifolia*		
Slenderstalk	*Gaura filipes*		
Dwarf huckleberry	*Gaylussacia dumosa*		
Blue huckleberry	*Gaylussacia frondosa*		
Woolly huckleberry	*Gaylussacia mosieri*		
Carolina jessamine	*Gelsemium sempervirens*		
Yellow jessamine	*Gelsemium sempervirens*		
Wiregrass gentian	*Gentiana pennelliana*	E	
Cranesbill	*Geranium carolinianum*		
Rose mock vervain	*Glandularia canadensis*		
Water locust	*Gleditsia aquatica*		
Honey locust	*Gleditsia triacanthos*		
Bagpod	*Glottidium vesicarium*		
Sweet everlasting	*Gnaphalium obtusifolium*		
Spoonleaf purple everlasting	*Gnaphalium purpureum*		
Loblolly bay	*Gordonia lasianthus*		
Sticky hedgehyssop	*Gratiola brevifolia*		
Rough hedgehyssop	*Gratiola hispida*		
Shaggy hedgehyssop	*Gratiola pilosa*		
Branched hedgehyssop	*Gratiola ramosa*		
Bearded skeletongrass	*Gymnopogon ambiguus*		
Shortleaf skeletongrass	*Gymnopogon brevifolius*		
Chapman's skeletongrass	*Gymnopogon chapmanianus*		
Toothpetal false reinorchid	*Habenaria floribunda*		
Bog orchid	*Habenaria quinqueseta*		
Carolina silverbell	*Halesia caroliniana*		
Shoal grass	*Halodule wrightii*		
Paddle-grass	*Halophila decipens*		
Engelmann's seagrass, star grass	*Halophila engelmannii*		
American witchhazel	*Hamamelis virginiana*		
Innocence	*Hedyotis procumbens*		
Common sneezeweed	*Helenium autumnale*		
Southeastern sneezeweed	*Helenium pinnatifidum*		
Savannah sneezeweed	*Helenium vernale*		

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Carolina frostweed	*Helianthemum carolinianum*		
Georgia frostweed	*Helianthemum georgianum*		
Swamp sunflower	*Helianthus angustifolius*		
Variableleaf sunflower	*Helianthus heterophyllus*		
Rayless sunflower, stiff sunflower	*Helianthus radula*		
Seaside heliotrope, salt heliotrope	*Heliotropium curassavicum*		
Crested coralroot	*Hexalectris spicata*		
Comfortroot	*Hibiscus aculeatus*		
Crimsoneyed rosemallow	*Hibiscus moscheutos*		
Queen-devil	*Hieracium gronovii*		
Coastalplain hawkweed	*Hieracium megacephalon*		
Pennywort	*Hydrocotyle* spp.		
Marsh pennywort	*Hydrocotyle umbellata*		
Sky flower	*Hydrolea corymbosa*		
Coastalplain spiderlily	*Hymenocallis crassifolia*		
Godfrey's spiderlily	*Hymenocallis godfreyi*	E	
Coastalplain St. John's-wort	*Hypericum brachyphyllum*		
Roundpod St. John's-wort	*Hypericum cistifolium*		
St. Peter's-wort	*Hypericum crux-andreae*		
Bedstraw St. John's-wort	*Hypericum galioides*		
Peelbark St. John's-wort	*Hypericum fasciculatum*		
St. Andrew's-cross	*Hypericum hypericoides*		
Flatwoods St. John's-wort	*Hypericum microsepalum*		
Dwarf St. John's wort	*Hypericum mutilum*		
Myrtleleaf St. John's-wort	*Hypericum myrtifolium*		
Hairy St. John's-wort	*Hypericum setosum*		
Fourpetal st. John's wort	*Hypericum tetrapetalum*		
Common yellow stargrass	*Hypoxis curtissi*		
Common goldstar	*Hypoxis hirsuta*		
Fringed yellow stargrass	*Hypoxis juncea*		
Stiff stargrass	*Hypoxis rigida*		
Glossyseed yellow stargrass	*Hypoxis sessilis*		
Musky mint, clustered bushmint	*Hyptis alata*		
Carolina holly	*Ilex ambigua*		
Dahoon holly	*Ilex cassine*		
Large gallberry	*Ilex coriacea*		
Possumhaw	*Ilex decidua*		
Gallberry, inkberry	*Ilex glabra*		
Myrtle dahoon	*Ilex myrtifolia*		
American holly	*Ilex opaca*		
Yaupon holly	*Ilex vomitoria*		
Wild indigo, carolina indigo	*Indigofera caroliniana*		
Trailing indigo	*Indigofera spicata*		
Flaxleaf whitetop aster	*Ionactis linariifolius*		
Man-of-the-earth	*Ipomoea pandurata*		
Saltmarsh morningglory	*Ipomoea sagittata*		
Prairie iris, blueflag	*Iris hexagona*		
Virginia willow, sweetspire	*Itea virginica*		
Marshelder, sumpweed, jesuit's bark	*Iva frutescens*		
Seacoast marshelder	*Iva imbricate*		
Canadian rush	*Juncus canadensis*		
Forked rush	*Juncus dichotomus*		

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Common rush	*Juncus effusus*		
Shore rush	*Juncus marginatus*		
Manyhead rush	*Juncus polycephalos*		
Black needlerush	*Juncus roemerianus*		
Needlepod rush	*Juncus scirpoides*		
Redpod rush	*Juncus trigonocarpus*		
Red cedar	*Juniperus silicicola*		
Southern red cedar	*Juniperus virginiana*		
Wicky, hairy laurel	*Kalmia hirsuta*		
Virginia saltmarsh mallow	*Kosteletzkya virginica*		
Dwarf dandelion	*Krigia virginica*		
False boneset	*Kuhnia eupatorioides*		
Carolina redroot	*Lachnanthes caroliana*		
Whitehead bogbutton	*Lachnocaulon anceps*		
Small's bogbutton	*Lachnocaulon minus*		
Deckert's pinweed	*Lechea deckertii*		
Thymeleaf pinweed	*Lechea minor*		
Legget's pinweed	*Lechea pulchella*		
Pineland pinweed	*Lechea sessiliflora*		
Corkwood	*Leitneria floridana*	T	
Little duckweed	*Lemna obscura*		
Virginia pepperweed	*Lepidium virginicum*		
Narrowleaf lespedeza	*Lespedeza angustifolia*		
Hairy lespedeza	*Lespedeza hirta*		
Trailing lespedeza	*Lespedeza procumbens*		
Creeping lespedeza	*Lespedeza repens*		
Tall lespedeza	*Lespedeza stuevei*		
Coastal doghobble	*Leucothoe axillaries*		
Swamp doghobble	*Leucothoe racemosa*		
Chapman's gayfeather, Chapman's blazing star	*Liatris chapmanii*		
Pinkscale gayfeather	*Liatris elegans*		
Slender gayfeather	*Liatris gracilis*		
Grassleaf gayfeather, grassleaf blazing star	*Liatris graminifolia*		
Few flowered gayfeather, fewflower blazing star	*Liatris pauciflora*		
Godfrey's blazing star	*Liatris provincialis*	E	
Piedmont blazing star	*Liatris secunda*		
Dense gayfeather	*Liatris spicata*		
Shortleaf gayfeather	*Liatris tenuifolia*		
Gopher apple	*Licania michauxii*		
Eastern glasswort	*Lilaeopsis chinensis*		
Pine lily	*Lilium catesbaei*	T	
Carolina sealavendar	*Limonium carolinianum*		
Blue toadflax	*Linaria canadensis*		
Savannah false pimpernel	*Lindernia grandiflora*		
Florida yellow flax	*Linum floridanum*		
Stiff yellow flax	*Linum medium*		
Sweetgum	*Liquidambar styraciflua*		
Yellow-poplar	*Liriodendron tulipifera*		
Cardinal flower	*Lobelia cardinalis*	T	
Glades lobelia	*Lobelia glandulosa*		
White lobelia	*Lobelia paludosa*		
Coral honeysuckle	*Lonicera sempervirens*		

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Goldencrest	*Lophiola americana*		
Spindleroot	*Ludwigia hirtella*		
Narrow primrose-willow	*Ludwigia linearis*		
Seaside primrose-willow	*Ludwigia maritima*		
Smallfruit primrose-willow	*Ludwigia microcarpa*		
Marsh seedbox	*Ludwigia palustris*		
Creeping primrose-willow	*Ludwigia repens*		
Savannah primrose-willow	*Ludwigia virgata*		
Sundial lupine	*Lupinus perennis*		
Lady lupine	*Lupinus villosus*		
Christmasberry, Carolina desertthorn	*Lycium carolinianum*		
Foxtail club-moss	*Lycopodium alopecuroides*		
Southern club-moss	*Lycopodium appressa*		
Slender club-moss	*Lycopodium carolinianum*		
Rose-rush	*Lygodesmia aphylla*		
Rusty staggerbush	*Lyonia ferruginea*		
Coastalplain staggerbush	*Lyonia fruticosa*		
Maleberry	*Lyonia ligustrina*		
Fetterbush	*Lyonia lucida*		
Piedmont staggerbush	*Lyonia mariana*		
Wand lythrum	*Lythrum lineare*		
Wild bushbean	*Macroptilium lathyroides*		
Southern magnolia	*Magnolia grandiflora*		
Sweetbay	*Magnolia virginiana*		
Florida adder's-mouth orchid	*Malaxis spicata*		
Southern crabapple	*Malus angustifolia*	T	
Alabama milkvine	*Matelea alabamensis*		
Florida spiny pod	*Matelea floridana*	E	
Angel-pod	*Matelea suberosa*		
Axilflower	*Mecardonia acuminata*		
Snow squarestem	*Melanthera nivea*		
White sweetclover	*Melilotus albus*		
Creeping cucumber	*Melothria pendula*		
Climbing hempvine	*Mikania scandens*		
Littleleaf sensitive briar	*Mimosa microphylla*		
Sensitive briar	*Mimosa quadrivalvis angustata*		
Partridgeberry	*Mitchella repens*		
Narrowleaf hornpod	*Mitreola angustifolia*		
Lax hornpod	*Mitreola petiolata*		
Swamp hornpod	*Mitreola sessilifolia*		
Horsemint, spotted beebalm	*Monarda punctata*		
Red mulberry	*Morus rubra*		
Hairgrass, muhly grass, hairawn muhly	*Muhlenbergia capilaris filipes*		
Cutover muhly	*Muhlenbergia capilaris trichopodes*		
Cutover muhly	*Muhlenbergia expansa*		
Southern bayberry	*Myrica caroliniensis*		
Wax myrtle, southern bayberry	*Myrica cerifera*		
Odorless bayberry	*Myrica inodora*		
Southern waternymph	*Najas guadalupensis*		
Tropical puff	*Neptunia pubescens*		
Water tupelo	*Nyssa aquatica*		
Ogeechee tupelo	*Nyssa ogeche*		

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Black gum	*Nyssa sylvatica*		
Swamp tupelo	*Nyssa sylvatica biflora*		
Narrowleaf evening-primrose	*Oenothera fruticosa*		
Cutleaf evening-primrose, willow primrose	*Oenothera laciniata*		
Clustered mile graines	*Oldenlandia uniflora*		
Woodsgrass	*Oplismenus hirtellas*		
Tuna cactus	*Opuntia ficus-india*		
Pricklypear	*Opuntia humifusa*		
Prickly pear cactus	*Opuntia stricta*	T	
Samson's snakeroot	*Orbexilum pedunculatum*		
Devilwood	*Osmanthus americanus*		
Cinnamon fern	*Osmunda cinnamomea*	C	
Royal fern	*Osmunda regalis*	C	
Eastern hophornbeam	*Ostrya virginiana*		
Common yellow woodsorrel	*Oxalis corniculata*		
Water cowbane, water dropwort	*Oxypolis filiformis*		
Piedmont cowbane	*Oxypolis ternata*		
Coastalplain palafox	*Palafoxia integrifolia*		
Beaked panicum	*Panicum anceps*		
Maidencane	*Panicum hemitomon*		
Panicgrass	*Panicum longifolium*		
Redtop panicum	*Panicum rigidulum*		
Bluejoint panicum	*Panicum tenerum*		
Warty panicgrass	*Panicum verrucosum*		
Switchgrass	*Panicum virgatum*		
Pineland nailwort	*Paronychia patula*		
Virginia creeper	*Parthenocissus quinquefolia*		
Crowngrass	*Paspalum bifidum*		
Florida paspalum	*Paspalum floridanum*		
Early paspalum	*Pasaplum praecox*		
Thin paspalum	*Paspalum setaceum*		
Purple passionflower	*Passiflora incarnata*		
Buckroot	*Pediomelum canescens*		
Mayflower beardtongue	*Penstemon multiflorus*		
Red bay	*Persea borbonia*		
Swamp bay	*Persea palustris*		
Summer farewell	*Petalostemon pinnatum*		
Savannah panicum	*Phanopyrum gymnocarpon*		
Goldenfoot fern, golden polypody	*Phlebodium aureum*		
Florida false sunflower	*Phoebanthus grandiflorus*		
Florida phlox	*Phlox floridana*		
Red chokeberry	*Photinia pyrifolia*		
Common cane, roseau cane	*Phragmites australis*		
Fogfruit, capeweed	*Phyla nodiflora*		
Cypresshead groundcherry	*Physalis arenicola*		
Starhair groundcherry	*Physalis viscosa*		
Walter's groundcherry	*Physalis walteri*		
Slenderleaf false dragonhead	*Physostegia leptophylla*		
Eastern false dragonhead	*Physostegia purpurea*		
American pokeweed	*Phytolacca americana*		
Wild pennyroyal	*Piloblephis rigida*		
Fevertree	*Pinckneya bracteata*	T	

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Fevertree	*Pinckneya pubens*		
Blueflower butterwort	*Pinguicula caerulea*	T	
Yellow butterwort	*Pinguicula lutea*	T	
Chapman's butterwort	*Pinguicula planifolia*	T	
Small butterwort	*Pinguicula pumila*		
Sand pine	*Pinus clausa*		
Slash pine	*Pinus elliottii*		
Spruce pine	*Pinus glabra*		
Longleaf pine	*Pinus palustris*		
Pond pine	*Pinus serotina*		
Loblolly pine	*Pinus taeda*		
Blackseed needlegrass	*Piptochaetium avenaeceum*		
Pitted stripesteed	*Piriqueta caroliniana*		
Cheesewood	*Pittosporum* spp.		
Carolina silkgrass	*Pityopsis adenolepis*		
Pineland silkgrass	*Pityopsis aspera*		
Florida golden aster	*Pityopsis flexuosa*	E	
Narrowleaf silkgrass	*Pityopsis graminifolia*		
Grassleaf golden aster	*Pityopsis oligantha*		
Waterelm	*Planera aquatica*		
Southern plantain	*Plantago virginica*		
Yellow fringed orchid	*Platanthera ciliaris*	T	
Green wood orchid	*Platanthera clavellata*	E	
Yellow fringeless orchid	*Platanthera integra*	E	
Resurrection fern	*Pleopeltis polypodioides*		
Stinking camphorweed	*Pluchea foetida*		
Sweetscent	*Pluchea odorata*		
Rosy camphorweed	*Pluchea rosea*		
Rose pogonia	*Pogonia ophioglossoides*	T	
Baldwin's milkwort	*Polygala balduinii*		
Scalloped milkwort	*Polygala crenata*		
Drumheads	*Polygala cruciata*		
Showy milkwort	*Polygala grandiflora*		
Orange milkwort	*Polygala lutea*		
Candyroot	*Polygala nana*		
Racemed milkwort	*Polygala polygama*		
Low pinebarren milkwort	*Polygala ramosa*		
Coastalplain milkwort	*Polygala setacea*		
Tall jointweed	*Polygonella gracilis*		
Octoberflower	*Polygonella polygama*		
Swamp smartweed	*Polygonum hydropiperoides*		
Dotted smartweed	*Polygonum punctatum*		
Resurrection fern	*Polypodium polypodioides*		
Rustweed	*Polypremum procumbens*		
Pickerelweed	*Pontederia cordata*		
Hairy shadow witch	*Ponthieva racemosa*		
Eastern cottonwood	*Populus deltoids*		
Illinois pondweed	*Potamogeton illinoensis*		
Claspingleaf	*Potamogeton perfoliatus*		
Small pondweed	*Potamogeton pusillus*		
Marsh mermaidweed	*Proserpinaca palustris*		
Combleaf mermaidweed	*Proserpinaca pectinata*		

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American plum	*Prunus americana*		
Chickasaw plum	*Prunus angustifolia*		
Carolina laurel cherry	*Prunus caroliniana*		
Black cherry	*Prunus serotina*		
Flatwoods plum	*Prunus umbellata*		
Heller's cudweed	*Pseudognaphalium helleri*		
Sampson's snakeroot	*Psoralea psoralioides*		
Tailed bracken	*Pteridium aquilinum pseudocaudatum*		
Blackroot, rabbit tobacco	*Pterocaulon pycnostachyum*		
Wand blackroot	*Pterocaulon virgatum*		
Mock bishopsweed, herbwilliam	*Ptilimnium capillaceum*		
White oak	*Quercus alba*		
Chapman's oak	*Quercus chapmanii*		
Runner oak	*Quercus elliottii*		
Southern red oak	*Quercus falcata*		
Sand live oak	*Quercus geminata*		
Bluejack oak	*Quercus incana*		
Turkey oak	*Quercus laevis*		
Laurel oak	*Quercus laurifolia*		
Overcup oak	*Quercus lyrata*		
Sand post oak	*Quercus margaretta*		
Swamp chestnut oak	*Quercus michauxii*		
Dwarf live oak	*Quercus minima*		
Myrtle oak	*Quercus myrtifolia*		
Water oak	*Quercus nigra*		
Shumard's oak	*Quercus shumardii*		
Bluff oak	*Quercus sinuata*		
Virginia live oak	*Quercus virginiana*		
Wild radish	*Raphanus raphanistrum*		
Needle palm	*Rhapidophyllum hystrix*	C	
Savannah meadowbeauty	*Rhexia alifanus*		
West indian meadowbeauty	*Rhexia cubensis*		
Yellow meadowbeauty	*Rhexia lutea*		
Pale meadow beauty	*Rhexia mariana*		
Nuttall's meadowbeauty	*Rhexia nuttallii*		
Fringed meadowbeauty	*Rhexia petiolata*		
Red mangrove	*Rhizphorus mangle*		
Sweet pinxter azalea	*Rhododendron canescens*		
Indian azalea	*Rhododendron simsii*		
Swamp azalea	*Rhododendron viscosum*		
Winged sumac	*Rhus copallinum*		
Royal snoutbean	*Rhynchosia cytisoides*		
Michaux's snoutbean	*Rhynchosia michauxii*		
Dollarleaf	*Rhynchosia reniformis*		
Baldwin's beaksedge	*Rhynchospora baldwinii*		
Shortbristle beaksedge	*Rhynchospora breviseta*		
Loosehead beaksedge	*Rhynchospora chalarocephala*		
Chapman's beaksedge	*Rhynchospora chapmanii*		
Fringed beaksedge	*Rhynchospora ciliaris*		
Star-top rush, starrush whitetop	*Rhynchospora colorata*		
Short bristled horned beaksedge	*Rhynchospora corniculata*		
Curtiss' beaksedge	*Rhynchospora curtissii*		

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Fascicled beaksedge	*Rhynchospora facicularis*		
Threadleaf beaksedge	*Rhynchospora filifolia*	E	
Globe beaksedge	*Rhynchospora globularis*		
Slender beaksedge	*Rhynchospora gracilenta*		
Gray's beaksedge	*Rhynchospora grayi*		
Pinebarren beaksedge	*Rhynchospora intermedia*		
Giant whitetop	*Rhynchospora latifolia*		
Millet beaksedge	*Rhynchospora miliacea*		
Pineland beaksedge	*Rhynchospora perplexa*		
Plumed beaksedge	*Rhynchospora plumosa*		
Fairy beaksedge	*Rhynchospora pusilla*		
Fewflower beaksedge	*Rhynchospora rariflora*		
Swamp rose	*Rosa palustris*		
Sawtooth blackberry	*Rubus argutus*		
Sand blackberry	*Rubus cuneifolius*		
Northern dewberry	*Rubus flagellaris*		
Southern dewberry	*Rubus trivialis*		
Orange coneflower	*Rudbeckia fulgida*		
Blackeyed susan	*Rudbeckia hirta*		
Carolina wild petunia	*Ruellia caroliniensis*		
Hairyflower wild petunia	*Ruellia ciliatiflora*		
Ciliate wild petunia	*Ruellia ciliosa*		
Nightflowering petunia	*Ruellia noctiflora*	E	
Swamp dock	*Rumex verticillatus*		
Widgeongrass	*Ruppia maritima*		
Bluestream palmetto	*Sabal minor*		
Cabbage palm	*Sabal palmetto*		
Shortleaf rosegentian	*Sabatia brevifolia*		
Coastal rosegentian	*Sabatia calycina*		
Slender rosegentian	*Sabatia campanulata*		
Largeleaf rosegentian	*Sabatia macrophylla*		
Fourangle rosegentian	*Sabatia quadrangula*		
Rose of plymouth	*Sabatia stellaris*		
Sugarcane plumegrass	*Saccharum coarctatum*		
Sugarcane plumegrass	*Saccharum giganteum*		
Chapman's arrowhead	*Sagittaria graminea*		
Strap-leaved sagittaria	*Saggitaria kurziana*		
Bulltongue arrowhead	*Sagittaria lancifolia*		
Awl-leaf arrowhead	*Sagittaria subulata*		
Annual glasswort	*Salicornia bigelovii*		
Perrenial glasswort	*Salicornia virginica*		
Carolina willow, coastalplain willow	*Salix caroliniana*		
Black willow	*Salix nigra*		
Azure blue sage	*Salvia azurea*		
Lyreleaf sage	*Salvia lyrata*		
Water spangles	*Salvinia minima*		
Elderberry	*Sambucus canadensis*		
American elder	*Sambucus nigra canadenis*		
Water pimpernel	*Samolus ebracteatus*		
Pineland pimpernel	*Samolus parviflorus*		
Pineland pimpernel, seaside brookweed	*Samolus valerandi*		
Canadian blacksnakeroot	*Sanicula canadensis*		

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Hooded pitcherplant	*Sarracenia minor*	T	
Parrot pitcherplant	*Sarracenia psittacina*	T	
Sassafras	*Sassafras albidum*		
Lizard's tail	*Saururus cernuus*		
Bay starvine	*Schisandra glabra*	E	
Little bluestem	*Schizachyrium scoparium*		
Creeping bluestem	*Schizachyrium stoloniferum*		
Slender bluestem	*Schizachyrium tenerum*		
Florida sensitive brier	*Schrankia microphylla*		
Three-square sedge	*Scirpus olneyi*		
Threesquare bulrush	*Scirpus pungens*		
Leafy sedge	*Scirpus robustus*		
Baldwin's nutrush	*Scleria baldwinii*		
Fringed nutrush	*Scleria ciliata*		
Fewflower nutrush	*Scleria ciliata pauciflora*		
Slenderfruit nutrush	*Scleria georgiana*		
Netted nutrush	*Scleria retulgris*		
Tall nutgrass	*Scleria triglomerata*		
Low nutrush	*Scleria verticillata*		
Florida scrub skullcap	*Scutellaria arenicola*		
Small's skullcap	*Scutellaria multiglandulosa*		
Maryland wild sensitive plant	*Senna marilandica*		
Saw palmetto	*Serenoa repens*		
Dixie whitetopped aster	*Sericocarpus tortifolius*		
Seapurslane	*Sesuvium portulacastrum*		
Yaupon blacksenna	*Seymeria cassioides*		
Piedmont blacksenna	*Seymeria pectinata*		
Gum bully	*Sideroxylon lanuginosa*		
Florida bully	*Sideroxylon reclinatum*		
Starry rosinweed	*Silphium asteriscus*		
Kidneyleaf rosinweed	*Silphium compositum*		
White blue-eyed grass	*Sisyrinchium albidum*		
Narrowleaf blue-eyed grass	*Sisyrinchium angustifolium*		
Eastern blue-eyed grass	*Sisyrinchium atlanticum*		
Nash's blue-eyed grass	*Sisyrinchium nashii*		
Annual blue-eyed grass	*Sisyrinchium rosulatum*		
Hemlock waterparsnip	*Sium suave*		
Earleaf greenbrier	*Smilax auriculata*		
Saw greenbrier	*Smilax bona-nox*		
Cat greenbrier	*Smilax glauca*		
Laurel greenbrier	*Smilax laurifolia*		
Sarsaparilla vine	*Smilax pumila*		
Bristly greenbrier	*Smilax tamnoides*		
American black nightshade	*Solanum americanum*		
Florida horsenettle	*Solanum carolinense*		
Pinebarren goldenron	*Solidago fistulosa*		
Giant goldenrod	*Solidago gigantea*		
Chapman's goldenrod, anise-scented goldenrod	*Solidago odora odora*		
Wrinkleleaf goldenrod	*Solidago rugosa*		
Wand goldenrod	*Solidago stricta*		
Spiny sowthistle	*Sonchus asper*		
Slender indiangrass	*Sorghastrum elliottii*		

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Yellow indiangrass	*Sorghastrum nutans*		
Lopsided indiangrass	*Sorghastrum secundum*		
Smooth cordgrass, oystergrass	*Spartina alterniflora*		
Saltmeadow hay, saltmeadow cordgrass	*Spartina patens*		
Giant cordgrass, rough cordgrass	*Spartina cynosuroides*		
Gulf cordgrass	*Spartina spartinae*		
Woodland false buttonweed	*Spermacoce assurgens*		
Bog moss species	*Sphagnum* spp.		
Florida ladiestrsses	*Spiranthes floridana*	E	
Spring ladiestresses	*Spiranthes vernalis*		
Common duckweed	*Spirodela polyrhiza*		
Hidden dropseed	*Sporobolus clandestinus*		
Florida dropseed	*Sporobolus floridanus*		
Pineywoods dropseed	*Sporobolus junceus*		
Seashore dropseed	*Sporobolus virginicus*		
Sweet shaggytuft	*Stenandrium dulce*		
St. Augustine grass	*Stenoaphrum secundatum*		
Water toothleaf, corkwood	*Stillingia aquatica*		
Queensdelight	*Stillingia sylvatica*		
Pink fuzzybean	*Strophostyles umbellata*		
Coastalplain dawnflower	*Stylisma patens*		
Sidebeak pencilflower	*Stylosanthes biflora*		
American snowbell	*Styrax americanus*		
Bigleaf snowbell	*Styrax grandiflorus*		
Sea blite	*Suadea linearis*		
Scaleleaf aster	*Symphyotrichum adnatum*		
Savannah aster	*Symphyotrichum chapmanii*		
Easten silver aster	*Symphyotrichum concolor*		
Rice button aster	*Symphyotrichum dumosum*		
Perennial saltmarsh aster	*Symphyotrichum tenuifolium*		
Common sweetleaf	*Symplocos tinctoria*		
Yellow hatpins	*Syngonanthus flavidulus*		
Manatee grass	*Syringodium filiforme*		
Pond-cypress	*Taxodium ascendens*		
Bald-cypress	*Taxodium distichum*		
Scurf hoarypea	*Tephrosia chrysophylla*		
Florida hoarypea	*Tephrosia florida*		
Sprawling hoarypea	*Tephrosia hispidula*		
Spiked hoarypea	*Tephrosia spicata*		
Wood sage	*Teucrium canadense*		
Turtle grass	*Thalassia testudinum*		
Widespread maiden fern	*Thelypteris kunthii*		
Widespread maiden fern	*Thelypteris normalis*		
Marsh fern	*Thelypteris palustris*		
Carolina basswood	*Tilia americana caroliniana*		
White basswood	*Tilia americana heterophylla*		
Bartram's airplant	*Tillandsia bartramii*		
Spanish moss	*Tillandsia usneoides*		
Crippled cranefly orchid	*Tipularia discolor*	T	
Coastal false asphodel	*Tofieldia racemosa*		
Eastern poison oak	*Toxicodendron pubescens*		
Poison ivy	*Toxicodendron radicans*		

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Atlantic poison oak	*Toxicodendron toxicarium*		
Poison sumac	*Toxicodendron vernix*		
Climbing dogbane	*Trachelospermum difforme*		
Spiderwort	*Tradescantia* spp.		
Small's noseburn	*Tragia smallii*		
Wavyleaf noseburn	*Tragia urens*		
Nettleleaf noseburn	*Tragia urticifolia*		
Forked bluecurls	*Trichostema dichotomum*		
Carolina fluffgrass	*Tridens carolinianus*		
Field clover	*Trifolium campestre*		
White clover	*Trifolium repens*		
Trillium species	*Trillium* spp.		
Venus's lookingglass	*Triodanis perfoliata*		
Perennial sandgrass	*Triplasis americana*		
Purple sandgrass	*Triplasis purpurea*		
Winged elm	*Ulmus alata*		
American elm	*Ulmus americana*		
Little floating bladderwort	*Utricularia radiata*		
Bladderwort	*Utricularia subulata*		
Sparkleberry	*Vaccinium arboretum*		
Highbush blueberry	*Vaccinium corymbosum*		
Darrow's blueberry	*Vaccinium darrowii*		
Shiny blueberry	*Vaccinium myrsinites*		
Deerberry	*Vaccinium stamineum*		
Tapegrass	*Vallisenaria americana*		
Brazilian vervain	*Verbena brasiliensis*		
Frostweed, white crownbeard	*Verbesina virginica*		
Tall ironweed	*Vernonia angustifolia*		
Giant ironweed	*Vernonia gigantea*		
Southern arrowwood	*Viburnum dentate*		
Possumhaw	*Viburnum nudan*		
Walter's viburnum	*Viburnum obovatum*		
Rusty blackhaw	*Viburnum rufidulum*		
Fourleaf vetch	*Vicia acutifolia*		
Vetch species	*Vicia* spp.		
Hairypod cowpea	*Vigna luteola*		
Common blue violet	*Viola floridana*		
Bog white violet	*Viola lanceolata*		
Early blue violet	*Viola palmata*		
Primroseleaf violet	*Viola primulifolia*		
Common blue violet	*Viola sororia*		
Prostrate blue violet	*Viola walteri*		
Summer grape	*Vitis aestivalis*		
Graybark grape	*Vitis cinerea*		
Muscadine	*Vitis rotundifolia*		
Calloose grape	*Vitis shuttleworthii*		
Southern rockbell	*Wahlenbergia marginata*		
Netted chain fern	*Woodwardia areolata*		
Virginia chain fern	*Woodwardia virginica*		
Coastal plain yellow-eyed grass	*Xyris ambigua*		
Baldwin's yellow-eyed grass	*Xyris baldwiniana*		
Carolina yellow-eyed grass	*Xyris caroliniana*		

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Curtiss' yellow-eyed grass	*Xyris difformis curtissii*		
Elliott's yellow-eyed grass	*Xyris elliottii*		
Savannah yellow-eyed grass	*Xyris flabelliformis*		
Tall yellow-eyed grass	*Xyris platylelpis*		
Spanish bayonet, aloe yucca	*Yucca aloifolia*		
Adam's needle	*Yucca filamentosa*		
Coontie	*Zamia pumila*	C	
Hercules'-club, prickly ash	*Zanthoxylum clava-herculis*		
Wild lime	*Zanthoxylum fagara*		
Atamasco lily, rainlily	*Zephyranthes atamasca*		
Treat's rainlily	*Zephyranthes treatiae*	T	
Crowpoison, osceola'a plume	*Zigadenus densus*		
Annual wild rice	*Zizania aquatica*		
Birds			
Cooper's hawk	*Accipiter cooperii*		
Sharp-shinned hawk	*Accipiter striatus*		
Spotted sandpiper	*Actitis macularia*		
Red-winged blackbird	*Agelaius phoeniceus*		
Bachman's sparrow	*Aimophila asetivalis*		
Wood duck	*Ais sponsa*		
Saltmarsh sharp-tailed sparrow	*Ammodramus caudacutus*		
Henslow's sparrow	*Ammodramus henslowii*		
Leconte's sparrow	*Ammodramus leconteii*		
Seaside sparrow	*Ammodramus maritimus juncicola*	SSC	
Scott's seaside sparrow	*Ammodramus maritimus peninsulae*	SSC	
Nelson's sharp-tailed sparrow	*Ammodramus nelsoni*		
Grasshopper sparrow	*Ammodramus savannarum*	E	E
Northern pintail	*Anas acuta*		
American wigeon	*Anas americana*		
Northern shoveler	*Anas clypeata*		
Green-winged teal	*Anas crecca*		
Cinnamon teal	*Anas cyanoptera*		
Blue-winged teal	*Anas discors*		
Mottled duck	*Anas fulvigula*		
Mallard	*Anas platyrhynchos*		
American black duck	*Anas rubripes*		
Gadwall	*Anas strepera*		
Anhinga	*Anhinga anhinga*		
Greater white-fronted goose	*Anser albifrons*		
American pipit	*Anthus rubescens*		
Scrub jay	*Aphelocoma coerulescens coeruluescens*	T	T
Limpkin	*Aramus guarauna*	SSC	
Ruby-throated hummingbird	*Archilochus colubris*		
Great blue heron	*Ardea herodias*		
Great white heron	*Ardea herodias occidentalis*		
Ruddy turnstone	*Arenaria interpres*		
Short-eared owl	*Asio flammeus*		
Florida burrowing owl	*Athene cunicularia*	SSC	
Lesser scaup	*Aythya affinis*		
Redhead	*Aythya americana*		
Ring-necked duck	*Aythya collaris*		

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Greater scaup	*Aythya marila*		
Canvasback	*Aythya valisineria*		
Tufted titmouse	*Baeolophus bicolor*		
Upland sandpiper	*Bartramia longicauda*		
Cedar waxwing	*Bombycilla cedrorum*		
American bittern	*Botaurus lentiginosus*		
Canada goose	*Branta canadensis*		
Great horned owl	*Bubo virginianus*		
Cattle egret	*Bubulcus ibis*		
Bufflehead	*Bucephala albeola*		
Common goldeneye	*Bucephala clangula*		
Red-tailed hawk	*Buteo jamaicensis*		
Red-shouldered hawk	*Buteo lineatus*		
Broad-winged hawk	*Buteo platypterus*		
Green-backed heron	*Butorides striatus*		
Green-backed heron	*Butorides virescens*		
Sanderling	*Calidris alba*		
Dunlin	*Calidris alpina*		
Red knot	*Calidris canutus*		
White rumped sandpiper	*Calidris fuscicollis*		
Stilt sandpiper	*Calidris himantipus*		
Western sandpiper	*Calidris mauri*		
Pectoral sandpiper	*Calidris melanotos*		
Least sandpiper	*Calidris minutilla*		
Semipalmated sandpiper	*Calidris pusilla*		
Chuck-will's-widow	*Caprimulgus carolinensis*		
Whip-poor-will	*Caprimulgus vociferus*		
Crested caracara	*Caracara cheriway*		
Northern cardinal	*Cardinalis cardinalis*		
Pine siskin	*Carduelis pinus*		
American goldfinch	*Carduelis tristis*		
Purple finch	*Carpodacus purpureus*		
Turkey vulture	*Cathartes aura*		
Veery	*Catharus fuscescens*		
Hermit thrush	*Catharus guttatus*		
Gray-cheeked thrush	*Catharus minimus*		
Swainson's thrush	*Catharus ustulatus*		
Willet	*Catoptrophorus semipalmatus*		
Brown creeper	*Certhia americana*		
Belted kingfisher	*Ceryle alcyon*		
Chimney swift	*Chaetura pelagica*		
Snowy plover	*Charadrius alexandrinus tenuirostris*	T	
Piping plover	*Charadrius melodus*	T	T
Semipalmated plover	*Charadrius semipalmatus*		
Killdeer	*Charadrius vociferus*		
Wilson's plover	*Charadrius wilsonia*		
Snow goose	*Chen caerulescens*		
Black tern	*Chlidonias niger*		
Lark sparrow	*Chondestes grammacus*		
Common nighthawk	*Choreiles minor*		
Northern harrier	*Circus cyaneus*		
Marsh wren	*Cistothorus palustris*	SSC	

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Sedge wren	*Cistothorus platensis*		
Long-tailed duck	*Clangula hyemalis*		
Yellow-billed cuckoo	*Coccyzus americanus*		
Black-billed cuckoo	*Coccyzus erythropthalmus*		
Northern flicker	*Colaptes auratus*		
Northern bobwhite	*Colinus virginianus*		
Rock dove	*Columba livia*		
Common-ground dove	*Columbina passerina*		
Eastern wood-pewee	*Contopus virens*		
Black vulture	*Coragyps atratus*		
American crow	*Corvus brachyrhynchos*		
Fish crow	*Corvus ossifragus*		
Yellow rail	*Coturnicops noveboracensis*		
Grove-billed ani	*Crotophaga sulcirostris*		
Blue jay	*Cyanocitta cristata*		
Tundra swan	*Cygnus columbianus*		
Fulvous whistling-duck	*Dendrocygna bicolor*		
Black-throated blue warbler	*Dendroica caerulescens*		
Bay-breasted warbler	*Dendroica castanea*		
Cerulean warbler	*Dendroica cerulea*		
Yellow-rumped warbler	*Dendroica coronata*		
Prairie warbler	*Dendroica discolor*		
Yellow-throated warbler	*Dendroica dominica*		
Blackburnian warbler	*Dendroica fusca*		
Kirtland's warbler	*Dendroica kirtlandii*	E	E
Magnolia warbler	*Dendroica magnolia*		
Palm warbler	*Dendroica palmarum*		
Chestnut-sided warbler	*Dendroica pensylvanica*		
Yellow warbler	*Dendroica petechia*		
Pine warbler	*Dendroica pinus*		
Blackpoll warbler	*Dendroica striata*		
Cape May warbler	*Dendroica tigrina*		
Black-throated green warbler	*Dendroica virens*		
Bobolink	*Dolichonyx oryzivorus*		
Pileated woodpecker	*Dryocopus pileatus*		
Gray catbird	*Dumetella carolinensis*		
Great egret	*Egretta alba*		
Little blue heron	*Egretta caerulea*	SSC	
Reddish egret	*Egretta rufescens*	SSC	
Snowy egret	*Egretta thula*	SSC	
Tricolored heron	*Egretta tricolor*	SSC	
American swallow-tailed kite	*Elanoides forficatus*		
Acadian flycatcher	*Empidonax virescens*		
White ibis	*Eudocimus albus*	SSC	
Rusty blackbird	*Euphagus carolinus*		
Merlin	*Falco columbarius*		
Peregrine falcon	*Falco peregrinus tundrius*	E	
American kestrel	*Falco sparverius paulus*	T	
Magnificent frigatebird	*Fregata magnificens*		
American coot	*Fulica americana*		
Wilson's snipe	*Gallinago delicata*		
Common snipe	*Gallinago gallinago*		

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Common moorhen	*Gallinula chloropus*		
Common loon	*Gavia immer*		
Red-throated loon	*Gavia stellata*		
Gull billed tern	*Gelochelidon nilotica*		
Common yellowthroat	*Geothlypis trichas*		
Florida sandhill crane	*Grus canadensis pratensis*	T	
Blue grosbeak	*Guiraca caerulea*		
American oystercatcher	*Haematopus palliatus*	SSC	
Bald eagle	*Haliaeetus leucocephalus*		
Worm-eating warbler	*Helmitheros vermivorus*		
Black-necked stilt	*Himantopus mexicanus*		
Barn swallow	*Hirundo rustica*		
Wood thrush	*Hylocichla mustelina*		
Yellow-breasted chat	*Icteria virens*		
Baltimore oriole, northern oriole	*Icterus galbula*		
Orchard oriole	*Icterus spurius*		
Mississippi kite	*Ictinia mississippiensis*		
Dark-eyed junco	*Junco hyemalis*		
Loggerhead shrike	*Lanius ludovicianus*		
Herring gull	*Larus argentatus*		
Laughing gull	*Larus atricilla*		
Ring-billed gull	*Larus delawarensis*		
Great black-backed gull	*Larus marinus*		
Bonaparte's gull	*Larus philadelphia*		
Black rail	*Laterallus jamaicensis*		
Short-billed dowitcher	*Limnodromus griseus*		
Long-billed dowitcher	*Limnodromus scolopaceus*		
Swainson's warbler	*Limnothlypis swainsonii*		
Marbled godwit	*Limosa fedoa*		
Hooded merganser	*Lophodytes cucullatus*		
Least bittern	*Lxobrychus exilis*		
Red-bellied woodpecker	*Melanerpes carolinis*		
Red-headed woodpecker	*Melanerpes erythrocephalus*		
Black scoter	*Melanitta americana*		
Surf scoter	*Melanitta perspicillata*		
Wild turkey	*Meleagris gallopavo*		
Swamp sparrow	*Melospiza georgiana*		
Song sparrow	*Melospiza melodia*		
Common merganser	*Mergus merganser*		
Red-breasted merganser	*Mergus serrator*		
Northern mockingbird	*Mimus polyglottos*		
Black-and-white warbler	*Mniotilta varia*		
Brown-headed cowbird	*Molothrus ater*		
Shiny cowbird	*Molothrus bonariensis*		
Northern gannet	*Morus bassanus*		
Wood stork	*Mycteria americana*	E	E
Great crested flycatcher	*Myiarchus crinitus*		
Long-billed curlew	*Numenius americanus*		
Whimbrel	*Numenius phaeopus*		
Yellow-crowned night-heron	*Nyctanassa violacea*		
Black-crowned night-heron	*Nycticorax nycticorax*		
Connecticut warbler	*Oporonis agilis*		

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Kentucky warbler	*Oporornis formosus*		
Eastern screech-owl	*Otus asio*		
Ruddy duck	*Oxyura jamaicensis*		
Osprey	*Pandion haliaetus*		
Northern parula	*Parula americana*		
House sparrow	*Passer domesticus*		
Savannah sparrow	*Passerculus sandwichensis*		
Painted bunting	*Passerina ciris*		
Indigo bunting	*Passerina cyanea*		
American white pelican	*Pelecanus erythrorhynchos*		
Brown pelican	*Pelecanus occidentalis*	SSC	
Cliff swallow	*Petrochelidon pyrrhonota*		
Wilson's phalarope	*Phalaropus tricolor*		
Double-crested cormorant	*Phalocrocorax auritis*		
Rose-breasted grosbeak	*Pheucticus ludovicianus*		
Red-cockaded woodpecker	*Picoides borealis*	E	E
Downy woodpecker	*Picoides pubescens*		
Hairy woodpecker	*Picoides villosus*		
Rufous-sided towhee, eastern towhee	*Pipilo erythrophthalmus*		
Scarlet tanager	*Piranga olivacea*		
Summer tanager	*Piranga rubra*		
Roseate spoonbill	*Platalea ajaja*	SSC	
Glossy ibis	*Plegadis falcinellus*		
American golden-plover	*Pluvialis dominica*		
Black-bellied plover	*Pluvialis squatarola*		
Horned grebe	*Podiceps auritus*		
Red-necked grebe	*Podiceps grisegena*		
Pied-billed grebe	*Podilymbus podiceps*		
Carolina chickadee	*Poecile carolinensis*		
Blue-gray gnatcatcher	*Polioptila caerulea*		
Vesper sparrow	*Pooecetes gramineus*		
Purple gallinule	*Porphyrula martinica*		
Sora	*Porzana carolina*		
Purple martin	*Progne subis*		
Prothonotary warbler	*Protonotaria citrea*		
Vermilion flycatcher	*Pyrocephalus rubinus*		
Boat-tailed grackle	*Quiscalus major*		
Common grackle	*Quiscalus quiscula*		
King rail	*Rallus elegans*		
Virginia rail	*Rallus limicola*		
Clapper rail	*Rallus longirostris*		
American avocet	*Recurvirostra americana*		
Ruby-crowned kinglet	*Regulus calendula*		
Golden-crowned kinglet	*Regulus satrapa*		
Bank swallow	*Riparia riparia*		
Snail kite	*Rostrhamus sociabilis plumbeus*	E	E
Black skimmer	*Rynchops niger*	SSC	
Eastern phoebe	*Sayornis phoebe*		
American woodcock	*Scolopax minor*		
Ovenbird	*Seiurus aurocapilla*		
Louisiana waterthrush	*Seiurus motacilla*		
Northern waterthrush	*Seiurus noveboracensis*		

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American redstart	*Setophaga ruticilla*		
Eastern bluebird	*Sialia sialis*		
Red-breasted nuthatch	*Sitta canadensis*		
Brown-headed nuthatch	*Sitta pusilla*		
Burrowing owl	*Speotyto cunicularia*		
Yellow-bellied sapsucker	*Sphyrapicus varius*		
Dickcissel	*Spiza americana*		
Chipping sparrow	*Spizella passerina*		
Field sparrow	*Spizella pusilla*		
Northern rough-winged swallow	*Stelgidopteryx serripennis*		
Least tern	*Sterna antillarum*	T	E
Caspian tern	*Sterna caspia*		
Forster's tern	*Sterna forsteri*		
Common tern	*Sterna hirundo*		
Royal tern	*Sterna maxima*		
Sandwich tern	*Sterna sandvicensis*		
Barred owl	*Strix varia*		
Eastern meadowlark	*Sturnella magna*		
Tree swallow	*Tachycineta bicolor*		
Carolina wren	*Thryothorus ludovicianus*		
Brown thrasher	*Toxostoma rufum*		
Lesser yellowlegs	*Tringa flavipes*		
Greater yellowlegs	*Tringa melanoleuca*		
Solitary sandpiper	*Tringa solitaria*		
House wren	*Troglodytes aedon*		
Winter wren	*Troglodytes troglodytes*		
American robin	*Turdus migratorius*		
Gray kingbird	*Tyrannus dominicensis*		
Scissor-tailed flycatcher	*Tyrannus forficatus*		
Eastern kingbird	*Tyrannus tyrannus*		
Western kingbird	*Tyrannus verticalis*		
Common barn owl	*Tyto alba*		
Orange-crowned warbler	*Vermivora celata*		
Bachman's warbler	*Vermivora bachmanii*	E	E
Golden-winged warbler	*Vermivora chrysoptera*		
Tennessee warbler	*Vermivora peregrina*		
Blue-winged warbler	*Vermivora pinus*		
Yellow-throated vireo	*Vireo flavifrons*		
White-eyed vireo	*Vireo griseus*		
Red-eyed vireo	*Vireo olivaceus*		
Solitary vireo, blue-headed vireo	*Vireo solitarius*		
Hooded warbler	*Wilsonia citrina*		
Wilson's warbler	*Wilsonia pusilla*		
White-winged dove	*Zenaida asiatica*		
Mourning dove	*Zenaida macroura*		
White-throated sparrow	*Zonotrichia albicollis*		
White-crowned sparrow	*Zonotrichia leucophrys*		
Mammals			
Southern short-tailed shrew	*Blarina carolinensis*		
Beaver	*Castor canadensis*		
Least shrew	*Cryptotis parva*		

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Virginia opossum	*Didelphis virginiana*		
Big brown bat	*Eptescius fuscus*		
Southeastern pocket gopher	*Geomys pinetis*		
Southern flying squirrel	*Glaucomys volans*		
Red bat	*Lasiurus borealis*		
Hoary bat	*Lasiurus cinereus*		
Yellow bat	*Lasiurus intermedius*		
Seminole bat	*Lasiurus seminolus*		
River otter	*Lontra canadensis*		
Bobcat	*Lynx rufus*		
Striped skunk	*Mephitis mephitis*		
Pine vole	*Microtus pinetorum*		
Florida long-tailed weasel	*Mustela frenata*		
Saltmarsh mink, southern mink	*Mustela vision lutensis*		
Long-tailed weasel	*Mustella frenata peninsulae*		
Southeastern myotis	*Myotis austroriparius*		
Round-tailed muskrat	*Neofiber alleni*		
Wood rat	*Neotoma floridana*		
Evening bat	*Nycticeius humeralis*		
Golden mouse	*Ochrotomys nuttalli*		
White-tailed deer	*Odocoileus virginianus*		
Muskrat	*Ondatra zibenthicus*		
Marsh rice rat	*Oryzomys palustris*		
Cotton mouse	*Peromyscus gossypinus*		
Old field mouse	*Peromyscus polionotus*		
Eastern pipistrelle	*Pipistrellus austrorparius*		
Rafinesque's big-eared bat	*Plecotus rafinesqii*		
Florida mouse	*Podomys floridanus*	SSC	
Raccoon	*Procyon lotor*		
Florida panther	*Puma concolor coryi*	E	E
Eastern harvest mouse	*Reithrodontomys humulis*		
Eastern mole	*Scalopus aquaticus*		
Gray squirrel	*Sciurus carolinesis*		
Sherman's fox squirrel	*Sciurus niger shermani*	SSC	
Cotton rat	*Sigmodon hispidus*		
Southeastern shrew	*Sorex longirostris*		
Eastern spotted skunk	*Spilogale putorius*		
Eastern cottontail	*Sylvilagus floridanus*		
Marsh rabbit	*Sylvilagus palustris*		
Brazilian free-tailed bat	*Tadarida brasiliensis*		
Florida manatee	*Trichechus manatus latirostris*	E	E
Atlantic bottle-nosed dolphin	*Tursiops truncatus*		
Gray fox	*Urocyon cinereoargenteus*		
Florida black bear	*Ursus americanus floridanus*		
Red fox	*Vulpes vulpes*		
Amphibians			
Florida cricket frog	*Acris gryllus dorsalis*		
Flatwoods salamander	*Ambystoma cingulatum*	T	T
Marbled salamander	*Ambystoma opacum*		
Mole salamander	*Ambystoma talpoideum*		
Tiger salamander	*Ambystoma tigrinum tigrinum*		

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Two-toed amphiuma	*Amphiuma means*		
One-toed amphiuma	*Amphiuma pholeter*		
Oak toad	*Bufo quercicus*		
Southern toad	*Bufo terrestris*		
Southern dusky salamander	*Desmognathus auriculatus*		
Greenhouse frog	*Eleutherodactylus planirostris planirostris*		
Southern two-lined salamander	*Eurycea cirrigera*		
Three-lined salamander	*Eurycea guttolineata*		
Dwarf salamander	*Eurycea quadridigitata*		
Eastern narrow-mouthed toad	*Gastrophryne carolinensis*		
Gray treefrog	*Hyla chrysoscelis*		
Green treefrog	*Hyla cinerea*		
Pine woods treefrog	*Hyla femoralis*		
Barking treefrog	*Hyla gratiosa*		
Squirrel treefrog	*Hyla squirella*		
Blackwarrior waterdog	*Necturus alabamensis*		
Eastern Gulf Coast waterdog	*Necturus beyeri*		
Striped newt	*Notophthalmus perstriatus*		
Peninsula newt	*Notophthalmus viridescens piaropicola*		
Central newt	*Notophthalmus viridescens louisianensis*		
Southeastern slimy salamander	*Plethodon grobmani*		
Spring peeper	*Pseudacris crucifer bartramiana*		
Southern chorus frog	*Pseudacris nigrita nigrita*		
Florida chorus frog	*Pseudacris nigrita verrucosa*		
Little grass frog	*Pseudacris ocularis*		
Ornate chorus frog	*Pseudacris ornata*		
Narrow-striped dwarf siren	*Pseudobranchus axanthus axanthus*		
Slender dwarf siren	*Pseudobranchus striatus spheniscus*		
Gulf hammock dwarf siren	*Pseudobranchus striatus lustricolus*		
Gulf coast mud salamander	*Pseudotriton montanus flavissimus*		
Southern red salamander	*Pseudotriton ruber vioscai*		
Gopher frog	*Rana capito*	SSC	
Bullfrog	*Rana catesbeiana*		
Bronze frog	*Rana clamitans clamitans*		
Pig frog	*Rana grylio*		
River frog	*Rana heckscheri*		
Florida leopard frog	*Rana sphenocephala sphenocephala*		
Southern leopard frog	*Rana sphenocephala utricularia*		
Eastern spadefoot toad	*Scaphiopus holbrooki holbrooki*		
Eastern lesser siren	*Siren intermedia intermedia*		
Greater siren	*Siren lacertina*		
Fishes			
Scrawled cowfish	*Acanthostracion quadricornis*		
Lined sole	*Achirus lineatus*		
Atlantic sturgeon	*Acipenser oxyrhynchus oxyrinchus*	SSC	
Gulf sturgeon	*Acipenser oxyrinchus desotoi*	T	T
Diamond killifish	*Adinia xenica*		
Spotted eagle ray	*Aetobatus narinari*		
Alabama shad	*Alosa alabamae*		
Skipjack herring	*Alosa chrysochloris*		
Orange filefish	*Aluterus schoepfii*		

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White catfish	*Ameiurus catus*		
Yellow bullhead	*Ameiurus natalis*		
Brown bullhead	*Ameiurus nebulosus*		
Spotted bullhead	*Ameiurus serracanthus*		
Bowfin	*Amia calva*		
Fringed pipefish	*Anarchopterus criniger*		
Striped anchovy	*Anchoa hepsetus*		
Bay anchovy	*Anchoa mitchilli*		
Ocellated flounder	*Ancylopsetta quadrocellata*		
Sheepshead	*Archosargus probatocephalus*		
Hardhead catfish	*Ariopsis felis*		
Bronze cardinalfish	*Astrapogon alutus*		
Southern stargazer	*Astroscopus y-graecum*		
Gafftopsail catfish	*Bagre marinus*		
Silver perch	*Bairdiella chrysoura*		
Frillfin goby	*Bathygobius soporator*		
Gulf menhaden	*Brevoortia patronus*		
Grass porgy	*Calamus arctifrons*		
Blue runner	*Caranx crysos*		
Crevalle jack	*Caranx hippos*		
Bull shark	*Carcharhinus leucas*		
Blacktip shark	*Carcharhinus limbatus*		
Snook	*Centropomus undecimalis*		
Rock sea bass	*Centropristis philadelphica*		
Black sea bass	*Centropristis striata*		
Atlantic spadefish	*Chaetodipterus faber*		
Florida blenny	*Chasmodes saburrae*		
Striped burrfish	*Chilomycterus schoepfii*		
Atlantic bumper	*Chloroscombrus chrysurus*		
Spotted whiff	*Citharichthys macrops*		
Bay whiff	*Citharichthys spilopterus*		
Darter goby	*Ctenogobius boleosoma*		
Sand seatrout	*Cynoscion arenarius*		
Spotted seatrout	*Cynoscion nebulosus*		
Sheepshead minnow	*Cyprinodon variegatus*		
Southern stingray	*Dasyatis americana*		
Atlantic stingray	*Dasyatis sabina*		
Bluntnose stingray	*Dasyatis say*		
Round scad	*Decapterus punctatus*		
Irish pompano	*Diapterus auratus*		
Dwarf sand perch	*Diplectrum bivittatus*		
Sand perch	*Diplectrum formosum*		
Spottail pinfish	*Diplodus holbrookii*		
Gizzard shad	*Dorosoma cepedianum*		
Threadfin shad	*Dorosoma petenense*		
Sharksucker	*Echeneis naucrates*		
Whitefin sucker	*Echeneis neucratoides*		
Banded pygmy sunfish	*Elassoma zonatum*		
Ladyfish	*Elops saurus*		
Bluespotted sunfish	*Enneacanthus gloriosus*		
Jackknife fish	*Equetus lanceolatus*		
Lake chubsucker	*Erimyzon sucetta*		

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Redfin pickerel	*Esox americanus*		
Chain pickerel	*Esox niger*		
Swamp darter	*Etheostoma fusiforme*		
Fringed flounder	*Etropus crossotus*		
Smallmouth flounder	*Etropus microstomus*		
Gray flounder	*Etropus rimosus*		
Silver jenny	*Eucinostomus gula*		
Tidewater mojarra	*Eucinostomus harengulus*		
Goldspotted killifish	*Floridichthys carpio*		
Marsh killifish	*Fundulus confluentus*		
Gulf killifish	*Fundulus grandis*		
Lined topminnow	*Fundulus lineolatus*		
Seminole killifish	*Fundulus seminolis*		
Striped killifish	*Fundulus similis*		
Eastern mosquitofish	*Gambusia holbrooki*		
Skilletfish	*Gobiesox strumosus*		
Highfin goby	*Gobionellus oceanicus*		
Naked goby	*Gobiosoma bosc*		
Twoscale goby	*Gobiosoma longipala*		
Code goby	*Gobiosoma robustum*		
Ocellated moray	*Gymnothorax saxicola*		
Smooth butterfly ray	*Gymnura micrura*		
Tomtate	*Haemulon aurolineatum*		
White grunt	*Haemulon plumierii*		
Slippery dick	*Halichoeres bivittatus*		
Scaled sardine	*Harengula jaguana*		
Bluntnose jack	*Hemicaranx amblyrhynchus*		
Least killifish	*Heterandria formosa*		
Lined seahorse	*Hippocampus erectus*		
Dwarf seahorse	*Hippocampus zosterae*		
Zebratail blenny	*Hypleurochilus caudovittatus*		
American halfbeak	*Hyporhamphus meeki*		
Halfbeak	*Hyporhamphus unifasciatus*		
Feather blenny	*Hypsoblennius hentz*		
Channel cat	*Ictalurus punctatus*		
Brook silverside	*Labidesthes sicculus*		
Hogfish	*Lachnolaimus maximus*		
Trunkfish	*Lactophyrs trigonus*		
Pinfish	*Lagodon rhomboides*		
Spot	*Leiostomus xanthurus*		
Longnose gar	*Lepisosteus osseus*		
Florida gar	*Lepisosteus platyrhincus*		
Redbreasted sunfish	*Lepomis auritus*		
Warmouth	*Lepomis gulosus*		
Bluegill	*Lepomis macrochirus*		
Dollar sunfish	*Lepomis marginatus*		
Redear sunfish	*Lepomis microlophus*		
Spotted sunfish	*Lepomis punctatus*		
Freckled skate	*Leucoraja lentiginosa*		
Tripletail	*Lobotes surinamensis*		
Bluefin killifish	*Lucania goodei*		
Rainwater killifish	*Lucania parva*		

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Gray snapper	*Lutjanus griseus*		
Lane snapper	*Lutjanus synagris*		
Tarpon	*Megalops atlanticus*		
Rough silverside	*Membras martinica*		
Inland silverside	*Menidia beryllina*		
Southern kingfish	*Menticirrhus americanus*		
Northern kingfish	*Menticirrhus saxatalis*		
Clown goby	*Microgobius gulosus*		
Green goby	*Microgobius thalassinus*		
Atlantic croaker	*Micropogonias undulatus*		
Suwannee bass	*Micropterus notius*		
Largemouth bass	*Micropterus salmoides*		
Spotted sucker	*Minytrema melanops*		
Fringed filefish	*Monacanthus ciliatus*		
Striped mullet	*Mugil cephalus*		
White mullet	*Mugil curema*		
Fantail mullet	*Mugil gyrans*		
Red goatfish	*Mullus auratus*		
Smooth dogfish	*Mustelus canis*		
Gag	*Myctoperca microlepis*		
Speckled worm eel	*Myrophis punctatus*		
Lesser electric ray	*Narcine bancroftii*		
Spinycheek scorpionfish	*Neomerinthe hemingwayi*		
Emerald parrotfish	*Nicholsina usta*		
Golden shiner	*Notemigonus crysoleucas*		
Coastal shiner	*Notropis petersoni*		
Shiner	*Notropis spp.*		
Polka-dot batfish	*Ogcocephalus cubifrons*		
Leatherjacket	*Oligoplites saurus*		
Shrimp eel	*Ophichthus gomesii*		
Crested cusk-eel	*Ophidion welshii*		
Atlantic thread herring	*Opisthonema oglinum*		
Spotfin jawfish	*Opistognathus robinsi*		
Gulf toadfish	*Opsanus beta*		
Pigfish	*Orthopristis chrysoptera*		
Seaweed blenny	*Parablennius marmoreus*		
Banded blenny	*Paraclinus fasciatus*		
Gulf flounder	*Paralichthys albigutta*		
Southern flounder	*Paralichthys lethostigma*		
Broad flounder	*Paralichthys squamilentus*		
Gulf butterfish	*Peprilus burti*		
Harvestfish	*Peprilus paru*		
Sailfin molly	*Poecilia latipinna*		
Black drum	*Pogonias cromis*		
French angelfish	*Pomacanthus paru*		
Bluefish	*Pomatomus saltatrix*		
Black crappie	*Pomoxis nigromaculatus*		
Leopard sea robin	*Prionotus scitulus*		
Bighead sea robin	*Prionotus tribulus*		
Cobia	*Rachycentron canadum*		
Clearnose skate	*Raja eglantaria*		
Roundel skate	*Raja texana*		

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Atlantic guitar fish	*Rhinobatos lentiginosus*		
Cownose ray	*Rhinoptera bonasus*		
Atlantic sharpnose shark	*Rhizoprionodon terraenovae*		
Spanish sardine	*Sardinella aurita*		
Red drum	*Sciaenops ocellatus*		
Spanish mackerel	*Scomberomorus maculatus*		
Barbfish	*Scorpaena brasiliensis*		
Lookdown	*Selene vomer*		
Pygmy sea bass	*Serraniculus pumilio*		
Belted sandfish	*Serranus subligarius*		
Bucktooth parrotfish	*Sparisoma radians*		
Southern puffer	*Sphoeroides nephelus*		
Bandtail puffer	*Sphoeroides spengleri*		
Guaguanche	*Sphyaena guachancho*		
Great barracuda	*Sphyraena barracuda*		
Northern sennet	*Sphyraena borealis*		
Bonnethead shark	*Sphyrna tiburo*		
Checkered blenny	*Starksia ocellata*		
Planehead filefish	*Stephanolepis hispidus*		
Pygmy filefish	*Stephanolepis setifer*		
Atlantic needlefish	*Strongylura marina*		
Redfin needlefish	*Strongylura notata*		
Timucu	*Strongylura timucu*		
Dusky flounder	*Syacium papillosum*		
Blackcheeked tonguefish	*Symphurus plagiusa*		
Dusky pipefish	*Syngnathus floridae*		
Chain pipefish	*Syngnathus lousianae*		
Sargassum pipefish	*Syngnathus pelagicus*		
Gulf pipefish	*Syngnathus scovelli*		
Bull pipefish	*Syngnathus springeri*		
Inshore lizardfish	*Synodus foetens*		
Florida pompano	*Trachinotus carolinus*		
Permit	*Trachinotus falcatus*		
Hogchoker	*Trinectes maculatus*		
Houndfish	*Tylosorus crocodilus*		
Southern hake	*Urophycis floridana*		
Spotted hake	*Urophycis regia*		
Insects			
No common names	*Dicrotendipes* spp.		
True flies	*Diptera* spp.		
Beetles	*Coleoptera* spp.		
True bugs	*Hemiptera* spp.		
Seashore springtail	*Anurida maritima*		
Ants, bees, wasps	*Hymenoptera* spp.		
Butterflies, moths	*Lepidoptera* spp.		
Marine invertebrates			
Atlantic abra	*Abra aequalis*		
Striate glass-hair chiton	*Acanthochitona pygmaea*		
No common name	*Acar domingensis*		
Channelled barrel-bubble	*Acteocina canaliculata*		

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Cande's barrel-bubble	*Acteocina candei*		
West indian sea cucumber	*Actinopyga agassizi*		
Bay scallop	*Aequipectin irradians*		
Texas venus	*Agriopoma texasianum*		
Eastern aligena	*Aligena elevata*		
Aligena species	*Aligena* spp.		
Bigclaw snapping shrimp	*Alpheus heterochaelis*		
West indian alvania	*Alvania auberiana*		
Cockle	*Americardia* spp.		
No common name	*Amphicteis gunneri floridus*		
Atlantic papermussel	*Amygdalum papyrium*		
Cut-ribbed ark	*Anadara floridana*		
Cockle	*Anadara* spp.		
Traverse ark	*Anadara transversa*		
Sybaritic tellin	*Angulus sybariticus*		
Texas tellin	*Angulus taxanus*		
Delicate tellin	*Angulus tenellus*		
Many-colored tellin	*Angulus versicolor*		
Buttercup lucine	*Anodontia alba*		
Chalky buttercup lucine	*Anodontia philippiana*		
Pointed venus	*Anomalocardia cuneimeris*		
Common jingle	*Anomia simplex*		
Pilsbry tuskshell	*Antalis pilsbryi*		
Cockle	*Antigona* spp.		
Sea slug/spotted sea hare	*Aplysia dactylomela*		
No common name	*Aplysia wilcoxi*		
Mossy ark	*Arca imbricata*		
Turkey wing	*Arca zebra*		
Cancellate ark	*Arcopsis adamsi*		
Southern bay scallop	*Aropecten irradians taylorae*		
Atlantic assiminea	*Assiminea succinea*		
Coral	*Astrangia* spp.		
Lunar dovesnail	*Astyris lunata*		
Stiff penshell	*Atrina rigida*		
Half-naked penshell	*Atrina seminuda*		
Sawtooth penshell	*Atrina serrata*		
Riise's glassy bubble	*Atys riiseanus*		
Ivory barnacle	*Balanus eburneus*		
Corbula sportella	*Basterotia corbuloidea*		
Square sportella	*Basterotia quadrata*		
Grass cerith	*Bittiolum varium*		
Impressed odostome	*Boonea impressa*		
No common name	*Boonea nioba*		
Borniaclam	*Bornia longipes*		
Scorched mussel	*Brachidontes exustus*		
Biconic top-turris	*Brachycythara biconica*		
No common name	*Bucephalus cuculus*		
Striate bubble	*Bulla striata*		
Lightning whelk	*Busycon sinistrum*		
Pear whelk	*Busycotypus spiratus*		
Antillean caecum	*Caecum antilarum*		
Bipartite caecum	*Caecum bipartitum*		

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Cooper's caecum	*Caecum cooperi*		
Florida caecum	*Caecum floridanum*		
Fine-line caecum	*Caecum multicostatum*		
Beautiful caecum	*Caecum pulchellum*		
Striate caecum	*Caecum strigosum*		
Box crab	*Calappa* spp.		
No common name	*Callianassa jamicensis*		
Greater blue crab	*Callinectes sapidus*		
Lesser blue crab	*Callinectes similis*		
Beautiful topsnail	*Calliostoma pulchrum*		
Mauve mouth drill	*Calotrophon ostrearum*		
Circular chinese hat	*Calyptraea centralis*		
Common nutmeg	*Cancellaria reticulata*		
Cancellate cantharus	*Cantharus cancellarius*		
Broad ribbed cardita	*Cardita floridana*		
Broad-ribbed carditid	*Carditamera floridana*		
Needle odostome	*Careliopsis styliformis*		
Costate hornsnail	*Cerithidea costata turrita*		
Ladder hornsnail	*Cerithidea scalariformis*		
Yellow miniature cerith	*Cerithiopsis flava*		
Brown miniature cerith	*Cerithiopsis fusiformis*		
Gem miniature cerith	*Cerithiopsis gemmulosa*		
Green's miniature cerith	*Cerithiopsis greenii*		
Dark cerith	*Cerithium atratum*		
Variable cerith	*Cerithium lutosum*		
Flyspeck cerith	*Cerithium muscarum*		
Tea drillia	*Cerodilla thea*		
No common name	*Cerodillia perryae*		
Corrugate jewelbox	*Chama congregata*		
Lace murex	*Chicoreus florifer dilectus*		
Cross barred venus	*Chione cancellata*		
Venerid bivalve	*Chione elevata*		
Atlantic petricolid	*Choristodon robustum*		
Suppressed vitrinella	*Circulus suppressus*		
Hermit crab	*Clibanarius* spp.		
Fancy shell hermit crab	*Clibinarius vittatus*		
No common name	*Cliona vastifica*		
Striate scalesnail	*Cochliolepis striata*		
Tiger lucine	*Codakia orbicularis*		
Dwarf tiger lucine	*Codakia orbiculata*		
Rusty dovesnail	*Columbella rusticoides*		
Stearn's cone	*Conus stearnsi*		
Truncate corbula	*Corbula barrattiana*		
Contracted corbula	*Corbula contracta*		
Well-ribbed dovesnail	*Costoanachis lafresnayi*		
Gulf dovesnail	*Costoanachis semiplicata*		
Dovesnail	*Costoanachis species*		
Florida cave amphipod	*Crangonyx grandimanus*		
Hobb's cave amphipod	*Crangonyx hobbsi*		
Lunate crassinella	*Crassinella lunulata*		
Eastern or american oyster	*Crassostrea virginica*		
Spiny slippersnail	*Crepidula aculeata*		

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Depressed slippersnail	*Crepidula depressa*		
Slipper limpet	*Crepidula fonicata*		
Spotted slippersnail	*Crepidula maculosa*		
Waxy mangelia	*Cryoturris cerinella*		
Weak-ribber mangelia	*Cryoturris forthisensis*		
No common name	*Cryoturris vincula*		
Tellin semele	*Cumingia tellinoides vanhyningi*		
Isopod	*Cyathura polita*		
Trilex vitrinella	*Cyclostremiscus pentagonus*		
Two-tooth barrel-bubble	*Cylichnella bidentata*		
No common name	*Cymadus compta*		
Florida marshclam	*Cyrenoida floridana*		
Angelwing	*Cyrtopleura costata*		
Hermit crab	*Dardanus spp.*		
Gold-line marginella	*Dentimargo aureocinctus*		
Tan marginella	*Dentimargo eburneolus*		
Black sea urchin	*Diadema antillarium*		
Atlantic giant cockle	*Dinocardium robustum*		
Cayenne keyhole limpet	*Diodora cayenensis*		
Tube worm	*Diopatra cuprea*		
Marked diplodon	*Diplodonta notata*		
Pimpled diplodon	*Diplodonta semiaspera*		
Cross-hatched lucine	*Divaricella quadrisulcata*		
Disk dosinia	*Dosinia discus*		
Orange sea star	*Echinaster* spp.		
Interrupted periwinkle	*Echinolittorina interrupta*		
Sea urchin	*Echinometria* spp.		
Variable spike	*Elliptio icterina*		
Purple bankclimber	*Elliptoideus sloatianus*	T	T
Minor jackknife	*Ensis megistus*		
No common name	*Ensitellops ellipticus*		
Textured sportella	*Ensitellops protextus*		
Sportella	*Ensitellops species*		
Fringed vitrinella	*Episcynia inornata*		
Bladed wentletrap	*Epitonium albidum*		
Angulate wentletrap	*Epitonium angulatum*		
Semismooth wentletrap	*Epitonium apiculatum*		
Cande's wentletrap	*Epitonium candeanum*		
Wrinkled-rib wentletrap	*Epitonium foliaceicosta*		
Humphrey's wentletrap	*Epitonium humphreysii*		
Brown-band wentletrap	*Epitonium rupicoa*		
Mauger's erato	*Erato maugeriae*		
Concentric ervilia	*Ervilia concentrica*		
Gold-stripe eulima	*Eulima auricincta*		
Two-band eulima	*Eulima bifasciata*		
Channeled odostome	*Eulimastoma canaliculatum*		
Brown eulima	*Eulimostraca hemphillii*		
Turtle grass pheasant	*Eulithidium thalassicola*		
Sharp-rib drill	*Eupleura sulcidentata*		
Flat mud crab	*Eurypanopeus depresses*		
Alternate tellin	*Eurytellina alternata*		
Broad back mud crab	*Eurytium limosum*		
Pink shrimp	*Farfantepenaeus duorarum*		

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Commercial shrimp	*Farfantepenaeus* spp.		
Buijse's odostome	*Fargoa buijsei*		
Eastern banded tulip	*Fasciolaria hunteria*		
True tulip	*Fasciolaria tulipa*		
Pitted murex	*Favartia cellulosa*		
Golfball coral	*Favia fragum*		
No common name	*Finella adamsi*		
No common name	*Gammarus mucronatus*		
Atlantic gastrochaenid	*Gastrochaena hians*		
Amethyst gemclam	*Gemma gemma*		
Ribbed mussel	*Geukensia demissa*		
Snowflake marginella	*Gibberula lavalleeana*		
Santo Domingo carditid	*Glans dominguensis*		
Blood worm	*Glycera americana*		
Blood worm	*Glycera dibranchiata*		
Comb bittersweet	*Glycymeris pectinata*		
Square glyph-turris	*Glyphoturris quadrata*		
Eroded crab	*Glyptoxanthus spp.*		
No common name	*Grandidierella spp.*		
Hadria marginella	*Granulina hadria*		
Ivory tuskshell	*Graptacme eborea*		
Tanaid	*Halmyrapseudes bahamensis*		
Amber glassy-bubble	*Haminoea succinea*		
No common name	*Haploscoplos fragilis*		
Copepod	*Harpacticoid copepods*		
Capitellid thread worm	*Heteromastus filiformis*		
Giant eastern murex	*Hexaples fulvescens*		
Yellow sea cucumber, Florida sea cucumber	*Holothura floridana*		
Caridean shrimp	*Hyppolyte pleuracantha*		
Hooked mussel	*Ischadium recurvum*		
No common name	*Ischnochiton niveus*		
Brown-tip mangelia	*Kurtziella atrostyla*		
Punctate mangelia	*Kurtziella limonitella*		
Polychaete	*Laeonereis culveri*		
Common egg cockle	*Laevicardium laevigatum*		
Yellow eggcockle	*Laevicardium mortoni*		
Painted eggcockle	*Laevicardium pictum*		
Sea slug	*Lamellaria species*		
Southern fatmucket	*Lampsilis straminea claibornensis*		
No common name	*Laterus focorum*		
Spider crab	*Libinia* spp.		
Antillean fileclam	*Limaria pellucida*		
Atlantic horseshoe crab	*Limulus polyphemus*		
Miniature lucine	*Linga amiantus*		
White shrimp	*Litopenaeus setiferus*		
Mangrove periwinkle	*Littoraria angulifera*		
Marsh periwinkle	*Littoraria irrorata*		
Bantum hydrobe	*Littoridinops palustris*		
Crinkled pyram	*Longchaeus crennulatus*		
File fleshy limpet	*Lucapinella limatula*		
Woven lucine	*Lucina nassula*		
Thick lucine	*Lucina pectinata*		
No common name	*Lucina pennsylvanica*		

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Blood ark	*Lunarca ovalis*		
Florida lyonsia	*Lyonsia floridana*		
Green sea urchin	*Lytechinus variegatus*		
Short macoma	*Macoma brevifrons*		
Constricted macoma	*Macoma constricta*		
Calico clam	*Macrocallista maculata*		
Sunray venus	*Macrocallista nimbosa*		
Decorator crab	*Macrocoeloma* spp.		
Fragile surfclam	*Mactra fragilis*		
Rose coral	*Manicinia areolata*		
Gem cyclostreme	*Marevalvata tricarinata*		
Striate piddock	*Martesia striata*		
Ochlockonee moccasinshell	*Medionidus simpsonianus*	E	E
No common name	*Meioceras nitidum*		
Eastern melampus	*Melampus bidentatus*		
No common name	*Melanella atypha*		
Conoidal eulima	*Melanella conoidea*		
Sharp eulima	*Melanella hypsela*		
Jamaica eulima	*Melanella jamaicensis*		
No common name	*Melita nitida*		
Crown conch	*Melongena corona*		
Stone crab	*Menippe mercenaria*		
Southern quahog	*Mercenaria campechiensis*		
Hard-shell clam	*Mercenaria mercenaria*		
Striate tellin	*Merisca aequistriata*		
Spotted decorator crab	*Microphrys* spp.		
Clinging crab	*Mithrax* spp.		
False tip mussel	*Modiolus modiolus squamosus*		
Button snail	*Modulus modulus*		
Dward surfclam	*Mulinia lateralis*		
Lateral mussel	*Musculus lateralis*		
No common name	*Mysella* spp.		
Sharp nassa	*Nassarius acutus*		
Striate nassa	*Nassarius consensus*		
Bruised nassa	*Nassarius vibex*		
Gaudy natica	*Natica canrena*		
Pile worms	*Neanthes succinea*		
Round worm	*Nematoda* spp.		
Kingsly mud crab	*Neopanope packardi*		
Stimpson mud crab	*Neopanope texana*		
No common name	*Neverita delessertiana*		
Shark's eye	*Neverita duplicata*		
Brown-line niso	*Niso aeglees*		
Ponderous ark	*Noetia ponderosa*		
Bristleworm	*Notomastus latericeus*		
Pointed nutclam	*Nucalana acuta*		
Atlantic nutclam	*Nucula proxima*		
Caribbean reef octopus	*Octopus briareus*		
Ovoid odostome	*Odostomia laevigata*		
No common name	*Olivella inusta*		
Variable dwarf olive	*Olivella mutica*		
No common name	*Olivella perplexa*		
No common name	*Olivella prefloralia*		

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Tiny dwarf olive	*Olivella pusilla*		
Lettered olive	*Olivia sayana*		
Fine-lined hydrobe	*Onobops jacksoni*		
No common name	*Onuphis eremita oculata*		
Giant montacutid	*Orbitella floridana*		
West indian sea star	*Oreaster reticulata*		
Crested oyster	*Ostreola equestris*		
Antilles oxynoe	*Oxynoe antillarum*		
Hermit crab	*Pagurus* spp.		
Brackish green shrimp	*Palaemonetes intermedius*		
Grass shrimp	*Palaemonetes pugio*		
Grass shrimp	*Palaemonetes* spp.		
Common mud crab	*Panopeus herbstii*		
Subovate softshell	*Paramya subovata*		
Brown gem clam	*Parastarte triquestra*		
Fat dovesnail	*Parvanachis obesa*		
Oyster dovesnail	*Parvanachis ostreicola*		
Many lined lucine	*Parvilucina crenella*		
Interuppted vitrinella	*Parviturboides interruptus*		
No common name	*Pectinaria gouldii*		
Miraculous pedipes	*Pedipes mirabilis*		
Spiny lobster	*Penulirus argus*		
Anemone shrimp	*Periclimenes* spp.		
Tower pyram	*Peristichia toreta*		
Boring petricola	*Petricola lapicida*		
Hermit crab	*Petrochirus* spp.		
Apple murex	*Phyllonotus pomum*		
White-knobbed drillia	*Pilsbryspira leucocyma*		
Hairy crab	*Pilumnus* spp.		
Chalky pitar	*Pitar simpsoni*		
No common name	*Pithos* spp.		
Threetooth carditid	*Pleuromeris tridentata*		
Shark eye shell	*Polinices duplicatus*		
Tinted cantharus	*Pollia tincta*		
Polychaete worm	*Polydora websteri*		
Fourtooth toothshell	*Polyschides tetraschistus*		
Small finger coral	*Porites furcata*		
Iridescent swimming crab	*Portunus gibbesii*		
Blotched swimming crab	*Portunus spinimanus*		
Big blue spring cave crayfish	*Procambarus horsti*		
Common atlantic marginella	*Prunum apicinum*		
Little oat marginella	*Prunum avenaceum*		
No common name	*Prunum succinea*		
Florida lucine	*Pseudomiltha floridana*		
No common name	*Ptychodera bahamensis*		
Plicate mangelia	*Pyrgocythara plicosa*		
Mangelia	*Pyrgocythata species*		
Oyster turris	*Pyrgospira ostrearum*		
Mussel	*Quincuncina kleiniana*		
Emerson's miniature cerith	*Retilaskeya emersonii*		
Pitted baby-bubble	*Rictaxis punctostriatus*		
Reddish mangelia	*Rubellatoma rubella*		
No common name	*Sabellaria* spp.		

Common Name	Species Name	Status	
		State	Federal
Legend: T = Threatened • E = Endangered • SSC = Species of Special Concern			
Incongruous ark	*Scapharca brasiliana*		
Catesby's risso	*Schwartziella catesbyana*		
Florida risso	*Schwartziella floridana*		
Rainbow tellin	*Scissula iris*		
No common name	*Scoloplos fargilis*		
Adam's miniature cerith	*Seila adamsi*		
Cancellate semele	*Semele bellastriata*		
Atlantic semele	*Semele proficua*		
Nut semele	*Semelina nuculoides*		
Scotch bonnet	*Semicassis granulata granulata*		
White baby ear	*Sinum perspectivum*		
Skenea	*Skenea* spp.		
Blake's vitrinella	*Solariorbis blakei*		
Gabb's vitrinella	*Solariorbis infracarinata*		
Southern surfclam	*Spisula raveneli*		
Florida rock snail	*Stramonita haemastoma canaliculata*		
No common name	*Strictispira acurugata*		
Florida fighting conch	*Strombus alatus*		
No common name	*Stylochus frontalis*		
Lineate dovesnail	*Suturoglypta iontha*		
Minor snapping shrimp	*Synalpheus minus*		
Purplish tagelus	*Tagelus divisus*		
Miniature moon snail	*Tectonatica pusilla*		
High-spired vitrinella	*Teinostoma cryptospira*		
No common name	*Teinostoma parvicallum*		
White-crest tellin	*Tellidora cristata*		
Sunrise tellin	*Tellina radiata*		
Speckeled tellin	*Tellinella listeri*		
Concave auger	*Terebra concava*		
Eastern auger	*Terebra dislocata*		
Fine-ribbed auger	*Terebra protexta*		
Lilac auger	*Terebra vinosa*		
Southern oyster drill	*Thais haemastoma*		
Bryozoan shrimp	*Thor floridanus*		
Gray pygmy-venus	*Timoclea grus*		
Slender barrel-bubble	*Tornatina inconspicua*		
Arrow shrimp	*Tozeuma* spp.		
Florida pricklycockle	*Trachycardium egmontianum*		
Yellow pricklycockle	*Trachycardium muricatum*		
No common name	*Transenella conradina*		
Samana triphora	*Triphora albida*		
Mottled triphora	*Triphora decorata*		
No common name	*Triphora modesta*		
No common name	*Triphura nigrocincta*		
Horse conch	*Triplofusus giganteus*		
Tropical sea urchin	*Tripneustes ventricosus*		
Arrow dwarf triton	*Tritonoharpa lanceolata*		
Caribbean truncatella	*Truncatella caribaeensis*		
Beautiful truncatella	*Truncatella pulchella*		
Chestnut turban	*Turbo castanea*		
No common name	*Turbonilla arnoldoi*		
Hawk turbonille	*Turbonilla buteonis*		
No common name	*Turbonilla constricta*		

Common Name	Species Name	Status	
		State	Federal
Legend: T = Threatened • E = Endangered • SSC = Species of Special Concern			
Dall's turbonille	*Turbonilla dalli*		
No common name	*Turbonilla hemphilli*		
Delicate turbonille	*Turbonilla levis*		
Punctate turbonille	*Turbonilla puncta*		
No common name	*Turbonilla punicea*		
No common name	*Turbonilla pyrrha*		
Turbonille	*Turbonilla species*		
Toyatan's turbonille	*Turbonilla toyatani*		
No common name	*Turbonilla virga*		
Conrad's turbonille	*Turbonilla viridaria*		
Boring turretsnail	*Turritella acropora*		
Gulf marsh fiddler	*Uca longisignalis*		
Fiddler crab	*Uca* spp.		
Gulf oyster drill	*Urosalpinx perrugata*		
Tampa drill	*Urosalpinx tampaensis*		
Florida worm snail	*Vermicularia knorrii*		
Conical eulima	*Vitreolina conica*		
Terminal vitrinella	*Vitrinella terminalis*		
Southern spindle-bubble	*Volvulella persimilis*		
Smooth risso	*Zebina browniana*		
No common name	*Zebinella decussata*		
No common name	*Zebinella elegantissima*		
Reptiles			
Florida cottonmouth	*Agkistrodon piscivorous conanti*		
American alligator	*Alligator mississippiensis*	T (s/a)	
Green anole	*Anolis carolinensis carolinensis*		
Loggerhead sea turtle	*Caretta caretta*	T	T
Florida scarlet snake	*Cemophora coccinea coccinea*		
Northern scarlet snake	*Cemophora coccinea copei*		
Green sea turtle	*Chelonia mydas*	E	E
Florida snapping turtle	*Chelydra serpentina osceola*		
Common snapping turtle	*Chelydra serpentina serpentina*		
Spotted turtle	*Clemmys guttata*		
Six-lined racerunner	*Cnemidophorus sexlineatus sexlineatus*		
Brownchin racer	*Coluber constrictor helvigularis*		
Southern black racer	*Coluber constrictor priapus*		
Eastern diamondback rattlesnake	*Crotalus adamanteus*		
Timber rattlesnake	*Crotalus horridus*		
Florida chicken turtle	*Deirochelys reticularia chrysea*		
Eastern chicken turtle	*Deirochelys reticularia reticularia*		
Leatherback sea turtle	*Dermochelys coriacea*	E	E
Southern ringneck snake	*Diadophis punctatus punctatus*		
Eastern indigo snake	*Drymarchon corais couperi*	T	
Corn snake	*Elaphe guttata guttata*		
Rat snake	*Elaphe obsoleta*		
Yellow rat snake	*Elaphe obsoleta quadrivittata*		
Gray rat snake	*Elaphe obsoleta spiloides*		
Atlantic hawksbill sea turtle	*Eretmochelys imbricata imbricata*	E	E
Southern coal skink	*Eumeces anthracinus pluvialis*		
Cedar Key mole skink	*Eumeces egregius insularis*		
Peninsula mole skink	*Eumeces egregius onocrepis*		
Northern mole skink	*Eumeces egregius similis*		

Common Name	Species Name	Status	
		State	Federal
Legend: T = Threatened • E = Endangered • SSC = Species of Special Concern			
Five-lined skink	*Eumeces fasciatus*		
Southeastern five-lined skink	*Eumeces inexpectatus*		
Broad-headed skink	*Eumeces laticeps*		
Eastern mud snake	*Farancia abacura abacura*		
Rainbow snake	*Farancia erytrogramma erytrogramma*		
Gopher tortoise	*Gopherus polyphemus*	T	
Eastern hognose snake	*Heterodon platirhinos*		
Southern hognose snake	*Heterodon simus*		
Striped mud turtle	*Kinosternon baurii*		
Florida mud turtle	*Kinosternon subrubrum steindachneri*		
Eastern mud turtle	*Kinosternon subrubrum subrubrum*		
Florida kingsnake	*Lampropeltis getula floridana*		
Eastern kingsnake	*Lampropeltis getula getula*		
Scarlet kingsnake	*Lampropeltis triangulum elapsoides*		
Kemp's ridley sea turtle	*Lepidochelys kempii*	E	E
Alligator snapping turtle	*Macrochelys temminckii*	SSC	
Ornate diamondbacked terrapin	*Malaclemys terrapin macrospilota*		
Eastern coachwhip	*Masticophis flagellum flagellum*		
Coral snake	*Micrurus fulvius fulvius*		
Gulf salt marsh snake	*Nerodia clarkii clarkii*		
Mangrove salt marsh snake	*Nerodia clarkii compressicauda*		
Redbelly water snake	*Nerodia erythrogaster erythrogaster*		
Banded water snake	*Nerodia fasciata fasciata*		
Florida water snake	*Nerodia fasciata pictiventris*		
Florida green water snake	*Nerodia floridana*		
Brown water snake	*Nerodia taxispilota*		
Rough green snake	*Opheodrys aestivus*		
Eastern slender glass lizard	*Ophisaurus attenuatus longicaudus*		
Island glass lizard	*Ophisaurus compressus*		
Mimic glass lizard	*Ophisaurus mimicus*		
Eastern glass lizard	*Ophisaurus ventralis*		
Florida pine snake	*Pituophis melanoleucus mugitus*	SSC	
Mobile cooter	*Pseudemys concinna mobilensis*		
Suwannee cooter	*Pseudemys concinna suwanniensis*	SSC	
Florida cooter	*Pseudemys floridana floridana*		
Peninsula cooter	*Pseudemys floridana peninsularis*		
Florida red-bellied turtle	*Pseudemys nelsoni*		
Striped crayfish snake	*Regina alleni*		
Glossy crayfish snake	*Regina rigida rigida*		
Pine woods snake	*Rhadinaea flavilata*		
Florida worm lizard	*Rhineura floridana*		
Eastern fence lizard	*Sceloporus undulates*		
Southern fence lizard	*Sceloporus undulatus undulatus*		
Ground skink, little brown skink	*Scincella lateralis*		
North florida swamp snake	*Seminatrix pygaea pygaea*		
Dusky pigmy rattlesnake	*Sistrurus miliarius barbouri*		
Loggerhead musk turtle	*Sternotherus minor minor*		
Common musk turtle, stinkpot	*Sternotherus odoratus*		
Short-tailed snake	*Stilosoma extenuatum*		
Florida brown snake	*Storeria dekayi victa*		
Midland brown snake	*Storeria dekayi wrightorum*		
Florida redbelly snake	*Storeria occipitomaculata obscura*		
Florida box turtle	*Terrapene carolina bauri*		

Common Name	Species Name	Status	
		State	Federal
Legend: T = Threatened • E = Endangered • SSC = Species of Special Concern			
Gulf coast box turtle	*Terrapene carolina major*		
Three-toed box turtle	*Terrapene carolina triunguis*		
Bluestripe ribbon snake	*Thamnophis sauritus nitae*		
Florida ribbon snake	*Thamnophis sauritus sackeni*		
Bluestripe garter snake	*Thamnophis sirtalis similis*		
Eastern garter snake	*Thamnophis sirtalis sirtalis*		
Yellow-bellied slider	*Trachemys scripta scripta*		
Florida softshelled turtle	*Trionyx ferox*		
Rough earthsnake	*Virginia striatula*		
Eastern earth snake	*Virginia valeria valeria*		

*B.4.2 / **Invasive Non-native Species List***

Common Name	Species Name	FLEPPC* Category (Plants) Invasive Status (Others)
*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 FIroida plant ocmmunities to the extent shown by Category I species).		
Plants		
Mimosa, silktree	*Albizia julibrissin*	I
Alligatorweed	*Alternanthera philoxeroides*	II
Tung oil tree	*Aleurites fordii*	II
Coral ardisia	*Ardisia crenata*	I
Scarlet milkweed	*Asclepias curassavicum*	Invasive
Pindo palm	*Butia capitata*	Invasive
Madagascar periwinkle	*Catharanthus roseus*	Invasive
Camphor tree	*Cinnamomum camphora*	I
Wild taro	*Colocasia esculenta*	I
Winged yam	*Dioscorea alata*	I
Air-potato	*Dioscorea bulbifera*	I
Common water hyancith	*Eichhornia crassipes*	I
Hydrilla	*Hydrilla verticillata*	I
Cogon grass	*Imperata cylindrica*	I
Crape-myrtle	*Lagerstroemia indica*	Invasive
Dotted duckweed	*Landolita punctata*	Invasive
Lantana	*Lantana camara*	I
Japanese privet	*Ligustrum japonicum*	I
Glossy privet	*Ligustrum lucidum*	I
Chinese privet, hedge privet	*Ligustrum sinense*	I
Japenese honeysuckle	*Lonicera japonica*	I
Japanese climbing fern	*Lygodium japonicum*	I
Chinaberry	*Melia azedarach*	I
Eurasian water-milfoil	*Myriophyllum spicatum*	II
Nandina, heavenly bamboo	*Nandina domestica*	I
Sword fern	*Nephrolepis cordifolia*	I
Oleander	*Neria oleander*	Invasive
Violet wood sorrel	*Oxalis corymbosa*	Invasive
Skunk vine	*Paederia foetida*	I
Torpedo grass	*Panicum repens*	I
Bahiagrass	*Paspalum notadum saurae*	Invasive
Red-leaf photina	*Photina glabra*	Invasive
Golden bamboo	*Phyllostachys aurea*	II
Water lettuce	*Pistia stratiotes*	I

Common Name	Species Name	FLEPPC* Category (Plants) Invasive Status (Others)
*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 Flroida plant ocmmunities to the extent shown by Category I species).		
Chinese brake fern	*Pteris vittata*	II
Kudzu	*Pueraria montana*	I
Tropical Mexican clover	*Richardia brasiliensis*	Invasive
Castor bean	*Ricinus communis*	II
Mexican petunia	*Ruellia brittoniana*	I
Chinese tallow	*Sapium sebiferum*	Invasive
Brazilian pepper	*Schinus terebinthifolius*	Invasive
Sicklepod, coffeeweed	*Senna obtusifolia*	Invasive
Rattlebox, purple sesban	*Sesbania punicea*	II
White-flowered wandering jew	*Tradescantia fluminensis*	II
Caesar weed	*Urena lobata*	Invasive
Chinese wisteria	*Wisteria sinensis*	II
Malanga, elephant ear	*Xanthosoma sagittifolium*	II
Birds		
Eurasian widgeon	*Anas penelope*	Non-Native
Eurasian collared dove	*Streptopelia decaocto*	Non-Native
European starling	*Sturnus vulgaris*	Non-Native
Mammals		
Domestic dog	*Canis familaris*	Non-Native
Coyote	*Canis latrans*	Non-Native
Nine-banded armadillo	*Dasypus novemcinctus*	Non-Native
Domestic cat	*Felis silvestris*	Non-Native
House mouse	*Mus musculus*	Non-Native
Nutria	*Myocaster coypu*	Non-Native
Norway rat	*Rattus norvegicus*	Non-Native
Roof rat, black rat	*Rattus rattus*	Non-Native
Feral hog	*Sus scrofa*	Non-Native
Amphibians		
None		
Fishes		
Brown hoplo	*Hoplosternum littorale*	Non-Native
Red lionfish	*Pterois volitans*	Non-Native
Insects		
None		
Marine invertebrates		
Indo-Pacific swimming crab	*Charybdis helleri*	Non-Native
Asian clam	*Corbicula fluminea*	Non-Native
Common periwinkle	*Littorina littorea*	Non-Native
Green mussel	*Perna viridus*	Potential Invader
Porcelain crab	*Petrolisthes armatus*	Non-Native
Mantis shrimp	*Pullosquilla litoralis*	Non-Native
Reptiles		
Brown anole	*Anolis sagrans*	Non-Native
Algae		
No common name?	*Caulerpa taxifolia*	

Common Name	Species Name
Plants	
Mimosa, silktree	*Albizia julibrissin*
Alligatorweed	*Alternanthera philoxeroides*
Tung oil tree	*Aleurites fordii*
Coral ardisia	*Ardisia crenata*
Scarlet milkweed	*Asclepias curassavicum*
Pindo palm	*Butia capitata*
Madagascar periwinkle	*Catharanthus roseus*
Camphor tree	*Cinnamomum camphora*
Wild taro	*Colocasia esculenta*
Winged yam	*Dioscorea alata*
Air-potato	*Dioscorea bulbifera*
Common water hyancith	*Eichhornia crassipes*
Hydrilla	*Hydrilla verticillata*
Cogon grass	*Imperata cylindrica*
Crape-myrtle	*Lagerstroemia indica*
Dotted duckweed	*Landolita punctata*
Lantana	*Lantana camara*
Japanese privet	*Ligustrum japonicum*
Glossy privet	*Ligustrum lucidum*
Chinese privet, hedge privet	*Ligustrum sinense*
Japenese honeysuckle	*Lonicera japonica*
Japanese climbing fern	*Lygodium japonicum*
Chinaberry	*Melia azedarach*
Eurasian water-milfoil	*Myriophyllum spicatum*
Nandina, heavenly bamboo	*Nandina domestica*
Sword fern	*Nephrolepis cordifolia*
Oleander	*Neria oleander*
Violet wood sorrel	*Oxalis corymbosa*
Skunk vine	*Paederia foetida*
Torpedo grass	*Panicum repens*
Bahiagrass	*Paspalum notadum saurae*
Red-leaf photina	*Photina glabra*
Common cane, Roseau cane	*Phragmites australis*
Golden bamboo	*Phyllostachys aurea*
Water lettuce	*Pistia stratiotes*
Chinese brake fern	*Pteris vittata*
Kudzu	*Pueraria montana*
Tropical Mexican clover	*Richardia brasiliensis*
Castor bean	*Ricinus communis*
Mexican petunia	*Ruellia brittoniana*
Chinese tallow	*Sapium sebiferum*
Brazilian pepper	*Schinus terebinthifolius*
Sicklepod, coffeeweed	*Senna obtusifolia*
Rattlebox, purple sesban	*Sesbania punicea*
White-flowered wandering jew	*Tradescantia fluminensis*
Caesar weed	*Urena lobata*
Chinese wisteria	*Wisteria sinensis*
Malanga, elephant ear	*Xanthosoma sagittifolium*
Mammals	
Coyote	*Canis latrans*
Feral hog	*Sus scrofa*
Marine Invertebrates	
Green mussel	*Perna viridus*

*B.5 / **Monitoring Data***

Big Bend Seagrasses Aquatic Preserve's (BBSAP) monitoring data is extensive, spanning many years. For a copy of specific data, such as average temperature and salinity plots for each site, please contact the BBSAP office (3266 North Sailboat Ave., Crystal River, FL 34428; (352)563-0450).

*B.6 / **Summary of Florida Natural Areas Inventory Descriptions***

81 Natural Communities are classified by the Florida Natural Areas Inventory (FNAI). A Natural Community (NC) is defined as a distinct and reoccurring assemblage of populations of plants, animals, fungi and microorganisms naturally associated with each other and their physical environment. The levels of this classification become increasingly more complex and finely subdivided. At all levels, however, there are overlaps between types because of overlapping species distributions and intergrading physical conditions.

At the broadest level, the Natural Communities are grouped into seven Natural Community Categories based on hydrology and vegetation. A second level of the hierarchy splits the Natural Community Categories into Natural Community Groups. The third level of the classification, Natural Community Types, is the level at which Natural Communities are named and described. Natural Communities are characterized and defined by a combination of physiognomy, vegetation structure and composition, topography, land form, substrate, soil moisture condition, climate, and fire. They are named for their most characteristic biological or physical feature.

Three Levels of Natural Communities

- **CATEGORIES** - based on hydrology and vegetation
- **Groups** - defined by landform, substrate, and vegetation
- ***Types*** - characterized and defined by a combination of physiognomy, vegetation structure and composition, topography, land form, substrate, soil moisture condition, climate, and fire

Seven Natural Community Categories

1. Terrestrial Natural Communities - upland habitats dominated by plants which are not adapted to anaerobic soil conditions imposed by saturation or inundation for more than 10% of the growing season.
2. Palustrine Natural Communities - freshwater wetlands dominated by plants adapted to anaerobic substrate conditions imposed by substrate saturation or inundation during 10% or more of the growing season.
3. Lacustrine Natural Communities - nonflowing wetlands of natural depressions lacking persistent emergent vegetation except around the perimeter.
4. Riverine Natural Communities - natural, flowing waters from their source to the downstream limits of tidal influence, and bounded by channel banks.
5. Subterranean Natural Communities occur below ground surface.
6. Estuarine Natural Communities - subtidal, intertidal, and supratidal zones of coastal water bodies, usually partially enclosed by land but with a connection to the open sea, within which seawater is significantly diluted with freshwater inflow from the land.
7. Marine Natural Communities - occur in subtidal, intertidal, and supratidal zones of the sea, landward to the point at which seawater becomes significantly diluted with freshwater inflow from the land.

Descriptions of the Natural Community Types found in Big Bend Seagrasses Aquatic Preserve

TERRESTRIAL

Coastal Uplands - mesic or xeric communities restricted to barrier islands and near shore; woody or herbaceous vegetation; other communities may also occur in coastal environments.

Shell Mound - small hill of shells deposited by native Americans; mesic-xeric; statewide; rare or no fire; marine influence; closed canopy of mixed hardwoods; soapberry, snowberry, white stopper.

Sinkholes and Outcrop Communities - small extent communities in karst features or on exposed limestone.

Sinkhole - karst feature with steep walls; mesic-hydric; statewide; variable vegetation structure.

Limestone Outcrop - exposed limestone; mesic-hydric; statewide; often with mosses, liverworts, and a diversity of rare ferns.

PALUSTRINE

Freshwater Non-Forested Wetlands - herbaceous or shrubby palustrine communities in floodplains or depressions; canopy trees, if present, very sparse and often stunted.

Floodplain Marsh - floodplain with organic/sand/alluvial substrate; seasonally inundated; Panhandle to central peninsula; frequent or occasional fire (ca. 3 years, much less frequent in freshwater tidal marshes); treeless herbaceous community with few shrubs; sawgrass, maidencane, sand cordgrass, and/or mixed emergents.

Freshwater Forested Wetlands - floodplains or depressions dominated by hydrophytic trees.

Floodplain Swamp - along or near rivers and streams with organic/alluvial substrate; usually inundated; Panhandle to central peninsula; rare or no fire; closed canopy dominated by cypress, tupelo, and/or black gum.

Hardwood - dominated by a mix of hydrophytic hardwood trees; cypress or tupelo may be occasional or infrequent in the canopy; short hydroperiod.

Alluvial Forest - floodplain with alluvial substrate of sand, silt, clay or organic soil; inundated yearly during growing season; influenced by disturbance from ongoing floodplain processes (deposition of point bars, creation of "ridge and swale" topography); Panhandle to central peninsula; rare or no fire; closed canopy of mainly deciduous trees; water hickory, overcup oak, diamond-leaved oak, green ash, American elm, water locust, river birch.

RIVERINE - natural, flowing waters from their source to the downstream limits of tidal influence and bounded by channel banks.

Alluvial Stream - lower perennial or intermittent/seasonal watercourse characterized by turbid water with suspended silt, clay, sand and small gravel; Panhandle; generally with a distinct, sediment-derived (alluvial) floodplain and a sandy, elevated natural levee just inland from the bank.

Blackwater Stream - perennial or intermittent/seasonal watercourse characterized by tea-colored water with a high content of particulate and dissolved organic matter derived from drainage through swamps and marshes; statewide except Keys; generally lacking an alluvial floodplain.

Spring-run Stream - perennial watercourse with deep aquifer headwaters and clear water, circumneutral pH and, frequently, a solid limestone bottom; panhandle to central peninsula.

SUBTERRANEAN - twilight, middle, and deep zones of natural chambers overlain by the earth's crust and characterized by climatic stability and assemblages of trogloxenic, troglophilic, and troglobitic organisms.

Aquatic Cave - cave permanently or periodically submerged; often supporting troglobitic crustaceans and salamanders; includes high energy systems which receive large quantities of organic detritus and low energy systems; statewide.

MARINE AND ESTUARINE VEGETATED WETLANDS - intertidal or supratidal zone dominated by herbaceous or woody halophytic vascular plants; salinity >0.5 ppt.

Salt Marsh - estuarine wetland on muck/sand/or limestone substrate; inundated with saltwater by daily tides; statewide; occasional or rare fire; treeless, dense herb layer with few shrubs; saltmarsh cordgrass, needle rush, saltgrass, saltwort, perennial glasswort, seaside oxeye.

Mangrove Swamp - estuarine wetland on muck/sand/or limestone substrate; inundated with saltwater by daily tides; central peninsula and Keys; no fire; dominated by mangrove and mangrove associate species; red mangrove, black mangrove, white mangrove, buttonwood.

MARINE AND ESTUARINE - subtidal, intertidal, and supratidal zones of the sea, landward to the point at which seawater becomes significantly diluted with freshwater inflow from the land. (The distinction between the Marine and Estuarine Natural Communities is often subtle, and the natural communities types found under these two community categories have the same descriptions. For these reasons they have been grouped together.)

Mineral Based

Consolidated Substrate - expansive subtidal, intertidal, and supratidal area composed primarily of nonliving compacted or coherent and relatively hard, naturally formed mass of mineral matter (e.g., coquina limerock and relic reefs); statewide; octocorals, sponges, stony corals, nondrift macrophytic algae, blue-green mat-forming algae, and seagrasses sparse, if present.

Unconsolidated Substrate - expansive subtidal, intertidal, and supratidal area composed primarily of loose mineral matter (e.g., coralgal, gravel, marl, mud, sand and shell); statewide; octocorals, sponges, stony corals, nondrift macrophytic algae, blue-green mat-forming algae and seagrasses sparse, if present.

Faunal Based

Mollusk Reef - substantial subtidal or intertidal area with relief from concentrations of sessile organisms of the Phylum Mollusca, Class Bivalvia (e.g., mollusks, oysters, & worm shells); statewide; octocorals, sponges, stony corals, macrophytic algae and seagrasses sparse, if present.

Octocoral Bed - expansive subtidal area occupied primarily by living sessile organisms of the Class Anthozoa, Subclass Octocorallia (e.g., soft corals, horny corals, sea fans, sea whips, and sea pens); likely statewide; sponges, stony corals, nondrift macrophytic algae and seagrasses spares, if present.

Sponge Bed - expansive subtidal area occupied primarily by living sessile organisms of the Phylum Porifera (e.g., sheepswool sponge, Florida loggerhead sponge and branching candle sponge); statewide; octocorals, stony corals, nondrift macrophytic algae and seagrasses sparse, if present.

Floral Based (mainly subtidal)

Algal Bed - expansive subtidal, intertidal, or supratidal area, occupied primarily by attached thallophytic or mat-forming prokaryotic algae (e.g, halimeda, blue-green algae); statewide; octocorals, sponges, stony corals and seagrasses sparse, if present.

Seagrass Bed - expansive subtidal or intertidal area, occupied primarily by rooted vascular macrophytes, (e.g., shoal grass, halophila, widgeon grass, manatee grass and turtle grass); statewide; may include various epiphytes and epifauna; octocorals, sponges, stony corals, and attached macrophytic algae sparse, if present.

Composite Substrate

Composite Substrate - expansive subtidal, intertidal, or supratidal area, occupied primarily by natural community elements from more than one natural community category (e.g., grass bed and algal bed species; octocoral and algal bed species); statewide; includes both patchy and evenly distributed occurrences.

Florida Natural Areas Inventory, Natural Communities Rankings

Below are the relative ranks of the NCs. FNAI uses several criteria to determine the relative rarity and threat to each community type; these are translated or summarized into a global and a state rank, the G and S ranks, respectively. Most G ranks for NCs are temporary pending comparison and coordination with other states using this methodology to classify and rank vegetation types. (Contact Florida Natural Areas Inventory for most recent natural community ranks.) A few NCs and several Plant Communities occur only or mostly in Florida and can be considered endemic to Florida. (Muller, Hardin, Jackson, Gatewood, & Caire, 1989). “Summary Report on the Vascular Plants, Animals and Plant Communities Endemic to Florida”. Florida Game and Fresh Water Fish Commission, Nongame Wildlife Program, Technical Report No. 7.) The only opportunity for protection of these communities is in Florida and they should be given special consideration in Florida’s protection efforts.

TERRESTRIAL

Coastal Uplands
G2 S2 Shell Mound

Sinkholes & Outcrop Communities
G2 S2 Sinkhole
G2 S2 Limestone Outcrop

PALUSTRINE

Freshwater Non-Forested Wetlands
G3 S3 Floodplain Marsh

Freshwater Forested Wetlands
G4 S4 Floodplain Swamp

Hardwood
G4 S3 Alluvial Forest

SUBTERRANEAN

G3 S2 Aquatic Cave

RIVERINE

G4 S2 Alluvial Stream
G4 S3 Blackwater Stream

MARINE & ESTUARINE VEGETATED WETLANDS

G5 S4 Salt Marsh
G5 S4 Mangrove Swamp

MARINE & ESTUARINE

Mineral Based
G3 S3 Consolidated Substrate
G5 S5 Unconsolidated Substrate

Faunal Based
G3 S3 Mollusk Reef
G2 S1 Octocoral Bed
G2 S2 Sponge Bed

Floral Based
G3 S2 Algal Bed
G2 S2 Seagrass Bed

Composite Substrate
G3 S3 Composite Substrate

Definition of Global (G) element ranks:

G1 = Critically imperiled globally because of extreme rarity (5 or fewer occurrences or very little remaining area, e.g., <2,000 acres) or because of some factor(s) making it especially vulnerable to extinction;

G2 = Imperiled globally because of rarity (6-20 occurrences or very little remaining area, e.g., <10,000 acres) or because of some factor(s) making it very vulnerable to extinction throughout its range;

G3 = Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range or because of other factors making it vulnerable to extinction throughout its range, 21 to 100 occurrences;

G4 = Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery;

G5 = Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery;

G? = Uncertain Global rank.

Definition of State (S) element ranks:

S1 = Critically imperiled in state because of extreme rarity (5 or fewer occurrences or very little remaining area) or because of some factor(s) making it especially vulnerable to extinction;

S2 = Imperiled in state because of rarity (6-20 occurrences or little remaining area) or because of some factor(s) making it very vulnerable to extinction throughout it range; S3 = Rare or uncommon in state (on the order of 21 to 100 occurrences);

S4 = Apparently secure in state, although it may be rare in some parts of its state range;

S5 = Demonstrably secure in state and essentially ineradicable under present conditions;

S? = Uncertain State rank.

Appendix C

Public Involvement

*C.1 / **Advisory Committee***

The following appendices contain information about who serves on the Advisory Committee, when meetings were held, copies of the public advertisements for those meetings, and summaries of each meeting.

*C.1.1 / **List of Members and Their Affiliations***

Name	Affiliate
Tim Jones	Big Bend Aquatic Preserves Manager
Louis Mantini	Suwannee River Water Management District
Mike Kuhman	Florida Department of Agriculture and Consumer Services
Tom Frazer	University of Florida
Terry Peacock	U.S. Fish and Wildlife Service
Fred Vose	Taylor County

For more information, you may contact: Either Christopher Dabson, FDOT, Project Manager, (386)943-5321, e-mail: chris.dabson@dot.myflorida.com or Amy Sirmans, TranSytems, (407)875-8930, via email: amsirmans@transystems.com.

BOARD OF TRUSTEES OF INTERNAL IMPROVEMENT TRUST FUND

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

DATE AND TIME: Tuesday, June 19, 2012, 6:00 p.m. – 7:30 p.m.

PLACE: First District Community Building, 9335 N.E. 349 Hwy., Old Town, FL 32680

GENERAL SUBJECT MATTER TO BE CONSIDERED: The purpose is to receive public comment on the draft Big Bend Seagrasses Aquatic Preserve Management Plan.

A copy of the draft plan will be available for viewing starting May 19, 2012 at www.dep.state.fl.us/coastal. The Big Bend Seagrasses Aquatic Preserve Advisory Committee will be participating.

A copy of the agenda may be obtained by contacting: Aquatic Preserve Acting Manager, Tim Jones by e-mail: Timothy.W.Jones@dep.state.fl.us, by phone: (352)563-0450, or by mail: 3266 North Sailboat Ave., Crystal River, FL 34428-6205.

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 5 days before the workshop/meeting by contacting: Tim Jones, (352)563-0450. 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).

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

DATE AND TIME: Wednesday, June 20, 2012, 6:00 p.m. – 7:30 p.m.

PLACE: City Council Chambers, 224 S. Jefferson St., Perry, FL 32347

GENERAL SUBJECT MATTER TO BE CONSIDERED: The purpose is to receive public comment on the draft Big Bend Seagrasses Aquatic Preserve Management Plan.

A copy of the draft plan will be available for viewing starting May 19, 2012 at www.dep.state.fl.us/coastal. The Big Bend Seagrasses Aquatic Preserve Advisory Committee will be participating.

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

DATE AND TIME: Thursday, June 21, 2012, 9:00 a.m. – 4:00 p.m.

PLACE: City Council Chambers, 224 S. Jefferson St., Perry, FL 32347

GENERAL SUBJECT MATTER TO BE CONSIDERED: The purpose is for the members of the Big Bend Seagrasses Aquatic Preserve Advisory Committee to discuss the revision of the draft Big Bend Seagrasses Aquatic Preserve Management Plan.

A copy of the agenda may be obtained by contacting: Aquatic Preserve Acting Manager, Tim Jones by e-mail: Timothy.W.Jones@dep.state.fl.us, by phone: (352)563-0450, or by mail: 3266 North Sailboat Ave., Crystal River, FL 34428-6205.

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DEPARTMENT OF CITRUS

The Florida **Department of Citrus** announces a workshop to which all persons are invited.

DATES AND TIME: May 30, 2012; June 20, 2012, 9:30 a.m.

PLACE: Florida Department of Citrus, 605 East Main Street, Bartow, Florida

GENERAL SUBJECT MATTER TO BE CONSIDERED: The subject area to be addressed is the modification of FDOC rules to include maturity standards and citrus fruit dealer bond requirements, as well as other changes made to Chapter 601, F.S. during the 2012 Legislative session. Rule development could result in future FDOC proposed rules, which will be further noticed. Such proposed rules will create new rules for fresh and processed maturity standards (Chapters 20-50 through 20-56 and 20-82, F.A.C.) and amend Rule 20-108.004, F.A.C., to include the citrus fruit dealer bond requirements formerly in Chapter 601, F.S.

Big Bend Seagrasses Aquatic Preserve Advisory Meeting Summary
Thursday, June 21, 2012 at 9:00 a.m.
City Council Chambers
224 S. Jefferson Street, Perry, FL 32347

Attendees:

Advisory council - Louis Mantini (SRWMD), Mike Kuhman (DOACS), Tom Frazer (UF), Terry Peacock (USFWS), Fred Vose (Taylor County)

Public- Chet Thompson (Environmental Technical Manager, Buckeye Technologies, Inc.)

CAMA staff- Pam Philips, Penny Isom, Tim Jones, Jon Brucker, Kathy Smith.

Commenced at 9:16 a.m. by facilitator Pam Philips. Focused on Chapter 5. Began with comments on chapters 1-4. Read two written comments from June 20 public meeting and reviewed issues/comments from public meeting 'Issue kiosks'.

LM: A lot of good info – need inventories of every spring that quit flowing, etc. Tables lack references (table 3, pg 26). Would like to help revise final draft. As a stakeholder would like to provide edits. Will make effort to identify things that need changes and provide input for corrections. Comprehensive mailing needs to be added.

PP: Final draft due June 27, 2012. Several authors and several edits will be necessary. Move to pg. 84, goal 1, obj. 1:

TF – Four dataloggers – a lot of area to cover for two people. Measurements taken not primary. Nutrient issue should be incorporated into plan. Reduction in light caused by nutrients causes loss of seagrass based on data available. Program since 1997 has taken that long to see variables. Have 100+ stations. Funding an issue – can't continue to sample all 100. Find out which are alike and choose one representative station. It's a big issue. Where are stations in BBSAP?

JB: Suwannee, Cedar Key, Seahorse Key, Steinhatchee.

MK: Have been asked to do nutrient sampling using five standards from each shellfish area. Nutrient sampling related to DEP.

TJ: Integrate MC sampling with BBSAP sampling. TP: Need bio types to train people to help do monitoring, significant projects.

MK: Nutrient data is essential - started sampling two months ago.

TJ to MK: Where are gaps – estuarine data is limited. Apalachee monitoring being done by Russ Feinberg group.

MK: Funding for nutrients is not available – surface water gets all the money.

TF: Longevity of monitoring is important – need to decide which is vital

PP: Strategy two, performance measures:

JB: Partnering with others to expand monitoring has been discussed for some time.

MK: Aquatic Preserve overlaps other work – achieve objectives by creating partnerships.

PP: Not a work plan but a general direction with work plan – will be developed from the management plan budgets.

FV: Performance measures based on the work done – makes it tough to examine management plan.

JB: Comments help develop performance measures.

MK: A lot of gaps in monitoring – ask if going into STORET.

JB: Working on it – CAMA needs database – needs legally defensive data – GAQC need standards – protocol. No statewide training for technicians. DEP will send people to field office for day long training. Should be a database easy to access.

LM: Have web server to retrieve historical data download into Excel spreadsheets.

PP: Goal 2, objective 2:

JB: Education and outreach, kiosks, events to inform the public what we do and why it important. Partner with refuge to share information, participate in events – maintain partnerships

FV: 950,000 acres – issues are so different from county to county. What drives economies is very different. PNG – nonexistent since 1993. Artificial reef development (public access/use).

TF: Must prioritize due to small staff.

PP – Government and the public wants to see what the Aquatic Preserve provides economically, and what you do with water quality.

TF: Support multimillion dollar industries through the health of the environment. Priority is seagrass – that is the resource.

FV: Properly maintained channel may discourage prop scarring.

JB: Disagrees – prop scarring addressed by boater education. Signage is difficult to anchor to lime rock.

LM: Mapping – develop strategy – provide mapping.

TF: FWC Paul Carlson doing mapping.

LM: Large scale dark water event when seagrass loss opposed to normal flooding.

TF: Aerial hyper spectral survey too expensive to do on a regular basis. Monitor the drivers of the seagrass changes.

MK: Restoration projects?

TJ: Not in BBSAP but prop scar restoration in SMMAP.

LM: Restoration – Dr. Fredrick proposed oyster tubes to restore oyster reefs in Suwannee.

MK: Areas have fallen out of compliance but cycle is recovering.

LM: Monitor only sea grasses or all resources – monitor sea grasses and critical habitat.

MK: Clam bags done wrong – executed incorrectly.

TF: Sea level rise addressed?

PP: Yes – The Acquisition and Restoration Council has told us to include sea level rise in all management plans.

MK: Suwannee Sound and Cedar Key has had extreme sea level rise.

TF: Include places vulnerable to sea level rise – start core measurements now.

PP: This should be under critical habitats.

MK – Tree die off is Gulf Coast indicator for sea level rise.

PP: Issue 3 – access/use:

MK: Reduce amount of debris – marine debris.

LM: Overlap Issue 4 – debris objective 2 debris issues perhaps should be moved to obstacles goal 2.

PP: Discussed revising – move objective 2, strategy 2 to issue 4, goal.

JB: Need new objective 2 for goal 1.

FV: Int st 2 goal 1 – public – mark channels.

JB: Think this is under FWC purview.

FV: County's purview, then to U.S. Coast Guard, U.S. Army Corps of Engineers.

JB: We partner with FWC.

JB: Pg 91 signage – not impact seagrass – land based kiosk.

FV: Crab trap removal?

TJ & JB: Yes – try to do one time a year.

TJ: Suwannee Sound needs it.

FV: Will partner in crab trap removal.

LM: Pg 111 species "c" verify (commercial?) – verify lists.

TF: Monitoring should be effective. Need to prevent declines before it is too late.

Comment read – Steve Lopp: Put goals and issues first then background – capture better in executive summary. Staffing of facilities – possible satellite office/labs.

C.2 / *Formal Public Meetings*

The following Appendices contain information about the Formal Public Meeting(s) which was held in order to obtain input from the public about the Big Bend Seagrasses Aquatic Preserve Draft Management Plan. There are copies of the public advertisements for those meetings, a list of attendees, a summary of the meeting(s), and a copy of the written comments received.

C.2.1 / *Florida Administrative Weekly Postings*

See C.1.2 for the public meeting Florida Administrative Weekly posting.

C.2.2 / *Advertisement Flyers and Newspaper Announcements*

Florida Department of Environmental Protection • Office of Coastal & Aquatic Managed Areas

Big Bend Seagrasses Aquatic Preserve Management Planning

Public Meeting

Wednesday, June 20, 2012, 6:00 pm

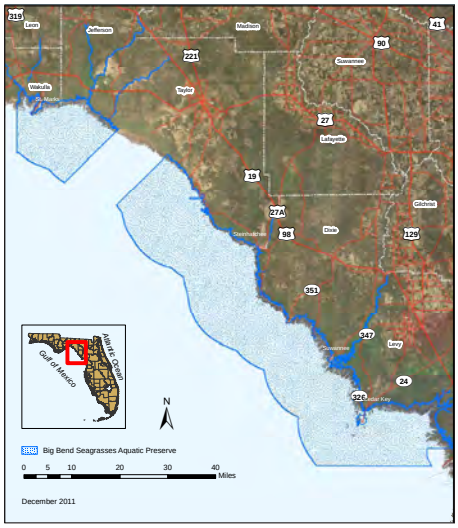
City Council Chambers
224 S. Jefferson St.
Perry, FL 32347

The Florida Department of Environmental Protection's Office of Coastal and Aquatic Managed Areas (CAMA) is responsible for the management of Florida's 41 aquatic preserves, 3 National Estuarine Research Reserves (NERRs), a National Marine Sanctuary, and the 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. CAMA is updating these management plans, and is currently seeking input on the draft Big Bend Seagrasses Aquatic Preserve plan. Meeting objectives:

1. Review purpose and process for revising the Big Bend Seagrasses 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 CAMA in the revision of the draft management plan.

For more information, please contact Tim Jones, (352) 563-0450 / Timothy.W.Jones@dep.state.fl.us or visit our website at www.dep.state.fl.us/coastal/sites/bigbend/. Written comments are welcome and can be submitted by fax: (850) 245-2110, Attn: Big Bend; or email FloridaCoasts@dep.state.fl.us on or before June 27, 2012.



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This publication funded in part through a grant agreement from the Florida Department of Environmental Protection, Florida Coastal Management Program by a grant provided by the Office of Ocean and Coastal Resource Management under the Coastal Zone Management Act of 1972, as amended, National Oceanic and Atmospheric Administration (NOAA) Award No. NA10NOS4190178-CM125, and NA11NOS4190073-CM227. The views, statements, finding, conclusions, and recommendations expressed herein are those of the author(s) and do not necessarily reflect the views of the State of Florida, NOAA, or any of its subagencies. May, 2012.

Florida Department of Environmental Protection • Office of Coastal & Aquatic Managed Areas

Big Bend Seagrasses Aquatic Preserve Management Planning

Public Meeting

Tuesday, June 19, 2012, 6:00 pm

The Community Building
9335 NE State Road 349
Old Town, FL 32680

The Florida Department of Environmental Protection's Office of Coastal and Aquatic Managed Areas (CAMA) is responsible for the management of Florida's 41 aquatic preserves, 3 National Estuarine Research Reserves (NERRs), a National Marine Sanctuary, and the 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. CAMA is updating these management plans, and is currently seeking input on the draft Big Bend Seagrasses Aquatic Preserve plan. Meeting objectives:

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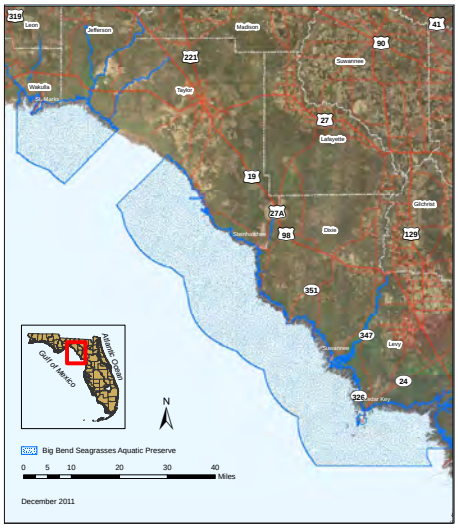
3. Receive input on the draft management plan.

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

For more information, please contact Tim Jones, (352) 563-0450 / Timothy.W.Jones@dep.state.fl.us or visit our website at www.dep.state.fl.us/coastal/sites/bigbend/. Written comments are welcome and can be submitted by fax: (850) 245-2110, Attn: Big Bend; or email FloridaCoasts@dep.state.fl.us on or before June 27, 2012.



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The Gainesville Sun - Jun 18, 2012 - - - A2

2A | THE GAINESVILLE SUN | MONDAY, JUNE 18, 2012

www.gainesville.com

PEOPLE

A scene from the movie "Madagascar 3: Europe's Most Wanted."

'Madagascar 3' stays on top

LOS ANGELES — Zoo animals remain hot at the box office. Singing stars and Adam Sandler are not.

Ben Stiller and his voice co-stars of "Madagascar 3: Europe's Most Wanted" held on to the No. 1 spot again, with $35.5 million for the animated sequel's second weekend in domestic theaters.

Studio estimates Sunday put Ridley Scott's sci-fi adventure "Prometheus" at No. 2 again with $20.2 million.

"Madagascar 3" and "Prometheus" held off two under-achieving newcomers. The star-studded musical "Rock of Ages," whose cast includes Tom Cruise, Catherine Zeta-Jones and Alec Baldwin, flopped at No. 3 with $15.1 million. Sandler's "That's My Boy" bombed with $13 million, the worst showing for one of his broad comedies since the mid-1990s.

Club from Chris Brown fight closes

NEW YORK — Police have shut down a New York City nightclub where singer Chris Brown and rapper Drake's entourage got into a bottle-throwing brawl.

Brown

A New York Police Department spokeswoman says the club W.i.P in the city's SoHo neighborhood was closed Saturday night because of code violations. The NYPD gave no details on the violations.

Chris Brown, his girlfriend and his bodyguard were among eight injured during the fight inside the club last week. Police say members of Drake's entourage stopped Brown as he was leaving. The fight escalated and bottles were thrown.

The late Joseph Heller, author of the anti-war novel "Catch-22."

'Catch-22' writing tools revealed

COLUMBIA, S.C. — Students more accustomed to computer screens than manual typewriters are getting a chance to sit at author Joseph Heller's stained wooden desk and type on the battered Smith-Corona he used to compose his acclaimed novel "Catch-22."

A small exhibit at a University of South Carolina library displays the desk, typewriter and lamp used by Heller as he wrote many of his major works. The university library has one of the largest collections of his papers, manuscripts and other memorabilia available to researchers, library officials said.

The display is available for students and library visitors until late December.

Rielle Hunter's memoir details affair, aftermath

The Associated Press

When John Edwards faced the prospect of an indictment that could put him behind bars, he calmly told his mistress he would probably wind up in a low-security prison in Virginia more like a country club than a jail. She quickly told him she and their daughter would move there to be near him if that happened.

Rielle Hunter details their phone call just days before his indictment in her new memoir, purchased by The Associated Press ahead of its release.

"What Really Happened: John Edwards, Our Daughter and Me," also includes Rielle Hunter's mixed views on Edwards' parenting of their daughter Quinn and descriptions of Elizabeth Edwards' outbursts. At the end of the book, Hunter says she still has romantic feelings for Edwards but doesn't know how their relationship will turn out.

The book also provides a window into Edwards' psyche as federal prosecutors began their case against him. Days before his indictment Hunter asked: "So if you went to jail, what kind of jail would it be? One of those country clubs?"

"He said, 'Yeah.'"

"'Where?' she asked.

"'Probably Virginia.'

"'So Quinn and I will move to Virginia. Virginia is a great state.'"

The only low-security federal prison in Virginia is in Petersburg, where former Washington, D.C., Mayor Marion Barry once served time.

On the day of the indictment, the two shared a surreal phone call as a newspaper reporter banged on her door in Charlotte, while the man she refers to as "Johnny" throughout the book called her cellphone to say that he was also being pursued.

"'I've got helicopters circling my house,' Johnny said."

Federal prosecutors spent a year prosecuting Edwards, culminating in a six-week trial that ended last month. Jurors acquitted Edwards on one count of accepting illegal campaign contributions and deadlocked on five other felony counts. The judge declared a mistrial.

Federal prosecutors then said in a court order earlier this month that they wouldn't retry Edwards, and the charges against him were dropped.

Neither Edwards nor Hunter testified.

Prosecutors had accused Edwards, 59, of masterminding a scheme to use about $1 million in secret payments from two wealthy political donors to hide his pregnant mistress as he sought the White House in 2008.

Hunter writes that Edwards is a doting father when he's around their daughter but that his obligations to his other children curtail their time together. The book features several pictures of the father and daughter together, smiling.

Immediately after his trial, Edwards said during a news conference — with his adult daughter, Cate, by his side — that he loved Quinn "more than any of you can ever imagine."

WHAT REALLY HAPPENED
John Edwards, Our Daughter, and Me
RIELLE HUNTER

THE ASSOCIATED PRESS

"What Really Happened" is a memoir about Rielle Hunter, her relationship with former presidential candidate John Edwards and their daughter.

NOTABLE DEATH

Financial journalist DAN DORFMAN, known for moving stock prices in the 1990s with his comments on CNBC, has died.

He was 82. According to the family, he died Saturday in New York of cardiogenic shock, a heart condition.

BIRTHDAYS

Rock singer-musician Sir Paul McCartney is 70. Movie critic Roger Ebert is 70. Rock musician Dizzy Reed (Guns N' Roses) is 49. Rhythm-and-blues singer Nathan Morris (Boyz II Men) is 41. Rapper Slick the Shocker is 37. Country singer Blake Shelton is 36. Actress Renee Olstead is 23.

gainesville.com TODAY ON THE WEB

TODAY'S TOPIC

Would you rather pay for road use through miles-based assessment or a gas tax?

The Gainesville Sun

Commitment to accuracy

MAIN NUMBER: 378-1411

The Florida Department of Environmental Protection, Office of Coastal and Aquatic Managed Areas announces public meetings to receive comments on the Big Bend Seagrasses Aquatic Preserve draft management plan. The meetings will be held in Levy County on June 19, 2012, 6:00-7:30 p.m. at First District Community Building, 9335 NE 349 Hwy, Old Town, FL 32680; and in Taylor County on June 20, 6:00-7:30 p.m. in Council Chambers, 224 S Jefferson St, Perry, FL 32347. A copy of the draft plan is posted at www.dep.state.fl.us/coastal. For the agenda, contact the preserve Acting Manager, Tim Jones by e-mail: Timothy.W.Jones@dep.state.fl.us, by phone (352)563-0450, or by mail: 3266 North Sailboat Ave, Crystal River, FL 34428.

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PERRY NEWS-HERALD/TACO TIMES
Published Weekly in the City of Perry
County of Taylor, State of Florida

AFFIDAVIT OF PUBLICATION

Before me, the undersigned authority personally appeared DONALD D. LINCOLN, who on oath says that he is the PUBLISHER of the Perry News-Herald/ Taco Times, both weekly newspapers published in Perry, Taylor County, Florida, that the attached copy of advertisement in re:

Public Meetings
Big Bend Seagrasses Aquatic Preserve

was published in said newspaper in the issues of:

June 13, 2012

Affiant says further that the said, newspapers published at Perry in said Taylor County, Florida, each week; has been entered as second class mail matter at the Post Office in Perry, Florida, in said Taylor County, Florida for a period of one year next proceeding the first publication of the attached copy of notice to appear: and affiant further says that he has neither paid nor promised any person, firm or corporation any discount, rebate, commission or refund for the purpose of securing this advertisement for publication in said newspaper.

Donald D. Lincoln, Publisher

Sworn to and subscribed
before me this
15 day of June 2012

Notary Public
County of Taylor
State of Florida
Personally Known
Personally Appeared
before me

DEBRA M. CARLTON
MY COMMISSION # EE 097631
EXPIRES: August 13, 2015
Bonded Thru Notary Public Underwriters

The Florida Department of Environment Protection, Office of Coastal and Aquatic Managed Areas announces public meetings to receive comments on the Big Bend Seagrasses Aquatic Preserve draft management plan. The meetings will be held in Levy County on June 19, 2012, 6:00-7:30 p.m. at First District Community Building, 9335 NE 349 Hwy, Old Town, FL 32680; and in Taylor County on June, 6:00-7:30 p.m. in Council Chambers, 224 S Jefferson St, Perry, FL 32347. A copy of the draft plan is posted at www.dep.state.fl.us/coastal. For the agenda, contact the preserve Acting Manager, Tim Jones by e-mail: Timothy.W.Jones@dep.state.fl.us; by phone (352) 563-0450, or by mail: 3266 North Sailboat Ave, Crystal River, FL 34428.
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COST $ 32.44

Big Bend Seagrasses Aquatic Preserve Public Meeting Summary
Tuesday, June 19, 2012 at 6:00 p.m.

First District Community Center
9335 NE State Road 349, Old Town, FL 32680

Introduction:

On June 19, the Big Bend Seagrasses Aquatic Preserve conducted a public meeting to meet the following objectives:

1. Review purpose of and process for reviewing the site management plan.
2. Present the Draft Big Bend Seagrasses Aquatic Preserve Management Plan, with a focus on the identified issues, goals, objectives and strategies.
3. Receive feedback from stakeholders on the draft management plan.

This was the first public meeting related to the review of the site's management plan.

The June 19th meeting followed the following agenda:

- Official Welcome and introduction to the meeting.
- Overview Presentation: A short presentation was given by the site manger to provide an overview of the planning process, the identified issues and proposed strategies.
- Public Comment and Stakeholder Feedback: An opportunity for the public to provide written and verbal feedback directly to the site staff by visiting "kiosks."
- Kiosk Reports: Staff provided a verbal summary of the comments they received at their kiosk.
- Public Comment: Participants who wanted to make a verbal public statement were asked to sign a posted "speakers list."

The public meeting was designed to encourage deep dialogue between the public and the Big Bend Seagrasses Aquatic Preserve staff on specific issues, as well as providing a forum for general comments and observations.

Summary of the reports made by the staff from the kiosks:
Below is an overall summary of the comments received by Big Bend Seagrasses Aquatic Preserve staff at the first public meeting:

Issue One – Water Quality

- There was concern over the "gap" at the Fenholloway River. Staff was encouraged to re-examine the gap to see if improvements in water quality and seagrass growth will allow the gap to be narrowed.
- It was suggested that staff include future sources of pollution and potential impacts into the management plan. Staff needs to be able to record impacts and provide input to appropriate agencies.

Issue Two – Seagrass

- Staff should increase signage, brochures, and other outreach materials to increase public awareness about seagrass. Additionally, staff should develop methods to increase boater awareness and knowledge of seagrass areas, especially for non-resident and non-local boaters.
- It was suggested that staff update and provide maps of seagrass areas to other state and federal agencies and the public, potentially in GPS formats.

Issue Three – Public Use

- Staff should partner with other agencies to set up annual crab trap clean-ups, and possibly develop techniques for using derelict traps for restoration.
- It is suggested that staff develop a comprehensive future public use plan, focusing on areas where population growth, and therefore public use, is expected.
- The public questioned whether increasing public use with increased population growth is an appropriate strategy. Moving forward, staff should document conditions to be able to comment on proposed changes, propose recommendations to appropriate agencies to reduce impacts and promote low impacts, and continue to work with other agencies to effectively manage the resources.

Issue Four – Obstacles in Resource Management

- All participants agreed that partnering with other agencies and organizations is critical to effectively managing resources.
- Additionally, it was agreed that budget constraints effect management; staff should create a plan where size and scope of work can be accomplished with the budget. Staff should always be looking to increase budget size for more effective management.
- Participants suggested that the management plan be structured in a different format; issues and goals should occur at the beginning of the management plan followed by all background and supporting information.

Written comments received on comments cards at the meeting:

None

Big Bend Seagrasses Aquatic Preserve Public Meeting Summary
Wednesday, June 20, 2012 at 6:00 p.m.
City Council Chambers
224 S. Jefferson Street, Perry, FL 32347

Introduction:

On June 20, the Big Bend Seagrasses Aquatic Preserve conducted a second public meeting to meet the following objectives:

1. Review purpose of and process for reviewing the site management plan.
2. Present the Draft Big Bend Seagrasses Aquatic Preserve Management Plan, with a focus on the identified issues, goals, objectives and strategies.
3. Receive feedback from stakeholders on the draft management plan.

This was the second public meeting related to the review of the site's management plan.

The June 20th meeting followed the following agenda:

- Official Welcome and introduction to the meeting.
- Overview Presentation: A short presentation was given by the site manger to provide an overview of the planning process, the identified issues and proposed strategies.
- Public Comment and Stakeholder Feedback: An opportunity for the public to provide written and verbal feedback directly to the site staff by visiting "kiosks."
- Kiosk Reports: Staff provided a verbal summary of the comments they received at their kiosk.
- Public Comment: Participants who wanted to make a verbal public statement were asked to sign a posted "speakers list."

The public meeting was designed to encourage deep dialogue between the public and the Big Bend Seagrasses Aquatic Preserve staff on specific issues, as well as providing a forum for general comments and observations.

Summary of the reports made by the staff from the kiosks:
Below is an overall summary of the comments received by Big Bend Seagrasses Aquatic Preserve staff at the second public meeting:

Issue One – Water Quality

- The public showed interest in the Fenholloway River area. Water quality improvements are being made in the area, and the public inquired about the state assessment scale for water quality. It was stated that recreational fishing has improved in the Fenholloway region. A representative from the Fenholloway plant stated that they are currently classified as a Class III waterway and are working to qualify for Florida Outstanding Water classification.
- Monitoring more of the Big Bend region is an increasing priority; creating a more widespread set of baseline data is important to the local commercial fishermen of the region. Monitoring north of the Fenholloway River should be completed; work with other state agencies and Florida State University.
- Integrating data into publicly available databases is crucial for future resource management. Make the data available on the internet.

Issue Two – Seagrass

- It was suggested that staff integrate monitoring and mapping efforts to create an online database.
- Increase public awareness regarding prop scarring and overall boater education. Seagrass awareness should be included in boater education. The participants were not entirely aware of current and future threats to seagrasses.
- The current and future approaches to seagrass regulation and enforcement were discussed, and questions regarding future changes in regulation were raised.
- It was suggested that dredging access channels would reduce prop scarring in sensitive areas. Utilizing signage or markers to designate grass flats may prevent people from prop scarring.

Issue Three – Public Use

- The public wants increased public access public lands, and the management plan should support increased use. There is a need to develop proper infrastructure for low-impact use; less government presence in aquatic preserves or increased partnerships with local entities to effectively manage the resources.
- Impacted areas should be mapped and made available to the public.
- The Aquatic Preserve should campaign to keep the preserve clean; inform the public about issues regarding derelict crab traps and other hazardous materials.

Issue Four – Obstacles in Resource Management

- Monitoring the fisheries is a top priority.
- The impact of jet skis and other recreational vessels should be examined.
- The Aquatic Preserve should consider working in conjunction with the silviculture industry.
- The Aquatic Preserve office should be more centrally located to properly manage the resources.
- Partnering with more local, state, and federal agencies would create more effective resource management.

Written comments received on comments cards at the meeting:

None

Goals, Objectives, and Strategies Table

D.1 / Current Goals, Objectives and Strategies Table

The following table is a summary of the issues, goals, objectives and strategies identified in Chapter 5. The "Management Program" column identifies which Management Program each strategy falls within. The "Implementation Date" column identifies the fiscal year when the strategy was, or will be, initiated. The "Project Initiation" column indicates if this is an activity that is already underway, currently under initial development, or will occur in the future. The "Length of Initiative" column indicates how long it is expected to complete the strategy, and the "Estimated Yearly Cost" column identifies the anticipated expenses associated with the strategy.

Goals, Objectives & Integrated Strategies	Management Program	Implementation Date (Planned)	Project Initiation	Length of Initiative	Estimated Yearly Cost
Issue 1: Water Quality					
Goal 1: Further develop and improve strategic, long-term water quality monitoring programs.					
Objective 1: Analyze and interpret the status and trends of BBSAP's water quality.					
Strategy: Continue datalogger program.	Ecosystem Science	2004	C	Ongoing	$30,780
Strategy: Continue Project COAST with UF.	Ecosystem Science	1997	C	Ongoing	$4,680
Strategy: Expand datalogger program.	Ecosystem Science	2013	F	Unknown	$23,320
Objective 2: Identify water quality issues regarding nutrients and pollution, and work with other agencies to develop response strategy.					
Strategy: Support nutrient criteria development	Resource Mgmt	2004	C	Ongoing	$12,500
Strategy: Support development of TMDLs.	Resource Mgmt	2004	C	Ongoing	Costs included in water quality monitoring
Strategy: Identify point and nonpoint sources of pollutants and turbidity.	Ecosystem Science	2000	C	Ongoing	$1,000
Strategy: Continue monitoring and maintaining Shellfish Harvesting Areas.	Resource Mgmt	2004	C	Ongoing	$1,000
Objective 3: Ensure sustainability of concerned species through the development of tiered approach of water quality monitoring.					
Strategy: Continue to monitor the distribution and abundance of indicator species to determine health of the system.	Ecosystem Science	2000	C	Ongoing	Costs included in other strategies
Strategy: Determine biodiversity of BBSAP.	Ecosystem Science	2000	C	Ongoing	$1,200
Goal 2: Provide timely and accurate water quality data and information to the public and other entities/agencies.					
Objective 1: Acquire repository to store water quality data in a centralized database that is user-friendly, provides quality assurance and quality control, and can be accessed via the internet.					
Strategy: Work with other agencies to develop centralized water quality storage database.	Partnering	2013	D	Unknown	Cost yet to be determined
Objective 2: Utilize a variety of methods to inform the public and other entities regarding water quality conditions, importance of water quality and ways to improve water quality					
Strategy: Utilize educational signage at strategic access points to educate the public about conserving natural resources.	Education/ Outreach	2006	C	Ongoing	Costs included in other strategies
Strategy: Coordinate and participate in public lectures to address water quality issues and ways to improve water quality.	Education/ Outreach	2000	C	Ongoing	$1,000
Strategy: Provide/create opportunities for the public to assist in monitoring efforts and outreach events.	Education/ Outreach	2006	C	Ongoing	No additional costs

Goals, Objectives & Integrated Strategies	Management Program	Implementation Date (Planned)	Project Initiation	Length of Initiative	Estimated Yearly Cost
Issue 2: Management and Protection of Seagrasses					
Goal 1: Manage seagrass communities through research and monitoring, education and outreach, continued resource management, and collaborative mapping efforts.					
Objective 1: Monitor status and trends of seagrass distribution within BBSAP.					
Strategy: Develop and implement long-term seagrass monitoring plan.	Ecosystem Science	2000	C	Ongoing	$15,000
Strategy: Continue collaborating with other agencies on the Seagrass Integrated Mapping and Monitoring report.	Ecosystem Science	2010	C	Ongoing	$1,000
Strategy: Use GIS to identify areas of concern and determine restoration needs.	Ecosystem Science	2000	C	Ongoing	$2,000
Strategy: Use GIS to quantify gains or losses in seagrass communities.	Resource Mgmt	2000	C	Ongoing	$2,000
Strategy: Establish and maintain close communication with other agencies making resource management decisions regarding water quality and seagrass in BBSAP.	Resource Mgmt	2000	C	Ongoing	No additional costs
Strategy: Coordinate with adjacent resource managers to support clean-up efforts to address derelict vessels or illegal fisheries gear that could impact seagrass habitat.	Resource Mgmt	2000	C	Ongoing	$1,000
Objective 2: Promote the importance of seagrass habitats by generating informational outlets that target user groups in BBSAP.					
Strategy: Update current BBSAP brochures.	Education/ Outreach	2013	F	Ongoing	$200
Strategy: Repair, replace and install educational signage pertaining to resource protection.	Education/ Outreach	2006	F	Ongoing	Variable
Strategy: Continue to participate in educational outreach programs throughout BBSAP.	Education/ Outreach	2000	C	Ongoing	$1,000
Issue 3: Public Access and Use					
Goal 1: Maintain safe and natural environment for BBSAP's wildlife, habitats, and user groups.					
Objective 1: Facilitate research to identify human use conflicts with natural resources.					
Strategy: Work with other agencies to identify and address uses in BBSAP that are not water-dependent, potentially illegal, or harmful to natural resources.	Resource Mgmt	2000	C	Ongoing	$1,000
Strategy: Partner with other entities to develop and distribute information identifying potential use conflicts and methods of prevention.	Education/ Outreach	2000	C	Ongoing	No additional costs
Objective 2: Reduce the amount of debris, contaminants, and other resource damages associated with user group activities.					
Strategy: Understand and address consumptive use impacts from fisheries and recreational fishing while recognizing their importance to local economies.	Ecosystem Science	2000	C	Ongoing	No additional costs
Strategy: Promote awareness and proper boating practices to reduce propeller scarring.	Education/ Outreach	2004	C	Ongoing	Costs included in other strategies
Strategy: Coordinate and participate in projects that remove or make use of debris in BBSAP.	Resource Mgmt	2000	C	Ongoing	$600
Strategy: Develop informational brochures to educate user groups of potential impacts associated with user activities.	Education/ Outreach	2013	F	Ongoing	$200

Goals, Objectives & Integrated Strategies	Management Program	Implementation Date (Planned)	Project Initiation	Length of Initiative	Estimated Yearly Cost
Goal 2: Promote low-impact, sustainable recreational opportunities.					
Objective 1: Increase awareness of non-consumptive use opportunities.					
Strategy: Identify appropriate locations for paddling launch sites and desirable destinations to access BBSAP.	Resource Mgmt	2000	C	Ongoing	No additional costs
Strategy: Work with other resource agencies and local vendors to educate users of unique recreational opportunities in BBSAP.	Education/ Outreach	2000	C	Ongoing	$500
Issue 4: Obstacles in Resource Management					
Goal 1: Document resources in BBSAP.					
Objective 1: Establish or continue to develop a baseline of the current location, composition, and abundance of various habitats and fauna.					
Strategy: Continue to develop partnerships to assist in managing resources in BBSAP.	Resource Mgmt	2000	C	Ongoing	No additional costs
Strategy: Continue partnerships with other natural resource agencies to reduce cost of including BBSAP in aerial photography efforts.	Education/ Outreach	2006	C	Ongoing	No additional costs
Objective 2: Develop and implement restoration goals for impacted areas or areas of concern.					
Strategy: Work with law enforcement to ensure implementation of the seagrass law prohibiting destruction of seagrasses.	Resource Mgmt	2010	C	Ongoing	No additional costs
Strategy: Coordinate with other resource agencies and law enforcement agencies to support efforts to address derelict and/or illegal fisheries gear and harvesting activities.	Resource Mgmt	2000	C	Ongoing	$500
Strategy: Partner with other agencies to develop habitat restoration projects involving the use of marine debris.	Ecosystem Science	2000	C	Ongoing	$1,000
Strategy: Partner with other agencies and enlist the public to assist in the removal of derelict fisheries gear.	Resource Mgmt	2000	C	Ongoing	$600
Goal 2: Educate the public about the importance of BBSAP's history, natural resources, and cultural resources.					
Objective 1: Partner with other agencies and/or non-governmental organizations to promote a greater understanding and interpretation of resources.					
Strategy: Develop and install kiosks or signage informing the public on how to avoid impacting seagrasses.	Education/ Outreach	2006	C	Ongoing	$1,200
Strategy: Repair, replace, or install up to date signage and kiosks regarding resources in BBSAP.	Education/ Outreach	2013	F	Ongoing	$1,000
Strategy: Develop informational brochure on BBSAP's current efforts on water quality, seagrass, and resource management programs.	Education/ Outreach	2013	F	Ongoing	$1,170
Objective 2: Partner with state, county, and municipal parks to incorporate information about BBSAP history and resources into guided tours, signage, staff training and promotional materials.					
Strategy: Provide interpretive training for tour guides on natural and cultural resources.	Education/ Outreach	2013	F	Ongoing	No additional costs
Strategy: Provide training for staff at local parks and other destinations.	Education/ Outreach	2013	F	Ongoing	No additional costs

*D.2 / **Budget Table***

The following table provides a cost estimate for conducting the priority 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 CAMA and other cooperating entities, and is based on actual costs for management activities, equipment purchases and maintenance, and for development of fixed capital facilities. The budget below exceeds the funds CAMA has been receiving through the state appropriations process, but is consistent with the direction necessary to achieve the goals and objectives identified in the Goals, Objectives and Strategies Table in Appendix D.1. Budget categories identified correlate with the CAMA Management Program Areas.

2013-2014 Cost Estimate			
Issue	**Strategy**	**Project Initiation**	**Estimated Yearly Cost**
Ecosystem Science			
Water Quality Monitoring	Continue datalogger program.	C	$30,780
Water Quality Monitoring	Continue Project COAST.	C	$4,680
Water Quality Monitoring	Expand datalogger program.	C	$23,320
Water Quality Monitoring	Identify point and nonpoint sources of pollutants and turbidity.	C	$1,000
Water Quality Monitoring	Continue to monitor the distribution and abundance of indicator species to determine health of the bay system.	C	Costs included in other strategies
Water Quality Monitoring	Determine biodiversity of BBSAP.	C	$1,200
Seagrass Monitoring	Develop and implement long-term seagrass monitoring plan.	C	$15,000
Seagrass Monitoring	Continue collaborating with other agencies on the Seagrass Integrated Mapping and Monitoring report.	C	$1,000
Seagrass Monitoring	Utilize GIS to identify areas of concern and determine restoration needs.	C	$2,000
Public Use	Understand and address consumptive use impacts from fisheries and recreational fishing while recognizing their importance to local economies.	C	No additional costs
Obstacles in Resource Management	Partner with other agencies to develop habitat restoration projects involving the use of marine debris.	C	$1,000
	Ecosystem Science Subtotal		**$79,980**
Resource Management			
Water Quality Monitoring	Support nutrient criteria development.	C	$12,500
Water Quality Monitoring	Support development of TMDLs.	C	Costs included in water quality monitoring
Water Quality Monitoring	Continue monitoring and maintaining Shellfish Harvesting Areas.	C	$1,000
Water Quality Monitoring	Work with other agencies to develop centralized water quality storage database.	D	Cost yet to be determined
Seagrass Monitoring	Use GIS to quantify gains or losses in seagrass communities.	C	$2,000
Seagrass Monitoring	Establish and maintain close communication with other agencies making resource management decisions regarding water quality and seagrass in BBSAP.	C	No additional costs
Seagrass Monitoring	Coordinate with adjacent resource managers to support clean-up efforts to address derelict vessels or illegal fisheries gear.	C	$1,000
Public Use	Work with other agencies to identify and address uses in BBSAP that are not water-dependent, potentially illegal, or harmful to natural resources.	C	$1,000
Public Use	Coordinate and participate in projects that remove or make use of debris in BBSAP.	C	$600
Project Initiation Legend: C = Currently Underway D = Under Initial Development F = Future Implementation			

2013-2014 Cost Estimate			
Issue	**Strategy**	**Project Initiation**	**Estimated Yearly Cost**
Public Use	Identify locations for paddling launch sites and desirable destinations to access BBSAP.	C	No additional costs
Obstacles in Resource Management	Continue to develop partnerships to assist in managing resources in BBSAP.	C	No additional costs
Obstacles in Resource Management	Work with law enforcement to ensure implementation of the seagrass law prohibiting destruction of seagrasses.	C	No additional costs
Obstacles in Resource Management	Partner with other agencies and enlist the public to assist in the removal of derelict fisheries gear.	C	$600
Obstacles in Resource Management	Coordinate with other resource agencies and law enforcement agencies to support efforts to address derelict and/or illegal fisheries gear and harvesting activities.	C	$500
	Resource Management Subtotal		**$19,200**
Education & Outreach			
Water Quality Monitoring	Utilize educational signage at strategic access points to educate the public about conserving natural resources.	D	Costs included in other strategies
Water Quality Monitoring	Coordinate and participate in public lectures to address water quality issues and ways to improve water quality.	C	$1,000
Water Quality Monitoring	Provide/create opportunities for the public to assist in monitoring efforts and outreach events.	C	No additional costs
Seagrass Monitoring	Update current BBSAP brochures.	D	$200
Seagrass Monitoring	Repair, replace, install educational signage pertaining to resource protection.	D	Variable
Seagrass Monitoring	Continue to participate in educational outreach programs throughout BBSAP.	C	$1,000
Public Use	Partner with others to develop and distribute information identifying potential use conflicts and methods of prevention.	C	No additional costs
Public Use	Promote awareness and proper boating practices to reduce propeller scarring.	C	Costs included in other strategies
Public Use	Develop informational brochures to educate user groups of potential impacts associated with user activities.	D	$200
Public Use	Work with other resource agencies and local vendors to educate users of unique recreational opportunities in BBSAP.	C	$500
Obstacles in Resource Management	Continue partnerships with other natural resource agencies to reduce cost of including BBSAP in aerial photography efforts.	C	No additional costs
Obstacles in Resource Management	Develop and install kiosks or signage informing the public on how to avoid impacting seagrasses.	C	$1,200
Obstacles in Resource Management	Repair, replace, or install up to date signage and kiosks regarding resources in BBSAP.	F	$1,000
Obstacles in Resource Management	Develop informational brochure on BBSAP's current efforts on water quality, seagrass, and resource management programs.	F	$1,170
Obstacles in Resource Management	Provide interpretive training for tour guides on natural and cultural resources.	F	No additional costs
Obstacles in Resource Management	Provide training for staff at local parks and other destinations.	F	No additional costs
	Education & Outreach Subtotal		**$6,270**
	2013-2014 Total		**$105,450**

Project Initiation Legend: C = Currently Underway D = Under Initial Development F = Future Implementation

2014-2015 Cost Estimate			
Issue	**Strategy**	**Project Initiation**	**Estimated Yearly Cost**
Ecosystem Science			
Water Quality Monitoring	Continue datalogger program.	C	$30,780
Water Quality Monitoring	Continue Project COAST.	C	$4,680
Water Quality Monitoring	Expand datalogger program.	C	$23,320
Water Quality Monitoring	Identify point and nonpoint sources of pollutants and turbidity.	C	$1,000
Water Quality Monitoring	Continue to monitor the distribution and abundance of indicator species to determine health of the bay system.	C	Costs included in other strategies
Water Quality Monitoring	Determine biodiversity of BBSAP.	C	$1,200
Seagrass Monitoring	Develop and implement long-term seagrass monitoring plan.	C	$18,000
Seagrass Monitoring	Continue collaborating with other agencies on the Seagrass Integrated Mapping and Monitoring report.	C	$1,000
Seagrass Monitoring	Utilize GIS to identify areas of concern and determine restoration needs.	C	$2,000
Public Use	Understand and address consumptive use impacts from fisheries and recreational fishing while recognizing their importance to local economies.	C	No additional costs
Obstacles in Resource Management	Partner with other agencies to develop habitat restoration projects involving the use of marine debris.	C	$1,000
	Ecosystem Science Subtotal		**$82,980**
Resource Management			
Water Quality Monitoring	Support nutrient criteria development.	C	$12,500
Water Quality Monitoring	Support development of TMDLs.	C	Costs included in water quality monitoring
Water Quality Monitoring	Continue monitoring and maintaining Shellfish Harvesting Areas.	C	$1,000
Water Quality Monitoring	Work with other agencies to develop centralized water quality storage database.	D	Cost yet to be determined
Seagrass Monitoring	Use GIS to quantify gains or losses in seagrass communities.	C	$2,000
Seagrass Monitoring	Establish and maintain close communication with other agencies making resource management decisions regarding water quality and seagrass in BBSAP.	C	No additional costs
Seagrass Monitoring	Coordinate with adjacent resource managers to support clean-up efforts to address derelict vessels or illegal fisheries gear.	C	$1,000
Public Use	Work with other agencies to identify and address uses in BBSAP that are not water-dependent, potentially illegal, or harmful to natural resources.	C	$1,000
Public Use	Coordinate and participate in projects that remove or make use of debris in BBSAP.	C	$600
Public Use	Identify locations for paddling launch sites and desirable destinations to access BBSAP.	C	No additional costs
Obstacles in Resource Management	Continue to develop partnerships to assist in managing resources in BBSAP.	C	No additional costs

Project Initiation Legend: C = Currently Underway D = Under Initial Development F = Future Implementation

2014-2015 Cost Estimate			
Issue	**Strategy**	**Project Initiation**	**Estimated Yearly Cost**
Obstacles in Resource Management	Work with law enforcement to ensure implementation of the seagrass law prohibiting destruction of seagrasses.	C	No additional costs
Obstacles in Resource Management	Partner with other agencies and enlist the public to assist in the removal of derelict fisheries gear.	C	$600
Obstacles in Resource Management	Coordinate with other resource agencies and law enforcement agencies to support efforts to address derelict and/or illegal fisheries gear and harvesting activities.	C	$500
	Resource Management Subtotal		**$19,200**
Education & Outreach			
Water Quality Monitoring	Utilize educational signage at strategic access points to educate the public about conserving natural resources.	D	Costs included in other strategies
Water Quality Monitoring	Coordinate and participate in public lectures to address water quality issues and ways to improve water quality.	C	$1,000
Water Quality Monitoring	Provide/create opportunities for the public to assist in monitoring efforts and outreach events.	C	No additional costs
Seagrass Monitoring	Update current BBSAP brochures.	D	$200
Seagrass Monitoring	Repair, replace, install educational signage pertaining to resource protection.	D	Variable
Seagrass Monitoring	Continue to participate in educational outreach programs throughout BBSAP.	C	$1,000
Public Use	Partner with other to develop and distribute information identifying potential use conflicts and methods of prevention.	C	No additional costs
Public Use	Promote awareness and proper boating practices to reduce propeller scarring.	C	Costs included in other strategies
Public Use	Develop informational brochures to educate user groups of potential impacts associated with user activities.	D	$200
Public Use	Work with other resource agencies and local vendors to educate users of unique recreational opportunities in BBSAP.	C	$500
Obstacles in Resource Management	Continue partnerships with other natural resource agencies to reduce cost of including BBSAP in aerial photography efforts.	C	No additional costs
Obstacles in Resource Management	Develop and install kiosks or signage informing the public on how to avoid impacting seagrasses.	C	$1,200
Obstacles in Resource Management	Repair, replace, or install up to date signage and kiosks regarding resources in BBSAP.	F	$1,000
Obstacles in Resource Management	Develop informational brochure on BBSAP's current efforts on water quality, seagrass, and resource management programs.	F	$1,170
Obstacles in Resource Management	Provide interpretive training for tour guides on natural and cultural resources.	F	No additional costs
Obstacles in Resource Management	Provide training for staff at local parks and other destinations.	F	No additional costs
	Education & Outreach Subtotal		**$6,270**
	2014-2015 Total		**$108,450**

Project Initiation Legend: C = Currently Underway D = Under Initial Development F = Future Implementation

2015-2016 Cost Estimate			
Issue	**Strategy**	**Project Initiation**	**Estimated Yearly Cost**
Ecosystem Science			
Water Quality Monitoring	Continue datalogger program.	C	$30,780
Water Quality Monitoring	Continue Project COAST.	C	$4,680
Water Quality Monitoring	Expand datalogger program.	C	$3,847
Water Quality Monitoring	Identify point and nonpoint sources of pollutants and turbidity.	C	$1,000
Water Quality Monitoring	Continue to monitor the distribution and abundance of indicator species to determine health of the bay system.	C	Costs included in other strategies
Water Quality Monitoring	Determine biodiversity of BBSAP.	C	$1,200
Seagrass Monitoring	Develop and implement long-term seagrass monitoring plan.	C	$15,000
Seagrass Monitoring	Continue collaborating with other agencies on the Seagrass Integrated Mapping and Monitoring report.	C	$1,000
Seagrass Monitoring	Utilize GIS to identify areas of concern and determine restoration needs.	C	$2,000
Public Use	Understand and address consumptive use impacts from fisheries and recreational fishing while recognizing their importance to local economies.	C	No additional costs
Obstacles in Resource Management	Partner with other agencies to develop habitat restoration projects involving the use of marine debris.	C	$1,000
	Ecosystem Science Subtotal		**$60,507**
Resource Management			
Water Quality Monitoring	Support nutrient criteria development.	C	$12,500
Water Quality Monitoring	Support development of TMDLs.	C	Costs included in water quality monitoring
Water Quality Monitoring	continue monitoring and maintaining Shellfish Harvesting Areas.	C	$1,000
Water Quality Monitoring	Work with other agencies to develop centralized water quality storage database.	D	Cost yet to be determined
Seagrass Monitoring	Use GIS to quantify gains or losses in seagrass communities.	C	$2,000
Seagrass Monitoring	Establish and maintain close communication with other agencies making resource management decisions regarding water quality and seagrass in BBSAP.	C	No additional costs
Seagrass Monitoring	Coordinate with adjacent resource managers to support clean-up efforts to address derelict vessels or illegal fisheries gear.	C	$1,000
Public Use	Work with other agencies to identify and address uses in BBSAP that are not water-dependent, potentially illegal, or harmful to natural resources.	C	$1,000
Public Use	Coordinate and participate in projects that remove or make use of debris in BBSAP.	C	$600
Public Use	Identify locations for paddling launch sites and desirable destinations to access BBSAP.	C	No additional costs
Obstacles in Resource Management	Continue to develop partnerships to assist in managing resources in BBSAP.	C	No additional costs

Project Initiation Legend: C = Currently Underway D = Under Initial Development F = Future Implementation

2015-2016 Cost Estimate			
Issue	**Strategy**	**Project Initiation**	**Estimated Yearly Cost**
Obstacles in Resource Management	Work with law enforcement to ensure implementation of the seagrass law prohibiting destruction of seagrasses.	C	No additional costs
Obstacles in Resource Management	Partner with other agencies and enlist the public to assist in the removal of derelict fisheries gear.	C	$600
Obstacles in Resource Management	Coordinate with other resource agencies and law enforcement agencies to support efforts to address derelict and/or illegal fisheries gear and harvesting activities.	C	$500
	Resource Management Subtotal		**$19,200**
Education & Outreach			
Water Quality Monitoring	Utilize educational signage at strategic access points to educate the public about conserving natural resources.	D	Costs included in other strategies
Water Quality Monitoring	Coordinate and participate in public lectures to address water quality issues and ways to improve water quality.	C	$1,000
Water Quality Monitoring	Provide/create opportunities for the public to assist in monitoring efforts and outreach events.	C	No additional costs
Seagrass Monitoring	Update current BBSAP brochures.	D	$200
Seagrass Monitoring	Repair, replace, install educational signage pertaining to resource protection.	D	Variable
Seagrass Monitoring	Continue to participate in educational outreach programs throughout BBSAP.	C	$1,000
Public Use	Partner with other to develop and distribute information identifying potential use conflicts and methods of prevention.	C	No additional costs
Public Use	Promote awareness and proper boating practices to reduce propeller scarring.	C	Costs included in other strategies
Public Use	Develop informational brochures to educate user groups of potential impacts associated with user activities.	D	$200
Public Use	Work with other resource agencies and local vendors to educate users of unique recreational opportunities in BBSAP.	C	$500
Obstacles in Resource Management	Continue partnerships with other natural resource agencies to reduce cost of including BBSAP in aerial photography efforts.	C	No additional costs
Obstacles in Resource Management	Develop and install kiosks or signage informing the public on how to avoid impacting seagrasses.	C	$1,200
Obstacles in Resource Management	Repair, replace, or install up to date signage and kiosks regarding resources in BBSAP.	F	$1,000
Obstacles in Resource Management	Develop informational brochure on BBSAP's current efforts on water quality, seagrass, and resource management programs.	F	$1,170
Obstacles in Resource Management	Provide interpretive training for tour guides on natural and cultural resources.	F	No additional costs
Obstacles in Resource Management	Provide training for staff at local parks and other destinations.	F	No additional costs
	Education & Outreach Subtotal		**$6,270**
	2015-2016 Total		**$85,977**

Project Initiation Legend: C = Currently Underway D = Under Initial Development F = Future Implementation

2016-2017 Cost Estimate			
Issue	**Strategy**	**Project Initiation**	**Estimated Yearly Cost**
Ecosystem Science			
Water Quality Monitoring	Continue datalogger program.	C	$30,780
Water Quality Monitoring	Continue Project COAST.	C	$4,680
Water Quality Monitoring	Expand datalogger program.	C	$3,847
Water Quality Monitoring	Identify point and nonpoint sources of pollutants and turbidity.	C	$1,000
Water Quality Monitoring	Continue to monitor the distribution and abundance of indicator species to determine health of the bay system.	C	Costs included in other strategies
Water Quality Monitoring	Determine biodiversity of BBSAP.	C	$1,200
Seagrass Monitoring	Develop and implement long-term seagrass monitoring plan.	C	$18,000
Seagrass Monitoring	Continue collaborating with other agencies on the Seagrass Integrated Mapping and Monitoring report.	C	$1,000
Seagrass Monitoring	Utilize GIS to identify areas of concern and determine restoration needs.	C	$2,000
Public Use	Understand and address consumptive use impacts from fisheries and recreational fishing while recognizing their importance to local economies.	C	No additional costs
Obstacles in Resource Management	Partner with other agencies to develop habitat restoration projects involving the use of marine debris.	C	$1,000
	Ecosystem Science Subtotal		**$63,507**
Resource Management			
Water Quality Monitoring	Support nutrient criteria development.	C	$12,500
Water Quality Monitoring	Support development of TMDLs.	C	Costs included in water quality monitoring
Water Quality Monitoring	Continue monitoring and maintaining Shellfish Harvesting Areas.	C	$1,000
Water Quality Monitoring	Work with other agencies to develop centralized water quality storage database.	D	Cost yet to be determined
Seagrass Monitoring	Use GIS to quantify gains or losses in seagrass communities.	C	$2,000
Seagrass Monitoring	Establish and maintain close communication with other agencies making resource management decisions regarding water quality and seagrass in BBSAP.	C	No additional costs
Seagrass Monitoring	Coordinate with adjacent resource managers to support clean-up efforts to address derelict vessels or illegal fisheries gear.	C	$1,000
Public Use	Work with other agencies to identify and address uses in BBSAP that are not water-dependent, potentially illegal, or harmful to natural resources.	C	$1,000
Public Use	Coordinate and participate in projects that remove or make use of debris in BBSAP.	C	$600
Public Use	Identify locations for paddling launch sites and desirable destinations to access BBSAP.	C	No additional costs
Obstacles in Resource Management	Continue to develop partnerships to assist in managing resources in BBSAP.	C	No additional costs
Project Initiation Legend: C = Currently Underway D = Under Initial Development F = Future Implementation			

2016-2017 Cost Estimate			
Issue	**Strategy**	**Project Initiation**	**Estimated Yearly Cost**
Obstacles in Resource Management	Work with law enforcement to ensure implementation of the seagrass law prohibiting destruction of seagrasses.	C	No additional costs
Obstacles in Resource Management	Partner with other agencies and enlist the public to assist in the removal of derelict fisheries gear.	C	$600
Obstacles in Resource Management	Coordinate with other resource agencies and law enforcement agencies to support efforts to address derelict and/or illegal fisheries gear and harvesting activities.	C	$500
	Resource Management Subtotal		**$19,200**
Education & Outreach			
Water Quality Monitoring	Utilize educational signage at strategic access points to educate the public about conserving natural resources.	D	Costs included in other strategies
Water Quality Monitoring	Coordinate and participate in public lectures to address water quality issues and ways to improve water quality.	C	$1,000
Water Quality Monitoring	Provide/create opportunities for the public to assist in monitoring efforts and outreach events.	C	No additional costs
Seagrass Monitoring	Update current BBSAP brochures.	D	$200
Seagrass Monitoring	Repair, replace, install educational signage pertaining to resource protection.	D	Variable
Seagrass Monitoring	Continue to participate in educational outreach programs throughout BBSAP.	C	$1,000
Public Use	Partner with others to develop and distribute information identifying potential use conflicts and methods of prevention.	C	No additional costs
Public Use	Promote awareness and proper boating practices to reduce propeller scarring.	C	Costs included in other strategies
Public Use	Develop informational brochures to educate user groups of potential impacts associated with user activities.	D	$200
Public Use	Work with other resource agencies and local vendors to educate users of unique recreational opportunities in BBSAP.	C	$500
Obstacles in Resource Management	Continue partnerships with other natural resource agencies to reduce cost of including BBSAP in aerial photography efforts.	C	No additional costs
Obstacles in Resource Management	Develop and install kiosks or signage informing the public on how to avoid impacting seagrasses.	C	$1,200
Obstacles in Resource Management	Repair, replace, or install up to date signage and kiosks regarding resources in BBSAP.	F	$1,000
Obstacles in Resource Management	Develop informational brochure on BBSAP's current efforts on water quality, seagrass, and resource management programs.	F	$1,170
Obstacles in Resource Management	Provide interpretive training for tour guides on natural and cultural resources.	F	No additional costs
Obstacles in Resource Management	Provide training for staff at local parks and other destinations.	F	No additional costs
	Education & Outreach Subtotal		**$6,270**
	2016-2017 Total		**$88,977**

Project Initiation Legend: C = Currently Underway D = Under Initial Development F = Future Implementation

2017-2018 Cost Estimate			
Issue	**Strategy**	**Project Initiation**	**Estimated Yearly Cost**
Ecosystem Science			
Water Quality Monitoring	Continue datalogger program.	C	$30,780
Water Quality Monitoring	Continue Project COAST.	C	$4,680
Water Quality Monitoring	Expand datalogger program.	C	$3,847
Water Quality Monitoring	Identify point and nonpoint sources of pollutants and turbidity.	C	$1,000
Water Quality Monitoring	Continue to monitor the distribution and abundance of indicator species to determine health of the bay system.	C	Costs included in other strategies
Water Quality Monitoring	Determine biodiversity of BBSAP.	C	$1,200
Seagrass Monitoring	Develop and implement long-term seagrass monitoring plan.	C	$18,000
Seagrass Monitoring	Continue collaborating with other agencies on the Seagrass Integrated Mapping and Monitoring report.	C	$1,000
Seagrass Monitoring	Utilize GIS to identify areas of concern and determine restoration needs.	C	$2,000
Public Use	Understand and address consumptive use impacts from fisheries and recreational fishing while recognizing their importance to local economies.	C	No additional costs
Obstacles in Resource Management	Partner with other agencies to develop habitat restoration projects involving the use of marine debris.	C	$1,000
	Ecosystem Science Subtotal		**$63,507**
Resource Management			
Water Quality Monitoring	Support nutrient criteria development.	C	$12,500
Water Quality Monitoring	Support development of TMDLs.	C	Costs included in water quality monitoring
Water Quality Monitoring	Continue monitoring and maintaining Shellfish Harvesting Areas.	C	$1,000
Water Quality Monitoring	Work with other agencies to develop centralized water quality storage database.	D	Cost yet to be determined
Seagrass Monitoring	Use GIS to quantify gains or losses in seagrass communities.	C	$2,000
Seagrass Monitoring	Establish and maintain close communication with other agencies making resource management decisions regarding water quality and seagrass in BBSAP.	C	No additional costs
Seagrass Monitoring	Coordinate with adjacent resource managers to support clean-up efforts to address derelict vessels or illegal fisheries gear.	C	$1,000
Public Use	Work with other agencies to identify and address uses in BBSAP that are not water-dependent, potentially illegal, or harmful to natural resources.	C	$1,000
Public Use	Coordinate and participate in projects that remove or make use of debris in BBSAP.	C	$600
Public Use	Identify locations for paddling launch sites and desirable destinations to access BBSAP.	C	No additional costs
Obstacles in Resource Management	Continue to develop partnerships to assist in managing resources in BBSAP.	C	No additional costs
Project Initiation Legend: C = Currently Underway D = Under Initial Development F = Future Implementation			

2017-2018 Cost Estimate			
Issue	**Strategy**	**Project Initiation**	**Estimated Yearly Cost**
Obstacles in Resource Management	Work with law enforcement to ensure implementation of the seagrass law prohibiting destruction of seagrasses.	C	No additional costs
Obstacles in Resource Management	Partner with other agencies and enlist the public to assist in the removal of derelict fisheries gear.	C	$600
Obstacles in Resource Management	Coordinate with other resource agencies and law enforcement agencies to support efforts to address derelict and/or illegal fisheries gear and harvesting activities.	C	$500
	Resource Management Subtotal		**$19,200**
Education & Outreach			
Water Quality Monitoring	Utilize educational signage at strategic access points to educate the public about conserving natural resources.	D	Costs included in other strategies
Water Quality Monitoring	Coordinate and participate in public lectures to address water quality issues and ways to improve water quality.	C	$1,000
Water Quality Monitoring	Provide/create opportunities for the public to assist in monitoring efforts and outreach events.	C	No additional costs
Seagrass Monitoring	Update current BBSAP brochures.	D	$200
Seagrass Monitoring	Repair, replace, install educational signage pertaining to resource protection.	D	Variable
Seagrass Monitoring	Continue to participate in educational outreach programs throughout BBSAP.	C	$1,000
Public Use	Partner with others to develop and distribute information identifying potential use conflicts and methods of prevention.	C	No additional costs
Public Use	Promote awareness and proper boating practices to reduce propeller scarring.	C	Costs included in other strategies
Public Use	Develop informational brochures to educate user groups of potential impacts associated with user activities.	D	$200
Public Use	Work with other resource agencies and local vendors to educate users of unique recreational opportunities in BBSAP.	C	$500
Obstacles in Resource Management	Continue partnerships with other natural resource agencies to reduce cost of including BBSAP in aerial photography efforts.	C	No additional costs
Obstacles in Resource Management	Develop and install kiosks or signage informing the public on how to avoid impacting seagrasses.	C	$1,200
Obstacles in Resource Management	Repair, replace, or install up to date signage and kiosks regarding resources in BBSAP.	F	$1,000
Obstacles in Resource Management	Develop informational brochure on BBSAP's current efforts on water quality, seagrass, and resource management programs.	F	$1,170
Obstacles in Resource Management	Provide interpretive training for tour guides on natural and cultural resources.	F	No additional costs
Obstacles in Resource Management	Provide training for staff at local parks and other destinations.	F	No additional costs
	Education & Outreach Subtotal		**$6,270**
	2017-2018 Total		**$88,977**

Project Initiation Legend: C = Currently Underway D = Under Initial Development F = Future Implementation

2018-2019 Cost Estimate			
Issue	**Strategy**	**Project Initiation**	**Estimated Yearly Cost**
Ecosystem Science			
Water Quality Monitoring	Continue datalogger program.	C	$35,780
Water Quality Monitoring	Continue Project COAST.	C	$4,680
Water Quality Monitoring	Expand datalogger program.	C	$3,847
Water Quality Monitoring	Identify point and nonpoint sources of pollutants and turbidity.	C	$1,000
Water Quality Monitoring	Continue to monitor the distribution and abundance of indicator species to determine health of the bay system.	C	Costs included in other strategies
Water Quality Monitoring	Determine biodiversity of BBSAP.	C	$1,200
Seagrass Monitoring	Develop and implement long-term seagrass monitoring plan.	C	$18,000
Seagrass Monitoring	Continue collaborating with other agencies on the Seagrass Integrated Mapping and Monitoring report.	C	$1,000
Seagrass Monitoring	Utilize GIS to identify areas of concern and determine restoration needs.	C	$2,000
Public Use	Understand and address consumptive use impacts from fisheries and recreational fishing while recognizing their importance to local economies.	C	No additional costs
Obstacles in Resource Management	Partner with other agencies to develop habitat restoration projects involving the use of marine debris.	C	$1,000
	Ecosystem Science Subtotal		**$68,507**
Resource Management			
Water Quality Monitoring	Support nutrient criteria development.	C	$12,500
Water Quality Monitoring	Support development of TMDLs.	C	Costs included in water quality monitoring
Water Quality Monitoring	Continue monitoring and maintaining Shellfish Harvesting Areas.	C	$1,000
Water Quality Monitoring	Work with other agencies to develop centralized water quality storage database.	D	Cost yet to be determined
Seagrass Monitoring	Use GIS to quantify gains or losses in seagrass communities.	C	$2,000
Seagrass Monitoring	Establish and maintain close communication with other agencies making resource management decisions regarding water quality and seagrass in BBSAP.	C	No additional costs
Seagrass Monitoring	Coordinate with adjacent resource managers to support clean-up efforts to address derelict vessels or illegal fisheries gear.	C	$1,000
Public Use	Work with other agencies to identify and address uses in BBSAP that are not water-dependent, potentially illegal, or harmful to natural resources.	C	$1,000
Public Use	Coordinate and participate in projects that remove or make use of debris in BBSAP.	C	$600
Public Use	Identify locations for paddling launch sites and desirable destinations to access BBSAP.	C	No additional costs
Obstacles in Resource Management	Continue to develop partnerships to assist in managing resources in BBSAP.	C	No additional costs
Project Initiation Legend: C = Currently Underway D = Under Initial Development F = Future Implementation			

2018-2019 Cost Estimate			
Issue	**Strategy**	**Project Initiation**	**Estimated Yearly Cost**
Obstacles in Resource Management	Work with law enforcement to ensure implementation of the seagrass law prohibiting destruction of seagrasses.	C	No additional costs
Obstacles in Resource Management	Partner with other agencies and enlist the public to assist in the removal of derelict fisheries gear.	C	$600
Obstacles in Resource Management	Coordinate with other resource agencies and law enforcement agencies to support efforts to address derelict and/or illegal fisheries gear and harvesting activities.	C	$500
	Resource Management Subtotal		**$19,200**
Education & Outreach			
Water Quality Monitoring	Utilize educational signage at strategic access points to educate the public about conserving natural resources.	D	Costs included in other strategies
Water Quality Monitoring	Coordinate and participate in public lectures to address water quality issues and ways to improve water quality.	C	$1,000
Water Quality Monitoring	Provide/create opportunities for the public to assist in monitoring efforts and outreach events.	C	No additional costs
Seagrass Monitoring	Update current BBSAP brochures.	D	$200
Seagrass Monitoring	Repair, replace, install educational signage pertaining to resource protection.	D	Variable
Seagrass Monitoring	Continue to participate in educational outreach programs throughout BBSAP.	C	$1,000
Public Use	Partner with others to develop and distribute information identifying potential use conflicts and methods of prevention.	C	No additional costs
Public Use	Promote awareness and proper boating practices to reduce propeller scarring.	C	Costs included in other strategies
Public Use	Develop informational brochures to educate user groups of potential impacts associated with user activities.	D	$200
Public Use	Work with other resource agencies and local vendors to educate users of unique recreational opportunities in BBSAP.	C	$500
Obstacles in Resource Management	Continue partnerships with other natural resource agencies to reduce cost of including BBSAP in aerial photography efforts.	C	No additional costs
Obstacles in Resource Management	Develop and install kiosks or signage informing the public on how to avoid impacting seagrasses.	C	$1,200
Obstacles in Resource Management	Repair, replace, or install up to date signage and kiosks regarding resources in BBSAP.	F	$1,000
Obstacles in Resource Management	Develop informational brochure on BBSAP's current efforts on water quality, seagrass, and resource management programs.	F	$1,170
Obstacles in Resource Management	Provide interpretive training for tour guides on natural and cultural resources.	F	No additional costs
Obstacles in Resource Management	Provide training for staff at local parks and other destinations.	F	No additional costs
	Education & Outreach Subtotal		**$6,270**
	2018-2019 Total		**$93,977**

Project Initiation Legend: C = Currently Underway D = Under Initial Development F = Future Implementation

2019-2020 Cost Estimate			
Issue	**Strategy**	**Project Initiation**	**Estimated Yearly Cost**
Ecosystem Science			
Water Quality Monitoring	Continue datalogger program.	C	$30,780
Water Quality Monitoring	Continue Project COAST.	C	$4,680
Water Quality Monitoring	Expand datalogger program.	C	$3,847
Water Quality Monitoring	Identify point and nonpoint sources of pollutants and turbidity.	C	$1,000
Water Quality Monitoring	Continue to monitor the distribution and abundance of indicator species to determine health of the bay system.	C	Costs included in other strategies
Water Quality Monitoring	Determine biodiversity of BBSAP.	C	$1,200
Seagrass Monitoring	Develop and implement long-term seagrass monitoring plan.	C	$18,000
Seagrass Monitoring	Continue collaborating with other agencies on the Seagrass Integrated Mapping and Monitoring report.	C	$1,000
Seagrass Monitoring	Utilize GIS to identify areas of concern and determine restoration needs.	C	$2,000
Public Use	Understand and address consumptive use impacts from fisheries and recreational fishing while recognizing their importance to local economies.	C	No additional costs
Obstacles in Resource Management	Partner with other agencies to develop habitat restoration projects involving the use of marine debris.	C	$1,000
	Ecosystem Science Subtotal		**$63,507**
Resource Management			
Water Quality Monitoring	Support nutrient criteria development.	C	$12,500
Water Quality Monitoring	Support development of TMDLs.	C	Costs included in water quality monitoring
Water Quality Monitoring	continue monitoring and maintaining Shellfish Harvesting Areas.	C	$1,000
Water Quality Monitoring	Work with other agencies to develop centralized water quality storage database.	D	Cost yet to be determined
Seagrass Monitoring	Use GIS to quantify gains or losses in seagrass communities.	C	$2,000
Seagrass Monitoring	Establish and maintain close communication with other agencies making resource management decisions regarding water quality and seagrass in BBSAP.	C	No additional costs
Seagrass Monitoring	Coordinate with adjacent resource managers to support clean-up efforts to address derelict vessels or illegal fisheries gear.	C	$1,000
Public Use	Work with other agencies to identify and address uses in BBSAP that are not water-dependent, potentially illegal, or harmful to natural resources.	C	$1,000
Public Use	Coordinate and participate in projects that remove or make use of debris in BBSAP.	C	$600
Public Use	Identify locations for paddling launch sites and desirable destinations to access BBSAP.	C	No additional costs
Obstacles in Resource Management	Continue to develop partnerships to assist in managing resources in BBSAP.	C	No additional costs
Project Initiation Legend: C = Currently Underway D = Under Initial Development F = Future Implementation			

2019-2020 Cost Estimate			
Issue	**Strategy**	**Project Initiation**	**Estimated Yearly Cost**
Obstacles in Resource Management	Work with law enforcement to ensure implementation of the seagrass law prohibiting destruction of seagrasses.	C	No additional costs
Obstacles in Resource Management	Partner with other agencies and enlist the public to assist in the removal of derelict fisheries gear.	C	$600
Obstacles in Resource Management	Coordinate with other resource agencies and law enforcement agencies to support efforts to address derelict and/or illegal fisheries gear and harvesting activities.	C	$500
	Resource Management Subtotal		**$19,200**
Education & Outreach			
Water Quality Monitoring	Utilize educational signage at strategic access points to educate the public about conserving natural resources.	D	Costs included in other strategies
Water Quality Monitoring	Coordinate and participate in public lectures to address water quality issues and ways to improve water quality.	C	$1,000
Water Quality Monitoring	Provide/create opportunities for the public to assist in monitoring efforts and outreach events.	C	No additional costs
Seagrass Monitoring	Update current BBSAP brochures.	D	$200
Seagrass Monitoring	Repair, replace, install educational signage pertaining to resource protection.	D	Variable
Seagrass Monitoring	Continue to participate in educational outreach programs throughout BBSAP.	C	$1,000
Public Use	Partner with others to develop and distribute information identifying potential use conflicts and methods of prevention.	C	No additional costs
Public Use	Promote awareness and proper boating practices to reduce propeller scarring.	C	Costs included in other strategies
Public Use	Develop informational brochures to educate user groups of potential impacts associated with user activities.	D	$200
Public Use	Work with other resource agencies and local vendors to educate users of unique recreational opportunities in BBSAP.	C	$500
Obstacles in Resource Management	Continue partnerships with other natural resource agencies to reduce cost of including BBSAP in aerial photography efforts.	C	No additional costs
Obstacles in Resource Management	Develop and install kiosks or signage informing the public on how to avoid impacting seagrasses.	C	$1,200
Obstacles in Resource Management	Repair, replace, or install up to date signage and kiosks regarding resources in BBSAP.	F	$1,000
Obstacles in Resource Management	Develop informational brochure on BBSAP's current efforts on water quality, seagrass, and resource management programs.	F	$1,170
Obstacles in Resource Management	Provide interpretive training for tour guides on natural and cultural resources.	F	No additional costs
Obstacles in Resource Management	Provide training for staff at local parks and other destinations.	F	No additional costs
	Education & Outreach Subtotal		**$6,270**
	2019-2020 Total		**$88,977**

Project Initiation Legend: C = Currently Underway D = Under Initial Development F = Future Implementation

2020-2021 Cost Estimate			
Issue	**Strategy**	**Project Initiation**	**Estimated Yearly Cost**
Ecosystem Science			
Water Quality Monitoring	Continue datalogger program.	C	$30,780
Water Quality Monitoring	Continue Project COAST.	C	$4,680
Water Quality Monitoring	Expand datalogger program.	C	$3,847
Water Quality Monitoring	Identify point and nonpoint sources of pollutants and turbidity.	C	$1,000
Water Quality Monitoring	Continue to monitor the distribution and abundance of indicator species to determine health of the bay system.	C	Costs included in other strategies
Water Quality Monitoring	Determine biodiversity of BBSAP.	C	$1,200
Seagrass Monitoring	Develop and implement long-term seagrass monitoring plan.	C	$18,000
Seagrass Monitoring	Continue collaborating with other agencies on the Seagrass Integrated Mapping and Monitoring report.	C	$1,000
Seagrass Monitoring	Utilize GIS to identify areas of concern and determine restoration needs.	C	$2,000
Public Use	Understand and address consumptive use impacts from fisheries and recreational fishing while recognizing their importance to local economies.	C	No additional costs
Obstacles in Resource Management	Partner with other agencies to develop habitat restoration projects involving the use of marine debris.	C	$1,000
	Ecosystem Science Subtotal		**$63,507**
Resource Management			
Water Quality Monitoring	Support nutrient criteria development.	C	$12,500
Water Quality Monitoring	Support development of TMDLs.	C	Costs included in water quality monitoring
Water Quality Monitoring	Continue monitoring and maintaining Shellfish Harvesting Areas.	C	$1,000
Water Quality Monitoring	Work with other agencies to develop centralized water quality storage database.	D	Cost yet to be determined
Seagrass Monitoring	Use GIS to quantify gains or losses in seagrass communities.	C	$2,000
Seagrass Monitoring	Establish and maintain close communication with other agencies making resource management decisions regarding water quality and seagrass in BBSAP.	C	No additional costs
Seagrass Monitoring	Coordinate with adjacent resource managers to support clean-up efforts to address derelict vessels or illegal fisheries gear.	C	$1,000
Public Use	Work with other agencies to identify and address uses in BBSAP that are not water-dependent, potentially illegal, or harmful to natural resources.	C	$1,000
Public Use	Coordinate and participate in projects that remove or make use of debris in BBSAP.	C	$600
Public Use	Identify locations for paddling launch sites and desirable destinations to access BBSAP.	C	No additional costs
Obstacles in Resource Management	Continue to develop partnerships to assist in managing resources in BBSAP.	C	No additional costs
Project Initiation Legend: C = Currently Underway D = Under Initial Development F = Future Implementation			

2020-2021 Cost Estimate			
Issue	**Strategy**	**Project Initiation**	**Estimated Yearly Cost**
Obstacles in Resource Management	Work with law enforcement to ensure implementation of the seagrass law prohibiting destruction of seagrasses.	C	No additional costs
Obstacles in Resource Management	Partner with other agencies and enlist the public to assist in the removal of derelict fisheries gear.	C	$600
Obstacles in Resource Management	Coordinate with other resource agencies and law enforcement agencies to support efforts to address derelict and/or illegal fisheries gear and harvesting activities.	C	$500
	Resource Management Subtotal		**$19,200**
Education & Outreach			
Water Quality Monitoring	Utilize educational signage at strategic access points to educate the public about conserving natural resources.	D	Costs included in other strategies
Water Quality Monitoring	Coordinate and participate in public lectures to address water quality issues and ways to improve water quality.	C	$1,000
Water Quality Monitoring	Provide/create opportunities for the public to assist in monitoring efforts and outreach events.	C	No additional costs
Seagrass Monitoring	Update current BBSAP brochures.	D	$200
Seagrass Monitoring	Repair, replace, install educational signage pertaining to resource protection.	D	Variable
Seagrass Monitoring	Continue to participate in educational outreach programs throughout BBSAP.	C	$1,000
Public Use	Partner with others to develop and distribute information identifying potential use conflicts and methods of prevention.	C	No additional costs
Public Use	Promote awareness and proper boating practices to reduce propeller scarring.	C	Costs included in other strategies
Public Use	Develop informational brochures to educate user groups of potential impacts associated with user activities.	D	$200
Public Use	Work with other resource agencies and local vendors to educate users of unique recreational opportunities in BBSAP.	C	$500
Obstacles in Resource Management	Continue partnerships with other natural resource agencies to reduce cost of including BBSAP in aerial photography efforts.	C	No additional costs
Obstacles in Resource Management	Develop and install kiosks or signage informing the public on how to avoid impacting seagrasses.	C	$1,200
Obstacles in Resource Management	Repair, replace, or install up to date signage and kiosks regarding resources in BBSAP.	F	$1,000
Obstacles in Resource Management	Develop informational brochure on BBSAP's current efforts on water quality, seagrass, and resource management programs.	F	$1,170
Obstacles in Resource Management	Provide interpretive training for tour guides on natural and cultural resources.	F	No additional costs
Obstacles in Resource Management	Provide training for staff at local parks and other destinations.	F	No additional costs
	Education & Outreach Subtotal		**$6,270**
	2020-2021 Total		**$88,977**

Project Initiation Legend: C = Currently Underway D = Under Initial Development F = Future Implementation

2021-2022 Cost Estimate			
Issue	**Strategy**	**Project Initiation**	**Estimated Yearly Cost**
Ecosystem Science			
Water Quality Monitoring	Continue datalogger program.	C	$35,780
Water Quality Monitoring	Continue Project COAST.	C	$4,680
Water Quality Monitoring	Expand datalogger program.	C	$3,847
Water Quality Monitoring	Identify point and nonpoint sources of pollutants and turbidity.	C	$1,000
Water Quality Monitoring	Continue to monitor the distribution and abundance of indicator species to determine health of the bay system.	C	Costs included in other strategies
Water Quality Monitoring	Determine biodiversity of BBSAP.	C	$1,200
Seagrass Monitoring	Develop and implement long-term seagrass monitoring plan.	C	$18,000
Seagrass Monitoring	Continue collaborating with other agencies on the Seagrass Integrated Mapping and Monitoring report.	C	$1,000
Seagrass Monitoring	Utilize GIS to identify areas of concern and determine restoration needs.	C	$2,000
Public Use	Understand and address consumptive use impacts from fisheries and recreational fishing while recognizing their importance to local economies.	C	No additional cost
Obstacles in Resource Management	Partner with other agencies to develop habitat restoration projects involving the use of marine debris.	C	$1,000
	Ecosystem Science Subtotal		**$68,507**
Resource Management			
Water Quality Monitoring	Support nutrient criteria development.	C	$12,500
Water Quality Monitoring	Support development of TMDLs.	C	Costs included in water quality monitoring
Water Quality Monitoring	Continue monitoring and maintaining Shellfish Harvesting Areas.	C	$1,000
Water Quality Monitoring	Work with other agencies to develop centralized water quality storage database.	D	Cost yet to be determined
Seagrass Monitoring	Use GIS to quantify gains or losses in seagrass communities.	C	$2,000
Seagrass Monitoring	Establish and maintain close communication with other agencies making resource management decisions regarding water quality and seagrass in BBSAP.	C	No additional cost
Seagrass Monitoring	Coordinate with adjacent resource managers to support clean-up efforts to address derelict vessels or illegal fisheries gear.	C	$1,000
Public Use	Work with other agencies to identify and address uses in BBSAP that are not water-dependent, potentially illegal, or harmful to natural resources.	C	$1,000
Public Use	Coordinate and participate in projects that remove or make use of debris in BBSAP.	C	$600
Public Use	Identify locations for paddling launch sites and desirable destinations to access BBSAP.	C	No additional cost
Obstacles in Resource Management	Continue to develop partnerships to assist in managing resources in BBSAP.	C	No additional cost
Obstacles in Resource Management	Work with law enforcement to ensure implementation of the seagrass law prohibiting destruction of seagrasses.	C	No additional cost

Project Initiation Legend: C = Currently Underway D = Under Initial Development F = Future Implementation

2021-2022 Cost Estimate			
Issue	**Strategy**	**Project Initiation**	**Estimated Yearly Cost**
Obstacles in Resource Management	Partner with other agencies and enlist the public to assist in the removal of derelict fisheries gear.	C	$600
Obstacles in Resource Management	Coordinate with other resource agencies and law enforcement agencies to support efforts to address derelict and/or illegal fisheries gear and harvesting activities.	C	$500
	Resource Management Subtotal		**$19,200**
Education & Outreach			
Water Quality Monitoring	Utilize educational signage at strategic access points to educate the public about conserving natural resources.	D	Costs included in other strategies
Water Quality Monitoring	Coordinate and participate in public lectures to address water quality issues and ways to improve water quality.	C	$1,000
Water Quality Monitoring	Provide/create opportunities for the public to assist in monitoring efforts and outreach events.	C	No additional costs
Seagrass Monitoring	Update current BBSAP brochures.	D	$200
Seagrass Monitoring	Repair, replace, install educational signage pertaining to resource protection.	D	Variable
Seagrass Monitoring	Continue to participate in educational outreach programs throughout BBSAP.	C	$1,000
Public Use	Partner with others to develop and distribute information identifying potential use conflicts and methods of prevention.	C	No additional cost
Public Use	Promote awareness and proper boating practices to reduce propeller scarring.	C	Costs included in other strategies
Public Use	Develop informational brochures to educate user groups of potential impacts associated with user activities.	D	$200
Public Use	Work with other resource agencies and local vendors to educate users of unique recreational opportunities in BBSAP.	C	$500
Obstacles in Resource Management	Continue partnerships with other natural resource agencies to reduce cost of including BBSAP in aerial photography efforts.	C	No additional cost
Obstacles in Resource Management	Develop and install kiosks or signage informing the public on how to avoid impacting seagrasses.	C	$1,200
Obstacles in Resource Management	Repair, replace, or install up to date signage and kiosks regarding resources in BBSAP.	F	$1,000
Obstacles in Resource Management	Develop informational brochure on BBSAP's current efforts on water quality, seagrass, and resource management programs.	F	$1,170
Obstacles in Resource Management	Provide interpretive training for tour guides on natural and cultural resources.	F	No additional cost
Obstacles in Resource Management	Provide training for staff at local parks and other destinations.	F	No additional cost
	Education & Outreach Subtotal		**$6,270**
	2021-2022 Total		**$93,977**

Project Initiation Legend: C = Currently Underway D = Under Initial Development F = Future Implementation

2022-2023 Cost Estimate			
Issue	**Strategy**	**Project Initiation**	**Estimated Yearly Cost**
Ecosystem Science			
Water Quality Monitoring	Continue datalogger program.	C	$30,780
Water Quality Monitoring	Continue Project COAST.	C	$4,680
Water Quality Monitoring	Expand datalogger program.	C	$3,847
Water Quality Monitoring	Identify point and nonpoint sources of pollutants and turbidity.	C	$1,000
Water Quality Monitoring	Continue to monitor the distribution and abundance of indicator species to determine health of the bay system.	C	Costs included in other strategies
Water Quality Monitoring	Determine biodiversity of BBSAP.	C	$1,200
Seagrass Monitoring	Develop and implement long-term seagrass monitoring plan.	C	$15,000
Seagrass Monitoring	Continue collaborating with other agencies on the Seagrass Integrated Mapping and Monitoring report.	C	$1,000
Seagrass Monitoring	Utilize GIS to identify areas of concern and determine restoration needs.	C	$2,000
Public Use	Understand and address consumptive use impacts from fisheries and recreational fishing while recognizing their importance to local economies.	C	No additional cost
Obstacles in Resource Management	Partner with other agencies to develop habitat restoration projects involving the use of marine debris.	C	$1,000
	Ecosystem Science Subtotal		**$60,507**
Resource Management			
Water Quality Monitoring	Support nutrient criteria development.	C	$12,500
Water Quality Monitoring	Support development of TMDLs.	C	Costs included in water quality monitoring
Water Quality Monitoring	continue monitoring and maintaining Shellfish Harvesting Areas.	C	$1,000
Water Quality Monitoring	Work with other agencies to develop centralized water quality storage database.	D	Cost yet to be determined
Seagrass Monitoring	Use GIS to quantify gains or losses in seagrass communities.	C	$2,000
Seagrass Monitoring	Establish and maintain close communication with other agencies making resource management decisions regarding water quality and seagrass in BBSAP.	C	No additional cost
Seagrass Monitoring	Coordinate with adjacent resource managers to support clean-up efforts to address derelict vessels or illegal fisheries gear.	C	$1,000
Public Use	Work with other agencies to identify and address uses in BBSAP that are not water-dependent, potentially illegal, or harmful to natural resources.	C	$1,000
Public Use	Coordinate and participate in projects that remove or make use of debris in BBSAP.	C	$600
Public Use	Identify locations for paddling launch sites and desirable destinations to access BBSAP.	C	No additional cost
Obstacles in Resource Management	Continue to develop partnerships to assist in managing resources in BBSAP.	C	No additional cost

Project Initiation Legend: C = Currently Underway D = Under Initial Development F = Future Implementation

2022-2023 Cost Estimate			
Issue	**Strategy**	**Project Initiation**	**Estimated Yearly Cost**
Obstacles in Resource Management	Work with law enforcement to ensure implementation of the seagrass law prohibiting destruction of seagrasses.	C	No additional cost
Obstacles in Resource Management	Partner with other agencies and enlist the public to assist in the removal of derelict fisheries gear.	C	$600
Obstacles in Resource Management	Coordinate with other resource agencies and law enforcement agencies to support efforts to address derelict and/or illegal fisheries gear and harvesting activities.	C	$500
	Resource Management Subtotal		**$19,200**
Education & Outreach			
Water Quality Monitoring	Utilize educational signage at strategic access points to educate the public about conserving natural resources.	D	Costs included in other strategies
Water Quality Monitoring	Coordinate and participate in public lectures to address water quality issues and ways to improve water quality.	C	$1,000
Water Quality Monitoring	Provide/create opportunities for the public to assist in monitoring efforts and outreach events.	C	No additional costs
Seagrass Monitoring	Update current BBSAP brochures.	D	$200
Seagrass Monitoring	Repair, replace, install educational signage pertaining to resource protection.	D	Variable
Seagrass Monitoring	Continue to participate in educational outreach programs throughout BBSAP.	C	$1,000
Public Use	Partner with others to develop and distribute information identifying potential use conflicts and methods of prevention.	C	No additional cost
Public Use	Promote awareness and proper boating practices to reduce propeller scarring.	C	Costs included in other strategies
Public Use	Develop informational brochures to educate user groups of potential impacts associated with user activities.	D	$200
Public Use	Work with other resource agencies and local vendors to educate users of unique recreational opportunities in BBSAP.	C	$500
Obstacles in Resource Management	Continue partnerships with other natural resource agencies to reduce cost of including BBSAP in aerial photography efforts.	C	No additional cost
Obstacles in Resource Management	Develop and install kiosks or signage informing the public on how to avoid impacting seagrasses.	C	$1,200
Obstacles in Resource Management	Repair, replace, or install up to date signage and kiosks regarding resources in BBSAP.	F	$1,000
Obstacles in Resource Management	Develop informational brochure on BBSAP's current efforts on water quality, seagrass, and resource management programs.	F	$1,170
Obstacles in Resource Management	Provide interpretive training for tour guides on natural and cultural resources.	F	No additional cost
Obstacles in Resource Management	Provide training for staff at local parks and other destinations.	F	No additional cost
	Education & Outreach Subtotal		**$6,270**
	2022-2023 Total		**$85,977**

Project Initiation Legend: C = Currently Underway D = Under Initial Development F = Future Implementation

D.3 / ***Budget Summary Table***

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

2013-2014 Cost Estimate	
Ecosystem Science Subtotal	$79,980
Resource Management Subtotal	$19,200
Education and Outreach Subtotal	$6,270
2013-2014 Total	***$105,450***

2014-2015 Cost Estimate	
Ecosystem Science Subtotal	$82,980
Resource Management Subtotal	$19,200
Education and Outreach Subtotal	$6,270
2014-2015 Total	***$108,450***

2015-2016 Cost Estimate	
Ecosystem Science Subtotal	$60,507
Resource Management Subtotal	$19,200
Education and Outreach Subtotal	$6,270
2015-2016 Total	***$85,977***

2016-2017 Cost Estimate	
Ecosystem Science Subtotal	$63,507
Resource Management Subtotal	$19,200
Education and Outreach Subtotal	$6,270
2016-2017 Total	***$88,977***

2017-2018 Cost Estimate	
Ecosystem Science Subtotal	$63,507
Resource Management Subtotal	$19,200
Education and Outreach Subtotal	$6,270
2017-2018 Total	***$88,977***

2018-2019 Cost Estimate	
Ecosystem Science Subtotal	$68,507
Resource Management Subtotal	$19,200
Education and Outreach Subtotal	$6,270
2018-2019 Total	***$93,977***

2019-2020 Cost Estimate	
Ecosystem Science Subtotal	$63,507
Resource Management Subtotal	$19,200
Education and Outreach Subtotal	$6,270
2019-2020 Total	***$88,977***

2020-2021 Cost Estimate	
Ecosystem Science Subtotal	$63,507
Resource Management Subtotal	$19,200
Education and Outreach Subtotal	$6,270
2020-2021 Total	***$88,977***

2021-2022 Cost Estimate	
Ecosystem Science Subtotal	$68,507
Resource Management Subtotal	$19,200
Education and Outreach Subtotal	$6,270
2021-2022 Total	***$93,977***

2022-2023 Cost Estimate	
Ecosystem Science Subtotal	$60,507
Resource Management Subtotal	$19,200
Education and Outreach Subtotal	$6,270
2022-2023 Total	***$85,977***

Appendix E

Other Requirements

*E.1 / **Acquisition and Restoration Council Management Plan Compliance Checklist***

The following appendices contain information about who serves on the Advisory Committee, when meetings were held, copies of the public advertisements for those meetings, and summaries of each meeting.

Land Management Plan Compliance Checklist - *Required for State-owned conservation lands over 160 acres*

Item	Requirement	Statute/Rule	Page / Appendix
Section A: Acquisition Information Items			
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. 2
3	Degree of title interest held by the Board, including reservations and encumbrances such as leases.	18-2.021	p. 2, 9, & 10
4	The legal description and acreage of the property.	18-2.018 & 18-2.021	Ex. Sum & p. 10-12
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. 2 & 12
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	p. 54 (Map 18)
8	Identification of adjacent land uses that conflict with the planned use of the property, if any.	18-2.021	p. 56-58
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. 14, 19-25, & 49-57
Section B: Use Items			
11	The designated single use or multiple use management for the property, including use by other managing entities.	18-2.018 & 18-2.021	81
12	A description of past and existing uses, including any unauthorized uses of the property.	18-2.018 & 18-2.021	p. 49-57
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. 5-8
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	p. 45-49, 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	p. 49-55
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. 80-81, 88
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. 3-7

Land Management Plan Compliance Checklist - *Required for State-owned conservation lands over 160 acres*			
Item	**Requirement**	**Statute/Rule**	**Page / Appendix**
19	Letter of compliance from the local government stating that the LMP is in compliance with the Local Government Comprehensive Plan.	BOT requirement	N/A
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	p. 28-42, 55-57
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	Ex. Sum, p.47-57
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	p. 55-57
23	A statement regarding incompatible use in reference to Ch. 253.034(10).	253.034(10)	N/A
*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	p. 3, 151
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)	p. 154-157
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)	p. 150
27	Summary of comments and concerns expressed by the advisory group for parcels over 160 acres	18-2.021	p. 152-153
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)	p. 154-157

Land Management Plan Compliance Checklist - *Required for State-owned conservation lands over 160 acres*			
Item	**Requirement**	**Statute/Rule**	**Page / Appendix**
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 managers replies to the teams findings and recommendations.*	259.036	151
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
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
Section D: Natural Resources			
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. 17-19
33	Insert FNAI based natural community maps when available.	ARC consensus	p. 28-29
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	p. 15-18
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. 19-25, 29-43
36	Location and description of known and reasonably identifiable renewable and non-renewable resources of the property regarding beaches and dunes.	18-2.021	No naturally occurring beaches or dunes in the Big Bend.
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	N/A
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. 47-48
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. 43-44
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. 28-43
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. 45-46
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.		p. 83-91 & 160-162
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.		p. 160-162
42-C	The associated measurable objectives to achieve the goals.		p. 83-91 & 160-162

Land Management Plan Compliance Checklist - *Required for State-owned conservation lands over 160 acres*			
Item	**Requirement**	**Statute/Rule**	**Page / Appendix**
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.*		p. 185-190
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.		p. 163-183
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
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).		N/A
44-B	Detailed description of both short and long-term management goals (see requirement for # 42-B).		N/A
44-C	Measurable objectives (see requirement for #42-C).		N/A
44-D	Related activities (see requirement for #42-D).		N/A
44-E	Budgets (see requirement for #42-E).		N/A
45	Imperiled species, habitat maintenance, enhancement, restoration or population restoration	259.032(10) & 253.034(5)	p. 44-45 & 105-143
45-A	Management needs, problems and a desired outcome (see requirement for # 42-A).		p. 43-49
45-B	Detailed description of both short and long-term management goals (see requirement for # 42-B).		p. 185-190
45-C	Measurable objectives (see requirement for #42-C).		p. 185-190
45-D	Related activities (see requirement for #42-D).		p. 185-190
45-E	Budgets (see requirement for #42-E).		p. 163-183
46	***Quantitative data description of the land regarding an inventory of exotic and invasive plants and associated acreage. *See footnote.*	253.034(5)	N/A
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	N/A (No BOT lease)
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).		p. 44-45, 185-190
48-B	Detailed description of both short and long-term management goals (see requirement for # 42-B).		p. 185-190
48-C	Measurable objectives (see requirement for #42-C).		p. 185-190
48-D	Related activities (see requirement for #42-D).		p. 185-190
48-E	Budgets (see requirement for #42-E).		p. 163-183
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. 1-2
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. 11-13, 19-27, 29-43

Land Management Plan Compliance Checklist - *Required for State-owned conservation lands over 160 acres*			
Item	**Requirement**	**Statute/Rule**	**Page / Appendix**
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. 11-13, | 19-27, 29-43
52	***Quantitative description of the land regarding an inventory of hydrological features and associated acreage. *See footnote.*	253.034(5)	p. 19-26
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).		p. 62-65, 160-161
53-B	Detailed description of both short and long-term management goals (see requirement for # 42-B).		p. 84-87
53-C	Measurable objectives (see requirement for #42-C).		p. 84-87
53-D	Related activities (see requirement for #42-D).		p. 84-87
53-E	Budgets (see requirement for #42-E).		p. 163-183
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. 9-10, 45-47, E.3
55	***Quantitative data description of the land regarding an inventory of significant land, cultural or historical features and associated acreage.	253.034(5)	p. 45-47
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	p. 48-49
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).		p. 161-162
57-B	Detailed description of both short and long-term management goals (see requirement for # 42-B).		p. 161-162
57-C	Measurable objectives (see requirement for #42-C).		p. 161-162
57-D	Related activities (see requirement for #42-D).		p. 161-162
57-E	Budgets (see requirement for #42-E).		p. 163-183
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. 95-96
59	Capital Facilities and Infrastructure	259.032(10) & 253.034(5)	
59-A	Management needs, problems and a desired outcome (see requirement for # 42-A).		p. 95-96
59-B	Detailed description of both short and long-term management goals (see requirement for # 42-B).		p. 95-96

***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.*

Land Management Plan Compliance Checklist - *Required for State-owned conservation lands over 160 acres*			
Item	**Requirement**	**Statute/Rule**	**Page / Appendix**
59-C	Measurable objectives (see requirement for #42-C).		N/A
59-D	Related activities (see requirement for #42-D).		N/A
59-E	Budgets (see requirement for #42-E).		p. 163-183
60	*** Quantitative data description of the land regarding an inventory of recreational facilities and associated acreage.	253.034(5)	p. 50-56 & 82, Maps 30-36
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).		p. 47, 80-81, 88-90
61-B	Detailed description of both short and long-term management goals (see requirement for # 42-B).		p. 88-90, 161-162
61-C	Measurable objectives (see requirement for #42-C).		p. 88-90, 161-162
61-D	Related activities (see requirement for #42-D).		p. 88-90, 161-162
61-E	Budgets (see requirement for #42-E).		p. 163-183
Section H: Other/ Managing Agency Tools			
62	Place this LMP Compliance Checklist at the front of the plan.	ARC and managing agency consensus	Front & p. 184
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	N/A
65	Key management activities necessary to achieve the desired outcomes regarding other appropriate resource management.	259.032(10)	p. 83-92
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)	p. 183
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)	p. 160-162
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.*

E.2 / ***Management Procedures for Archaeological and Historical Sites and Propertieson State-Owned or Controlled Lands*** (revised March 2013)

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:

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: 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

Historic Shipwreck		
Site ID	**Site Name**	**Site Type 1**
CI00122	Steamship Lt Izard Wreck	Historic shipwreck
DI00067	NN	Historic shipwreck
DI00110	Boiler Gap Wreck	Historic shipwreck
FR00892	Lanark Reef Wreck	Historic shipwreck
FR00937	Dog Island Flotsam	Historic shipwreck
FR00970	AP O-19	Historic shipwreck
LV00295	David Yulee	Historic shipwreck
TA00058	NN Shipwreck	Historic shipwreck
WA00304	Olin Boat Dock	Historic shipwreck
WA00501	San Marco Shipwreck I	Historic shipwreck
WA00683	St. Marks Lighthouse Wreck	Historic shipwreck

BUFFERDIST 0.000		
Site ID	**Ref Num**	**Res Name**
CI00001	70000178	Crystal River Indian Mounds
DI00004	91000454	Garden Patch Archeological Site (8Di4)
FR00005	73000577	Yent Mound
LV00120	84000252	Island Hotel
LV00244	88001449	Cedar Keys Historic and Arch Dist
WA00030	72000357	Bird Hammock
WA00088	76000607	Old Wakulla County Courthouse
WA00425	90000849	Sopchoppy High School Gym, Old
WA00667	01001088	Sopchoppy School

Ineligible		
Site ID	**Site Name**	**Site Type 1**
CI00860	Oak Park Estates I	Campsite (prehistoric)
CI01203	East Peninsula Point	Campsite (prehistoric)
CI01208	Gomez Midden	Campsite (prehistoric)
CI01209	Kings Creek Midden	Prehistoric shell midden
CI01212	Deer Mouth	Artifact scatter-low density
CI01213	Deer Creek 1	Campsite (prehistoric)
CI01215	Pig's Last Stand	Prehistoric shell midden
CI00013	Black Point	Prehistoric shell midden
CI00058	Burtine Island	Prehistoric shell midden
CI00059	Burtine Island B	Prehistoric shell midden
CI00070	Florida Barge Canal 12	Redeposited site (to this location)
CI00091	FPC 4 (Florida Power Corp.)	Prehistoric shell midden
CI00092	FPC 3 (Florida Power Corp.)	Prehistoric shell midden
CI00103	FPC 21 (Florida Power Corp.)	Prehistoric shell midden
CI00105	FPC 19 (Florida Power Corp.)	Prehistoric shell midden
CI00106	FPC 18 (Florida Power Corp.)	Prehistoric shell midden

Ineligible		
Site ID	**Site Name**	**Site Type 1**
CI00107	FPC 17 (Florida Power Corp.)	Prehistoric shell midden
CI00108	FPC 16 (Florida Power Corp.)	Prehistoric shell midden
CI00109	FPC 15 (Florida Power Corp.)	Prehistoric shell midden
CI00110	FPC 14 (Florida Power Corp.)	Prehistoric shell midden
CI00111	FPC 13 (Florida Power Corp.)	Prehistoric shell midden
CI00112	FPC 12 (Florida Power Corp.)	Prehistoric shell midden
CI00113	FPC 11 (Florida Power Corp.)	Prehistoric shell midden
CI00114	FPC 10 (Florida Power Corp.)	Prehistoric shell midden
CI00115	FPC 9 (Florida Power Corp.)	Prehistoric shell midden
CI00116	FPC 8 (Florida Power Corp.)	Prehistoric shell midden
CI00117	FPC 7 (Florida Power Corp.)	Prehistoric shell midden
CI00119	Negro Island	Prehistoric shell midden
CI00120	FPC 6 (Florida Power Corp.)	Prehistoric shell midden
CI00575	Bagley Cove	Habitation (prehistoric)
CI00789	NN	Land-terrestrial
CI00790	NN	Land-terrestrial
CI00806	Lake Edge	Campsite (prehistoric)
CI00808	Ramp Pond	Campsite (prehistoric)
CI00830	Hernando Beach	Campsite (prehistoric)
CI00831	Mike's Folly	Land-terrestrial
CI00832	Weaving Fool	Land-terrestrial
CI00833	Felicia Shard	Land-terrestrial
CI00834	Coleman	Land-terrestrial
CI01218	Deer Stand 3	Spec site for proc of raw mat
CI00981	Old Chisholm Phosphate Mine	Land-terrestrial
CI00993	Turkey Trot	Campsite (prehistoric)
CI00994	Gobblers Knob	Campsite (prehistoric)
CI00995	Flying Mullet	Campsite (prehistoric)
CI00996	Oak Knoll	Campsite (prehistoric)
CI00997	Lonesome Flake	Campsite (prehistoric)
CI00998	Lone Pine	Land-terrestrial
CI00999	Hunting Lodge Ridge	Campsite (prehistoric)
CI01000	Green Grass Knoll	Campsite (prehistoric)
CI01001	Priest	Homestead
CI01002	Split Oak	Campsite (prehistoric)
CI01003	Johns	Land-terrestrial
CI01004	Natural Well	Land-terrestrial
CI01005	Dixon	Homestead
CI01006	Priest's Flake	Campsite (prehistoric)
CI01007	Old Rock Road	Land-terrestrial
CI01030	Suncoast	Land-terrestrial
CI01032	W. Gum Street	Land-terrestrial
CI01033	Satin Sinkhole	Land-terrestrial
CI01034	Summerwind	Land-terrestrial
CI01035	Native Dancer	Land-terrestrial
CI01038	Lone Flake	Land-terrestrial

Ineligible		
Site ID	**Site Name**	**Site Type 1**
CI01039	Emerald Oaks	Land-terrestrial
CI01059	Hollins Tract 1	Campsite (prehistoric)
CI01076	Withalacoochee Bend	Subsurface features are present
CI01089	Bennetts Creek	Habitation (prehistoric)
CI01090	Bennetts Creek 2	Habitation (prehistoric)
CI01110	Red Navel	Land-terrestrial
CI01116	Citrus Hill	Artifact scatter-low density
CI01117	Chimney	Building remains
CI01118	Bryant Hwy. Site	Historic refuse / Dump
CI01120	Atlantic Coastline Railroad Line	Land-terrestrial
CI01125	Seaboard Airline Railroad	Land-terrestrial
CI01135	Buckford 2	Habitation (prehistoric)
CI01137	Sinte 1	Habitation (prehistoric)
CI01138	Sinet 2	Habitation (prehistoric)
CI01139	Beaten Face	Habitation (prehistoric)
CI01140	Thla Rakke 1	Habitation (prehistoric)
CI01142	Thla Rakke 2	Habitation (prehistoric)
CI01145	Falling Off the Rock	Habitation (prehistoric)
CI01147	Crunchy Ground	Habitation (prehistoric)
CI01148	Old Snakes Path	Habitation (prehistoric)
CI01149	Berry Cakes	Habitation (prehistoric)
CI01150	Grandfather Egret's Pool	Habitation (prehistoric)
CI01151	Mother's Dimple	Habitation (prehistoric)
CI01152	Moving Dirt	Habitation (prehistoric)
CI01153	Two Rock Houses	Habitation (prehistoric)
CI01154	Crab warrriors	Habitation (prehistoric)
CI01155	Gossiping Palms	Habitation (prehistoric)
CI01156	Limus	Habitation (prehistoric)
CI01157	Terrapin Wipes His Nose	Habitation (prehistoric)
CI01158	Weeping Rock	Habitation (prehistoric)
CI01159	Noisy Woods	Habitation (prehistoric)
CI01161	Dying Cedars	Habitation (prehistoric)
CI01162	Grandma Sits Alone	Habitation (prehistoric)
CI01163	Fish Splashers	Habitation (prehistoric)
CI01164	Fiery Palms	Habitation (prehistoric)
CI01165	Rocky Place	Habitation (prehistoric)
CI01166	Broken Cups	Habitation (prehistoric)
CI01168	Pond in the Rock	Habitation (prehistoric)
CI01169	JD's Site	Habitation (prehistoric)
CI01171	Vicky's	Habitation (prehistoric)
CI01172	Tom's	Habitation (prehistoric)
CI01174	Jerry's	Habitation (prehistoric)
CI01177	Oyster Bridge	Habitation (prehistoric)
CI01178	Melissa's Site	Habitation (prehistoric)
CI01180	Davey's Site	Habitation (prehistoric)
CI01181	Jeanne's	Habitation (prehistoric)

Ineligible		
Site ID	**Site Name**	**Site Type 1**
CI01182	Telling Secrets	Habitation (prehistoric)
CI01183	Feet Getting Wet	Habitation (prehistoric)
CI01184	Everett Island 1	Habitation (prehistoric)
CI01186	Turtle Left His Shell	Habitation (prehistoric)
CI01187	Scorpion Palace	Habitation (prehistoric)
CI01194	Keith's 2	Campsite (prehistoric)
CI01195	Wasted	Prehistoric shell midden
DI00211	Eco 3	Habitation (prehistoric)
DI00213	Eco 5	Habitation (prehistoric)
DI00214	Pot 1	Spec site for proc of raw mat
DI00215	Jena 6b	Campsite (prehistoric)
DI00216	Wotki 1	Habitation (prehistoric)
DI00217	Wotki 2	Habitation (prehistoric)
DI00157	North Big Oaks	Campsite (prehistoric)
DI00158	South Big Oaks	Campsite (prehistoric)
DI00159	Blacksnake Field	Land-terrestrial
DI00021	Fishbone Island	Prehistoric midden(s)
DI00022	Big Pine Island	Prehistoric shell midden
DI00023	Big Pine Island Middle	Prehistoric shell midden
DI00024	Big Pine Island South	Prehistoric shell midden
DI00025	Big Pine Island Mound	Prehistoric shell midden
DI00035	Zamia	Prehistoric shell midden
DI00036	Big Zamia	Prehistoric shell midden
DI00037	First Site South of Big Zamia	Prehistoric shell midden
DI00038	Second Site South of Big Zamia	Prehistoric midden(s)
DI00047	Shired Creek 1	Prehistoric shell midden
DI00064	Little Pine Island	Prehistoric midden(s)
DI00074	Prickly Pear 1	Artifact scatter-low density
DI00075	Prickly Pear 2	Prehistoric mound(s)
DI00076	Road's End	Artifact scatter-low density
DI00108	Aerostat 1	Campsite (prehistoric)
DI00111	Two Hole	Campsite (prehistoric)
DI00150	East Salt Creek 1	Land-terrestrial
DI00160	12' Hill	Land-terrestrial
DI00165	Hardman #98	Land-terrestrial
DI00198	No-Can-Do	Land-terrestrial
DI00200	Planted Pine	Land-terrestrial
DI00209	Eco 1	Habitation (prehistoric)
DI00210	Eco 2	Habitation (prehistoric)
DI00222	Fuswu 1	Habitation (prehistoric)
DI00224	Jena 15	Habitation (prehistoric)
DI00225	Jena 16	Habitation (prehistoric)
DI00227	Jena 18	Land-terrestrial
DI00228	Jena 19	Campsite (prehistoric)
DI00229	Gec 1	Campsite (prehistoric)
DI00230	Gec 2	Campsite (prehistoric)

Ineligible		
Site ID	**Site Name**	**Site Type 1**
FR00040	Hidden Rattler	Habitation (prehistoric)
FR00043	Canal Site	Habitation (prehistoric)
FR00046	Wade	Habitation (prehistoric)
FR00894	Late Pm Shell Midden	Land-terrestrial
FR00901	Temp #1	Campsite (prehistoric)
FR00902	Temp #2	Campsite (prehistoric)
FR00903	Ballast Cove Wreck A	Saltwater submerged site
FR00906	Summercamp	Spec site for proc of raw mat
FR00907	Cmbt Tm No.2- Camp Gordon Johnston	Land-terrestrial
FR00909	Turkey Tracks	Land-terrestrial
FR00913	Sandy Hill	Land-terrestrial
FR00914	Lindsay Lake	Land-terrestrial
FR00941	Sunday Reel	Building remains
FR00962	Lone Point	Land-terrestrial
FR00963	NE New Road	Land-terrestrial
JE01574	SA01-1	Inundated land site
JE01575	SA01-2 Wilson Site	Inundated land site
JE01578	SA01-5	Inundated land site
LV00134	Piney 1	Artifact scatter-low density
LV00135	Piney 2	Destroyed
LV00137	Richards Island	Prehistoric burial(s)
LV00312	Kelly Creek II	Artifact scatter-low density
LV00313	Kelly Creek III	Artifact scatter-low density
LV00314	Kelly Creek IV	Artifact scatter-low density
LV00034	Island at Mouth of Wacasassa River	Spec site for proc of raw mat
LV00298	Rocky Run Island	Campsite (prehistoric)
LV00299	Rocky Run II	Campsite (prehistoric)
LV00302	Mud Creek	Prehistoric shell midden
LV00317	Transect 5	Prehistoric shell midden
LV00318	Leaning Oak II	Artifact scatter-low density
LV00319	Square Well	Prehistoric shell midden
LV00322	Barn at Loop Rd Entrance	Building remains
LV00323	Hearth Kelly Creek	Building remains
LV00324	Rocky Run Still	Artifact scatter-low density
LV00325	Cowpens, The	Building remains
LV00417	Crevasse Midden	Habitation (prehistoric)
LV00435	Gnat Island	Campsite (prehistoric)
LV00436	Sandfly Point A	Campsite (prehistoric)
LV00437	Little Gnat Island	Campsite (prehistoric)
LV00438	Demory Stub	Campsite (prehistoric)
LV00439	Thousand Point A	Single artifact or isolated find
LV00440	Thousand Point B	Spec site for proc of raw mat
LV00441	Thousand Point C	Campsite (prehistoric)
LV00442	Clothesline Island	Campsite (prehistoric)
LV00443	Bee Island	Campsite (prehistoric)
LV00444	Sandfly Point C	Campsite (prehistoric)

Ineligible		
Site ID	**Site Name**	**Site Type 1**
LV00445	Sherd Island	Campsite (prehistoric)
LV00446	Gnat Island 2	Campsite (prehistoric)
LV00447	Snake Island Point	Campsite (prehistoric)
LV00448	Fawn Island	Campsite (prehistoric)
LV00449	Dragonfly Isle	Campsite (prehistoric)
LV00450	Demory Tip	Campsite (prehistoric)
LV00451	Pitiful Island	Campsite (prehistoric)
LV00452	Plentiful Island	Campsite (prehistoric)
LV00453	TPS Point	Prehistoric shell midden
LV00454	Lowes Bay	Campsite (prehistoric)
LV00455	Lowes Bay 2	Campsite (prehistoric)
LV00456	Lowes Bay 4	Campsite (prehistoric)
LV00457	Sandfly Point B	Campsite (prehistoric)
LV00458	Confusion Point	Campsite (prehistoric)
LV00459	Four Cedars Island	Campsite (prehistoric)
LV00460	Hospitality Island	Campsite (prehistoric)
LV00461	Blue Ball Island	Campsite (prehistoric)
LV00462	Sandfly Island	Campsite (prehistoric)
LV00463	Shotgun Island	Campsite (prehistoric)
LV00464	Bitty Island	Campsite (prehistoric)
LV00465	Pottery Decoy Island	Campsite (prehistoric)
LV00466	House Site	Spec site for proc of raw mat
LV00467	Opus P Site	Habitation (prehistoric)
LV00468	Crackerville	Habitation (prehistoric)
LV00470	Thousandmile Creek	Campsite (prehistoric)
LV00471	Old Fiber Factory	Building remains
LV00472	South Point	Campsite (prehistoric)
LV00473	South Beach	Spec site for proc of raw mat
LV00474	Trout Creek	Spec site for proc of raw mat
LV00475	Sheephead Creek	Campsite (prehistoric)
LV00476	Thousand Island	Artifact scatter-low density
LV00483	NN	Land-terrestrial
LV00484	NN	Land-terrestrial
LV00485	NN	Land-terrestrial
LV00486	NN	Land-terrestrial
LV00487	NN	Land-terrestrial
LV00488	Jones Island	Campsite (prehistoric)
LV00489	Blue Crab Island	Campsite (prehistoric)
LV00491	S6-17-1	Land-terrestrial
LV00492	Cypress Hill	Campsite (prehistoric)
LV00493	Broken Flake	Land-terrestrial
LV00494	Lunchtime	Land-terrestrial
LV00495	Lone Magnolia	Land-terrestrial
LV00496	Istenov	Land-terrestrial
LV00497	Lost Tarp	Land-terrestrial
LV00498	Mudbog	Land-terrestrial

Ineligible		
Site ID	**Site Name**	**Site Type 1**
LV00499	Free Radical	Land-terrestrial
LV00500	Honest	Land-terrestrial
LV00522	Cappuccio	Historic refuse / Dump
LV00600	Gulf Hammock Southeast Drainage	Artifact scatter-dense
LV00601	Melissa Band	Artifact scatter-dense
LV00602	Dan's Drive	Artifact scatter-dense
LV00603	Full Moon Site	Lithic scatter/quarry (prehistoric: no ceramics)
LV00624	Magnolia Campground	Campsite (prehistoric)
LV00689	Speck's	Campsite (prehistoric)
LV00690	Ms. B's	Artifact scatter-low density
LV00702	Saxon	Campsite (prehistoric)
LV00710	Yard Art Site	Historic refuse / Dump
TA00324	Spring Creek 9	Campsite (prehistoric)
TA00325	Spring Creek 10	Spec site for proc of raw mat
TA00077	Seminole Plant #5	Land-terrestrial
TA00160	Salem I	Campsite (prehistoric)
TA00167	FAS 1 - Taylor	Campsite (prehistoric)
TA00168	FAS 2 - Taylor	Artifact scatter-low density
TA00169	Hampton Springs Fire Tower	Building remains
TA00241	Buckeye Pipeline #1	Land-terrestrial
TA00242	Buckeye Pipeline #2	Land-terrestrial
TA00243	Buckeye Pipeline #3	Land-terrestrial
TA00244	Buckeye Pipeline #4	Land-terrestrial
TA00245	Buckeye Pipeline #5	Land-terrestrial
TA00246	Buckeye Pipeline #6	Land-terrestrial
TA00247	Buckeye Pipeline #7	Land-terrestrial
TA00248	Buckeye Pipeline #8	Land-terrestrial
TA00249	Buckeye Pipeline #9	Land-terrestrial
TA00250	Buckeye Pipeline #10	Land-terrestrial
TA00251	Buckeye Pipeline #11	Land-terrestrial
TA00252	Buckeye Pipeline #12	Land-terrestrial
TA00253	Buckeye Pipeline #13	Land-terrestrial
TA00254	Buckeye Pipeline #14	Land-terrestrial
TA00255	Buckeye Pipeline #15	Land-terrestrial
WA00763	Big Pond East	Campsite (prehistoric)
WA00764	Big Pond Bottle Dump	Land-terrestrial
WA00765	West of Cemetery	Campsite (prehistoric)
WA00767	Pocket of Sherds	Campsite (prehistoric)
WA00768	South of Sink	Campsite (prehistoric)
WA00770	Silver Glen Dip Vat	Agriculture/Farm structure
WA00773	Deer Stand Battle Dump	Land-terrestrial
WA00774	Central Scatter	Land-terrestrial
TA00289	Hampton Springs Hotel Remains	Building remains
TA00290	Hickory Mound 1	Subsurface features are present
TA00291	Hickory Mound 2	Habitation (prehistoric)
TA00292	Hickory Mound 3	Habitation (prehistoric)

Ineligible		
Site ID	**Site Name**	**Site Type 1**
TA00293	Hickory Mound 4	Habitation (prehistoric)
TA00294	Hickory Mound 5	Habitation (prehistoric)
TA00295	Hickory Mound 6	Habitation (prehistoric)
TA00296	Hickory Mound 7	Habitation (prehistoric)
TA00297	Hickory Mound 8	Habitation (prehistoric)
TA00298	Hickory Mound 9	Habitation (prehistoric)
TA00299	Hickory Mound 10	Habitation (prehistoric)
TA00300	Hickory Mound 11	Habitation (prehistoric)
TA00301	Hickory Mound 12	Habitation (prehistoric)
TA00302	Hickory Mound 13	Habitation (prehistoric)
TA00305	Hickory Mound 16	Habitation (prehistoric)
TA00307	Hickory Mound 18	Campsite (prehistoric)
TA00316	Spring Creek 1	Habitation (prehistoric)
TA00330	Spring Creek 15	Campsite (prehistoric)
TA00331	Spring Creek 16	Campsite (prehistoric)
TA00332	Spring Creek 17	Spec site for proc of raw mat
TA00333	Spring Creek 18	Spec site for proc of raw mat
TA00336	Spring Creek 21	Spec site for proc of raw mat
TA00337	Spring Creek 22	Spec site for proc of raw mat
TA00339	Dallus Creek Landing 2	Habitation (prehistoric)
TA00340	Dallus Creek Sand Mound	Artifact scatter-low density
TA00343	Tide Swamp 5	Campsite (prehistoric)
TA00354	Tide Swamp 16	Campsite (prehistoric)
TA00355	Tide Swamp 17	Habitation (prehistoric)
TA00356	Tide Swamp 18	Habitation (prehistoric)
TA00357	Tide Swamp 19	Campsite (prehistoric)
TA00358	Tide Swamp 20	Campsite (prehistoric)
TA00359	Tide Swamp 21	Campsite (prehistoric)
TA00361	Tide Swamp 23	Habitation (prehistoric)
TA00368	Blue Creek 1	Campsite (prehistoric)
TA00369	Blue Creek 2	Campsite (prehistoric)
TA00384	South Georgia Railway	Railroad grade segment
TA00390	Spring Creek Trailhead	Land-terrestrial
TA00402	Cabbage Grove 1	Ceramic scatter
TA00403	Cabbage Grove 2	Prehistoric lithics only, but not quarry
WA00073	Rattler	Lithic scatter/quarry (prehistoric: no ceramics)
WA00257	USFS 86-8	House
WA00806	Nichols 1	Land-terrestrial
WA00004	Hall	Habitation (prehistoric)
WA00096	Black Dirt	Campsite (prehistoric)
WA00097	Mosquito Bay	Campsite (prehistoric)
WA00098	Ditch Bay	Artifact scatter-low density
WA00105	South Bridge	Campsite (prehistoric)
WA00109	NN	Single artifact or isolated find
WA00124	Sopchoppy 1	Campsite (prehistoric)
WA00125	Sopchoppy 2	Artifact scatter-low density

Ineligible		
Site ID	**Site Name**	**Site Type 1**
WA00126	Sopchoppy 3	Lithic scatter/quarry (prehistoric: no ceramics)
WA00127	Sopchoppy 4	Campsite (prehistoric)
WA00128	Sopchoppy 5	Campsite (prehistoric)
WA00129	Sopchoppy 6	Lithic scatter/quarry (prehistoric: no ceramics)
WA00130	Sopchoppy 7	Artifact scatter-low density
WA00131	Sopchoppy 8	Campsite (prehistoric)
WA00132	Sopchoppy 9	Campsite (prehistoric)
WA00133	Sopchoppy 10	Lithic scatter/quarry (prehistoric: no ceramics)
WA00134	Sopchoppy 11	Lithic scatter/quarry (prehistoric: no ceramics)
WA00135	Sopchoppy 12	Campsite (prehistoric)
WA00136	Sopchoppy 13	Campsite (prehistoric)
WA00138	Island D	Campsite (prehistoric)
WA00142	Island H	Historic refuse / Dump
WA00143	Island I	Historic refuse / Dump
WA00146	Boot Island	Lithic scatter/quarry (prehistoric: no ceramics)
WA00153	Apalachicola 14	Lithic scatter/quarry (prehistoric: no ceramics)
WA00155	USFS #78-16 WAK	Land-terrestrial
WA00160	USFS 79-9	Campsite (prehistoric)
WA00161	USFS 79-10	Campsite (prehistoric)
WA00162	USFS 79-11	Lithic scatter/quarry (prehistoric: no ceramics)
WA00163	USFS 79-12	Lithic scatter/quarry (prehistoric: no ceramics)
WA00192	USFS 81-42	Habitation (prehistoric)
WA00300	Giant Hole	Campsite (prehistoric)
WA00306	Confederate Salt Works (East River)	Saltworks
WA00368	Mount Beeser Mill	Homestead
WA00371	USFS #89-5 Wakulla	Lithic scatter/quarry (prehistoric: no ceramics)
WA00373	USFS WAK 89-07\Cut Buffer Site	Lithic scatter/quarry (prehistoric: no ceramics)
WA00393	USFS WAK 89-29/Already Chopped	Historic refuse / Dump
WA00397	Monkey Creek Hill	Campsite (prehistoric)
WA00411	USFS 90-8 WAK	Homestead
WA00421	Old 329 Site	Campsite (prehistoric)
WA00458	USFS 91-3 WAK/Dinky Flake Site	Campsite (prehistoric)
WA00467	USFS WAK 91-10, “Misty Site”	Campsite (prehistoric)
WA00468	USFS WAK 91-18/Island Site	Campsite (prehistoric)
WA00477	USFS WAK 91-26	Spec site for proc of raw mat
WA00536	USFS WAK 93-32	Single artifact or isolated find
WA00548	NN	Land-terrestrial
WA00558	South Lookout Tower Site	Land-terrestrial
WA00621	Lost Creek Tributary	Campsite (prehistoric)
WA00622	Southern Terminus	Land-terrestrial
WA00661	USFS #99-04 (H) WAK “Turp Pot”	Land-terrestrial
WA00664	Eye Poker	Campsite (prehistoric)
WA00666	Tonys’ Cool Tool	Campsite (prehistoric)
WA00725	USFS 03-02 WAK	Campsite (prehistoric)
WA00726	USFS 03-02 WAK	Campsite (prehistoric)

Historical Roads						
Site ID	**Site Name**	**Survey Num**	**FDOT Num**	**Built**	**Cond**	**Lngth**
FR00877	Panacea	3801	490920	1935	Fair	5821
WA00690	USFS #01-08 WAK, “Vause Bridge”	6425		C1930	Ruinous	-1
WA00720	#02-29 WAK	7745	594001	1942	Deteriorated	108
TA00386	Bridge 380038	12013	380038	1940	Fair	20

Elegible		
Site ID	**Site Name**	**Site Type 1**
CI00042	Crystal River 8 - Wash Island	Campsite (prehistoric)
CI01134	Buckford 1	Habitation (prehistoric)
CI01193	Camp Island	Prehistoric shell midden
DI00007	Shired Island	Prehistoric shell midden
DI00029	Cat Island	Campsite (prehistoric)
FR00843	Dog Island Turpentine Camp	Agriculture/Farm structure
JE00121	Sloth Hole	Inundated land site
JE00795	Ladybug	Other
JE01146	Cypress Hole	Other
JE01577	SA01-7 Ontolo Site	Inundated land site
LV00308	Gator Mound	Prehistoric burial mound(s)
LV00015	Atsena Otie Key	Habitation (prehistoric)
LV00042	Shell Mound	Prehistoric shell midden
LV00066A	North Key 2	Prehistoric shell midden
LV00235	Town of Atsena Otie	Building remains
LV00236	Suwanee Mill	Building remains
LV00237	Eberhard Faber Cedar Mill	Building remains
LV00506	Log Cabin	Campsite (prehistoric)
TA00387	Dekle	Habitation (prehistoric)
WA00812	Skeeter Hammock	Spec site for proc of raw mat
WA00013	Headquarters	Prehistoric midden(s)
WA00014	St Mark Refuge Firetower	Prehistoric midden(s)
WA00015	St Marks Refuge Firetower Cemetery Site	Prehistoric burial(s)
WA00020	NN	Prehistoric mound(s)
WA00027	Dickerson Bay	Habitation (prehistoric)
WA00030	Bird Hammock	Prehistoric burial mound(s)
WA00057	Gidden	Prehistoric midden(s)
WA00058	Jeep	Artifact scatter-low density
WA00059	T	Lithic scatter/quarry (prehistoric: no ceramics)
WA00060	New Road	Lithic scatter/quarry (prehistoric: no ceramics)
WA00061	Picnic Pond	Lithic scatter/quarry (prehistoric: no ceramics)
WA00137	Island C	Lithic scatter/quarry (prehistoric: no ceramics)
WA00139	Island E	Saltworks
WA00145	Viscount Island	Lithic scatter/quarry (prehistoric: no ceramics)
WA00147	Central Ditch	Campsite (prehistoric)
WA00148	Little Live Oak Island	Campsite (prehistoric)
WA00156	Apalachicola 17	Habitation (prehistoric)
WA00296	USFS 87-5 Wakulla	Artifact scatter-low density
WA00420	Honker Norwood	Campsite (prehistoric)
WA00514	USFS WAK 93-01	Campsite (prehistoric)
WA00651	Loping Bear	Campsite (prehistoric)
WA00723	VFD Site (USFS # 02-05 WAK)	Subsurface features are present

Salt Works		
Site ID	**Site Name**	**Site Type 1**
LV00133	Salt Works At Salt Island	Saltworks
TA00063	Confederate Salt Works	Saltworks
WA00121	Confederate Salt Works (Gibbs Island)	Saltworks
WA00139	Island E	Saltworks
WA00306	Confederate Salt Works (East River)	Saltworks

Likely Elegible		
Site ID	**Site Name**	**Site Type 1**
CI00807	Blue Sky	Land-terrestrial
JE01539	Mandalay	Artifact scatter-low density
LV00307	Leaning Oak	Prehistoric shell midden
LV00083	Watson	Habitation (prehistoric)
LV00253	Tidewater	Building remains
LV00300	Primitive Camp II	Prehistoric shell midden
LV00301	Primitive Camp	Prehistoric shell midden
LV00304	W A C	Prehistoric shell midden
LV00305	Tange Shell Mound	Prehistoric shell midden
LV00321	Watson Homestead	Building remains
LV00469	Spring Run Burial Mound	Prehistoric burial mound(s)
TA00196	McKay 6	Campsite (prehistoric)
TA00197	McKay 7	Lithic scatter/quarry (prehistoric: no ceramics)
TA00123	Anderson Tennile	Historic refuse / Dump
TA00147	Mandalay	Artifact scatter-low density
TA00148	Stallings	Artifact scatter-low density
TA00154	Spring Warrior Complex	Habitation (prehistoric)
TA00158	Spring Warrior Complex	Prehistoric burial(s)
TA00192	McKay 2	Campsite (prehistoric)
WA00406	Wastewater Treatment	Spec site for proc of raw mat
WA00426	USFS WAK 90-21/Knoll #1	Artifact scatter-low density
WA00427	USFS WAK 90-22/Knoll #3	Artifact scatter-low density
WA00428	USFS WAK 90-24/Flagged Landing Site	Single artifact or isolated find
WA00429	USFS WAK 90-25/Blackbird Swarm	Artifact scatter-low density
WA00430	USFS WAK 90-26/Knoll #4	Prehistoric lithics only, but not quarry
WA00431	USFS WAK 90-27/Is That A Mound	Mill of unspecified function
WA00432	USFS WAK 90-29/Time To Wade Home	Single artifact or isolated find
WA00433	USFS WAK 90-30/Possibly Paleo Priv Pit	Prehistoric lithics only, but not quarry
WA00434	USFS WAK 90-31/Tween 63 AND 65	Prehistoric lithics only, but not quarry
WA00435	USFS WAK 90-32/399W Homesite	Artifact scatter-low density
WA00442	USFS WAK 90-39/West Cheek	Prehistoric lithics only, but not quarry
WA00450	USFS WAK 90-28/Knoll #5 Swamp Road Site	Artifact scatter-low density
WA00451	USFS 90-51 WAK/Long Rain	Campsite (prehistoric)
WA00493	Walulla Beach I	Habitation (prehistoric)
WA00494	Wakulla Beach 2	Prehistoric shell midden
WA00495	Wakulla Beach 3	Building remains
WA00496	Wakulla Beach 4	Spec site for proc of raw mat
WA00497	Wakulla Beach 5	Spec site for proc of raw mat
WA00498	Wakulla Beach 6	Spec site for proc of raw mat
WA00499	Wakulla Beach 7	Spec site for proc of raw mat
WA00500	Wakulla Beach 8	Spec site for proc of raw mat

Human Remains		
Site ID	**Site Name**	**Site Type 1**
CI00001	Crystal River Indian Mounds	Habitation (prehistoric)
CI00043	Crystal River 9 - Shell Island	Prehistoric shell midden
CI00061	Burtine Island D	Prehistoric shell midden
CI00065	Richardson Creek	Prehistoric burial mound(s)
CI00096	Withlacoochee 13 Midden	Prehistoric shell midden
CI00098	Withlacoochee 11 Midden	Prehistoric shell midden
CI00099	Gibson Burial Mound	Prehistoric burial mound(s)
CI00101	Pat's Elbow - Johnny Gibson Homestead	Log Boat - Historic or Prehistoric
CI00336	Kah's Beach	Prehistoric shell midden
CI01076	Withalacoochee Bend	Subsurface features are present
DI00004	Garden Patch	Prehistoric burial mound(s)
DI00007	Shired Island	Prehistoric shell midden
DI00008	Mound Near Steinhatchee River	Prehistoric burial mound(s)
DI00009	Goodson's Fish Camp	Prehistoric burial mound(s)
DI00012	Murphy Landing	Prehistoric burial mound(s)
DI00015	Oven Hill	Habitation (prehistoric)
DI00029	Cat Island	Campsite (prehistoric)
DI00032	Little Bradford Island	Prehistoric burial(s)
DI00045	Hughes Island Mound	Prehistoric burial mound(s)
DI00046	Hog Pen	Prehistoric mound(s)
DI00047	Shired Creek 1	Prehistoric shell midden
DI00052	Bird Island	Prehistoric shell midden
DI00053	Pocoson Hammock	Prehistoric burial mound(s)
DI00055	NN	Historic burial(s)
DI00079	Hosie Pond	Prehistoric mound(s)
DI00080	Lolly Creek Ridge 3	Prehistoric burial mound(s)
DI00082	NN	Artifact scatter-low density
DI00093	Swamp Buggy Mound	Prehistoric burial mound(s)
DI00094	Hardman Midden I	Prehistoric burial mound(s)
DI00107	Jena-Tract Burial Mound	Prehistoric burial mound(s)
DI00116	Sand Point Complex (Hardman 152,153,154)	Habitation (prehistoric)
DI00149	Salt Creek Mound	No field inv--record based on informant
DI00150	East Salt Creek 1	Land-terrestrial
DI00172	Salt Creek Shell Midden	Prehistoric shell midden
DI00180	Station Lake East	No field inv--record based on informant
DI00220	Oakview 1	Land-terrestrial
FR00004	Tucker	Prehistoric burial mound(s)
FR00005	Yent Mound	Prehistoric burial mound(s)
FR00006	Ochlockonee Bay Midden	Prehistoric shell midden
FR00044	Turkey Point Site	Campsite (prehistoric)
FR00050	NN	Spec site for proc of raw mat
FR00808	Mud Cove Mound	Prehistoric burial mound(s)
JE00636	West Cutoff	Prehistoric midden(s)
JE00739	Fitch	Inundated land site
JE00740	J & J Hunt Site	Inundated land site
JE00771	Turtle Shell	Inundated land site

Human Remains		
Site ID	**Site Name**	**Site Type 1**
JE01575	Sa01-2 Wilson Site	Inundated land site
LV00137	Richards Island	Prehistoric burial(s)
LV00139	Shacklefoot Pond Mound	Prehistoric burial mound(s)
LV00308	Gator Mound	Prehistoric burial mound(s)
LV00279	Hale Mound	Prehistoric burial mound(s)
LV00284	Lions Club	Habitation (prehistoric)
LV00286	Museum Mound	Prehistoric burial mound(s)
LV00001	Fowler's Landing	Prehistoric burial mound(s)
LV00002	Graveyard Island	Prehistoric burial mound(s)
LV00003	Gigger Point	Prehistoric burial mound(s)
LV00004	Aboriginal Cemetery in Cedar Key	Prehistoric burial(s)
LV00017	Stonewall Pond	Prehistoric mound(s)
LV00020	Goose Cove Mound	Prehistoric burial mound(s)
LV00042	Shell Mound	Prehistoric shell midden
LV00065	North Key 1	Prehistoric shell midden
LV00082	Old Hudson Place	Prehistoric burial mound(s)
LV00099	Bishop Mound	Prehistoric burial mound(s)
LV00110	Beetree Slough	Prehistoric burial(s)
LV00235	Town of Atsena Otie	Building remains
LV00434	Atsena Otie Shell Midden	Habitation (prehistoric)
LV00469	Spring Run Burial Mound	Prehistoric burial mound(s)
TA00054	Fenholloway 2	Prehistoric burial mound(s)
TA00140	Fenholloway #1	Prehistoric burial(s)
TA00141	Fenholloway #2	Prehistoric burial(s)
TA00142	Fenholloway 3	Prehistoric burial(s)
TA00001	Aucilla River Mound	Prehistoric burial mound(s)
TA00002	Warrior River Mound A	Prehistoric burial mound(s)
TA00003	Warrior River Mound B	Prehistoric burial mound(s)
TA00004	Mound A Near Econfina River	Prehistoric burial mound(s)
TA00006	Fish Camp Warrior River	Prehistoric burial mound(s)
TA00019	Hickory Ridge	Prehistoric burial mound(s)
TA00025	Hickory Mound	Prehistoric burial mound(s)
TA00038	Blue Creek Burial Mound	Prehistoric burial mound(s)
TA00039	Cedar Creek Burial Mound	Prehistoric burial mound(s)
TA00124	Aucilla Bar	Prehistoric burial(s)
TA00154	Spring Warrior Complex	Habitation (prehistoric)
TA00156	Cabbage Creek Small Mound	Prehistoric burial(s)
TA00157	Hickory Ridge Complex	Prehistoric burial(s)
TA00158	Spring Warrior Complex	Prehistoric burial(s)
TA00259	Cutter I	Land-terrestrial
TA00264	Cutter Five	Land-terrestrial
WA00001	Marsh Island	Prehistoric burial mound(s)
WA00003	Nichols	Prehistoric midden(s)
WA00004	Hall	Habitation (prehistoric)
WA00005	Spring Creek	Prehistoric mound(s)
WA00008	Mound Field	Prehistoric mound(s)

Human Remains		
Site ID	**Site Name**	**Site Type 1**
WA00009	Bird Hammock A	Prehistoric mound(s)
WA00010	Bird Hammock B	Prehistoric mound(s)
WA00012	St Marks Mound	Prehistoric burial mound(s)
WA00015	St Marks Refuge Firetower Cemetery Site	Prehistoric burial(s)
WA00026	Fort San Marcos de Apalachee	Building remains
WA00030	Bird Hammock	Prehistoric burial mound(s)
WA00034	Ullmore Cove	Prehistoric midden(s)
WA00039	Panton, Leslie and Company Trading Post	Artifact scatter-low density
WA00052	Snow Beach	Prehistoric midden(s)
WA00085	Fourmile Point	Prehistoric burial mound(s)
WA00090	Old Creek	Prehistoric midden(s)
WA00217	FS 10-11	Prehistoric burial mound(s)
WA00549	William's	Land-terrestrial
WA00706	#02-19 WAK	Historic burial(s)

Historic Buildings		
Site ID	**Site Name**	**Address**
CI00338	Sportsman Fish Camp Log Cabin	7795A W Riverbend Rd
CI00339	Fish Camp Cabin	7795B W Riverbend Rd
CI00340	Red Level Baptist Church	West of US 19
CI00343	Felicia Substation	4710 N Florida Ave
CI00349	Phosphate Mining Company Office	US 41
CI00350	Phosphate Manager's Residence	
CI00351	Quin House	Florida Ave (US 41)
CI00352	Spooner, Ashley House	Florida Ave (US 41)
CI00353	Heritage Gas	2700 N Florida Ave
CI00354	Bender Realty	2636 N Florida Ave
CI00355	May, E C House	Florida Ave (US 41)
CI00356	Spires House	Florida Ave (US 41)
CI00357	Church of the Nazarene	Florida Ave (US 41)
CI00405	Church, Black Community of Holder	N Ross Terrace
CI00409	Winn House	6380 N Tallahassee Rd
CI00410	Sassard House	6355 N Tallahassee Rd
CI00443	Dr Hudson Office	564 N Citrus Ave
CI00457	Barco-Hood Building	556 Citrus Ave
CI00458	Sparkman Building	568 N Citrus Ave
CI00459	Sparkman Building 2	572 N Citrus Ave
CI00460	Crystal River Bank	1 US 19
CI00461	611 Citrus Ave	611 N Citrus Ave
CI00462	619 Citrus Ave	619 Citrus Ave
CI00463	626 Citrus Ave	626 Citrus Ave
CI00464	631 Citrus Ave	631 Citrus Ave
CI00465	638-640 Citrus Ave	638-640 Citrus Ave
CI00466	639 Citrus Ave	639 Citrus Ave
CI00467	Beagle House	650 Citrus Ave

Historic Buildings		
Site ID	**Site Name**	**Address**
CI00468	652 Citrus Ave	652 Citrus Ave
CI00469	Eubanks-Edwards Home	657 Citrus Ave
CI00470	659 Citrus Ave	659 Citrus Ave
CI00471	661 Citrus Ave	661 Citrus Ave
CI00472	Smith-Williams Home	808 Citrus Ave
CI00473	Hood Home	838 Citrus Ave
CI00474	Hudson Home	839 Citrus Ave
CI00475	906 Citrus Ave	906 Citrus Ave
CI00476	Crystal River Depot	109 Crystal St
CI00477	Jones Home	131 Crystal St
CI00478	Wylie-Barco Home	226 Crystal St
CI00479	Peterman Home	256 Crystal St
CI00480	Stanley Home	325 Crystal St
CI00481	Crystal River School	332 Crystal St
CI00482	Elementary School	334 Crystal St
CI00483	Blanton House	405 Crystal St
CI00494	Bethel AME Church	629 NE 2nd Ave
CI00495	754 Ne 2nd Ave	754 NE 2nd Ave
CI00496	1335 Ne 2nd Ave	1335 NE 2nd Ave
CI00497	1337 Ne 2nd Ave	1337 NE 2nd Ave
CI00513	Holder Apartments	820 NE 3rd Ave
CI00514	Miller-Holder House	950 NE 3rd Ave
CI00515	1004 NE 3rd Ave	1004 NE 3rd Ave
CI00516	Stevens House	1007 NE 3rd Ave
CI00517	1218 NE 3rd Ave	1218 NE 3rd Ave
CI00534	907 NE 4th Ave	907 NE 4th Ave
CI00535	Lone Pine	918 NE 4th Ave
CI00536	Judge Bowman House	940 NE 4th Ave
CI00537	Edwards, Drew House	1005 NE 4th Ave
CI00538	Teacherage	1012 NE 4th Ave
CI00539	113-130 NE 4th St	113-130 NE 4th Ave
CI00541	Carpenter House	1004 NE 5th Ave
CI00544	235 NE 5th St	235 NE 5th Ave
CI00546	Old Presbyterian Church	252 NE 9th St
CI00547	311 NE 9th St	311 NE 9th St
CI00548	319 NE 9th St	319 NE 9th St
CI00549	Bowman, Hugh House	331 NE 9th St
CI00550	Burgess-Dumas House	458 NE 9th St
CI00551	221 NE 10th St	221 NE 10th St
CI00552	Kennedy House	415 NE 11th St
CI00553	Moon, Dr House	515 NE 11th St
CI00554	Barnes House	602 NE 11th St
CI00825	SR 200 and Summit Road	SR 200 and Summit Rd
CI00845	2680 N Florida Avenue	2680 N Florida Ave
CI00846	2650 N Florida Avenue	2650 N Florida Ave
CI01009	12664 West Hcr Limestone Trail	12664 W Limestone Tral

Historic Buildings		
Site ID	**Site Name**	**Address**
CI01048	Lakeview School	2435 N Florida Ave E
CI01078	3044 Carl G Rose Hwy	3044 Carl G Rose Hwy
CI01079	3088 Carl G Rose Hwy	3088 Carl G Rose Hwy
CI01080	3138 Carl G Rose Hwy	3138 Carl G Rose Hwy
CI01103	103 US 19 (SR 55)	103 US 19
CI01104	Hayes Motel	1151 US 19
CI01105	4690 US 19 (SR 55)	4690 US 19
CI01106	4575 N Champion Pt	4575 N Champion Pt
CI01107	4609 N Champion Pt	4609 N Champion Pt
CI01108	5832 US 19 (SR 55)	5832 US 19 (SR 55)
CI01119	2480 N Florida Avenue	2480 N Florida Ave W
CI01121	3519 Norvell Bryant Hwy	3519 Norvell Bryant Hwy N
CI01122	2460 Railroad Way	2460 Railroad Way W
CI01123	3493 Norvell Bryant Hwy	3493 Norvell Bryant Hwy N
CI01124	3482 Oleander Lane	3482 Oleander Ln S
DI00231	Putnam Lodge	1890 NW 19 Hwy
DI00236	Triumph the Church	166 NE 106th St
DI00243	Yellow Jacket Cabin	386 SE 752 St
LV00120	Island Hotel	224 2nd Street
LV00121	Seahorse Key Lighthouse	Seahorse Key
LV00140	Hodges Cottage	A3rd from Corner 1st St
LV00141	Hodges Rental Cottage	A4th from Corner 1st St
LV00142	Rodgers, Bertl House	109 1st Street
LV00143	Whidden, Henrietta House	111 1st Street
LV00144	Hodges Rental	115 1st Street
LV00145	Lutterloh Building	NE Corn 2nd Street
LV00146	Bickell's Photo Gallery	A2nd in 2nd St
LV00147	Ice Cream Parlor	A3rd on 2nd from D Street
LV00148	Masonic Lodge	Corner of 2nd Street
LV00149	Hale, F E House	107 2nd Street
LV00150	First Baptist Church	111 2nd Street
LV00151	Rogers, H B House	113 2nd Street
LV00152	Lutterloh Building 1	117 2nd Street
LV00153	Kirchaine, Yulee House	120 2nd Street
LV00154	Gore, J Ira House	744 2nd Street
LV00155	White House Annex	125 2nd Street
LV00156	Richburg/Berry House	129 2nd Street
LV00157	Wadley, Boag C House	130 2nd Street
LV00158	131 2nd Street	131 2nd Street
LV00159	Prescott Building	210 2nd Street
LV00160	Kapote Building	211 2nd Street
LV00161	Cedar Key State Bank	212 2nd Street
LV00162	Schlemmer Bakery and Groceries	215 2nd Street
LV00163	Ellis Building	218 2nd Street
LV00164	Ellis Building	220 2nd Street
LV00165	Bodiford Building	221 2nd Street

Historic Buildings		
Site ID	**Site Name**	**Address**
LV00166	Zadowski General Merchandise	222 2nd Street
LV00167	Bodiford Drug Store	223 2nd Street
LV00168	Wadley's Grocery	233 2nd Street
LV00169	Cedar Key City Hall / City Hall	244 2nd Street
LV00170	Schlemmer House	245 2nd Street
LV00171	Hodges, W R House	253 2nd Street
LV00172	107 3rd Street	107 3rd Street
LV00173	Tooke House	A1st on left 3rd Street
LV00174	United States Fibre Company	NE end 3rd Street
LV00175	Lutterloh, E C House	A3rd Street at E Street
LV00176	Eagle Cedar Mill	A3rd Street at F Street
LV00177	Wadley, Frank House	E corner 4th Street
LV00178	Old Block House	Corner of 4th & G St
LV00179	Hodges Rental	16 4th Street
LV00180	Parrish House	21 4th Street
LV00181	Claywell, R S House	26 4th Street
LV00182	Wadley, Edward House	33 4th Street
LV00183	Tebo House	36 4th Street
LV00184	Parsons Rental	38 4th Street
LV00185	Old First Baptist Church	39 4th Street
LV00186	Old Public School	44 4th Street
LV00187	Cedar Key First M E Church	45 4th Street
LV00188	Hodges Rental	613 4th Street
LV00189	Deliano, W P House	Corner of 5th & G Street
LV00190	Mcleods Store	127 5th Street
LV00191	Hodges Rental	206 5th Street
LV00192	Kirby/Bense House	211 5th Street
LV00193	Whitman, St. Claire House	202 6th Street
LV00194	203 6th Street	203 6th Street
LV00195	209 6th Street	209 6th Street
LV00196	Demps, Bob House	220 6th Street
LV00197	Dancy, J D House	221 6th Street
LV00198	239 6th Street	239 6th Street
LV00199	241 6th Street	241 6th Street
LV00200	243 6th Street	243 6th Street
LV00201	Jenkins,Frank House	250 6th Street
LV00202	1 A Street	1 A Street
LV00203	3 A Street	3 A Street
LV00204	Old First Presbyterian Church	D Street
LV00205	Reynolds House	D Street
LV00206	Hodges Rental	A2nd from corner D Street
LV00207	Andrews, I O/Hale Building	Corner D St & 2nd St
LV00208	Episcopal Rectory	Corner D St & 6th St
LV00209	Richburg, John House	406 D Street
LV00210	Episcopal Parish Hall	414 D Street
LV00211	Charpia, H E House	317 E Street

Historic Buildings		
Site ID	**Site Name**	**Address**
LV00212	Gardiner House	320 E Street
LV00213	Stephens House	321 E Street
LV00214	Reddick, Samuel C House	323 E Street
LV00215	328 E Street	328 E Street
LV00216	Whitman, Fred House	6 F Street
LV00217	Hughes, J E House	205 F Street
LV00218	Eagle Cedar Mill House	210 F Street
LV00219	Wilson, J J	214 F Street
LV00220	Watson/Hodges House	215 F Street
LV00221	First Christian Church	224 F Street
LV00222	Walker, Wilson House	312 F Street
LV00223	Hale/Johnson House	325 F Street
LV00224	Crevasse, Henry Winter House	109 G Street
LV00225	Andrews, Dan House	A2nd house on L Mill St
LV00226	Fowler/Pugh House	Gulf Boulevard
LV00229	SR 24 - A	SR 24 - A
LV00230	Fayle Rental	SR 24
LV00231	Holman House	B SR 24
LV00232	Turner, Dr J W House	SR 24
LV00233	Noegel House	C SR 24
LV00234	Ziegler's Bait House	E SR 24
LV00297	NW 16th Ave and NW 13th St	NW 16th Ave and NW 13th
LV00490	Mashburn House	132 40 Hwy W
LV00625	Cabin	18010 NW 19 Hwy
LV00691	Fraternal Order of Eagles	410 3rd St SW
LV00698	Riverside Marina House	6451 Riverside Dr
LV00699	Riverside Marina Cottage	6451 Riverside Dr
LV00700	Riverside Marina Double Cottage	6451 Riverside Dr
LV00701	Riverside Marina Pump House	6451 Riverside Dr
LV00703	Saxon Oil Building	4935 Highway 40 W
LV00704	Church of God	5th St N
LV00705	Key Motel	574 6 St S
LV00707	6302 Riverside Drive	6302 Riverside Dr
LV00708	6304 Riverside Drive	6304 Riverside Dr
LV00709	#3 63rd Street	5 63rd St
TA00061	Langston Log Cabin	US 98
TA00205	Log Cabin 1	Riverside Dr SE
TA00206	Log Cabin 2	Riverside Dr SE
TA00381	Old Jerkins High School	1201 Martin Luther King Ave
TA00400	Aircraft Hangar	
WA00088	Old Wakulla County Courthouse	Church St
WA00114	St Marks Lighthouse	SR 59
WA00255	Posey's	Old Fort Drive
WA00425	Sopchoppy High School Gymnasium, Old	Second Ave & Summer St
WA00511	Zion Hill Primitive Baptist Church	Highway 319
WA00563	3061 US 98	3061 US 98

Historic Buildings		
Site ID	**Site Name**	**Address**
WA00564	3102 US 98	3102 US 98
WA00565	Tully Residence	3105 US 98
WA00566	Mike's Paint and Body Shop	3140 US 98
WA00567	Durrence House	unsp
WA00568	4716 Crawfordville Hwy	4716 Crawfordville Hwy
WA00569	Langston-Carter House	
WA00570	4567+/- Crawfordville Hwy	4567 Crawfordville Hwy
WA00571	3899+/- Crawfordville Hwy	3899 Crawfordville Hwy
WA00572	3910+/- Crawfordville Hwy	3910+/- Crawfordville Hwy
WA00573	3893 Crawfordville Hwy	3893 Crawfordville Hwy
WA00574	3670 Crawfordville Hwy	3670 Crawfordville Hwy
WA00575	Dux Discount Liquors and Decoy Lounge	3332 Crawfordville Hwy
WA00576	Forest Realty	3299 US 319
WA00577	A & B Cabins Crawfordville Hwy	3239+/- Crawfordville Hwy
WA00578	3236 Crawfordville Hwy	3236 Crawfordville Hwy
WA00579	3234 Crawfordville Hwy	3234 Crawfordville Hwy
WA00580	3210 Crawfordville Hwy	3210 Crawfordville Hwy
WA00581	3198 Crawfordville Hwy	3198 Crawfordville Hwy
WA00582	3123 Crawfordville Hwy	3123 Crawfordville Hwy
WA00583	Wakulla News	Unsp Crawfordville Hwy
WA00584	Family Affair Gifts	3160 Crawfordville Hwy
WA00585	3150 Crawfordville Hwy	3150 Crawfordville Hwy
WA00586	Atkinson's Electric	Unsp Crawfordville Hwy
WA00587	Printing Solutions	Unsp Crawfordville Hwy
WA00588	Mike Carter Lawyer	Unsp Crawfordville Hwy
WA00590	Jack B Harraway Real Estate Appraisal	3128 Crawfordville Hwy
WA00591	H T Adams Residence and Service Station	3031 Crawfordville Hwy
WA00592	New Life Christian Fellowship	18 Lower Bridge Rd
WA00593	4998 Lower Bridge Road	4998 Lower Bridge Rd
WA00594	Harper House	3106 Crawfordville Hwy
WA00595	Wakulla Florist	3070 Crawfordville Hwy
WA00599	Posey House	Unsp Unkn
WA00624	Railroad Mile Marker (no number)	
WA00660	Wakulla Co Courthouse Annex	24 High Dr
WA00667	Sopchoppy High School	164 Yellow Jacket Ave
WA00711	Curtis Mill School	
WA00722	Sopchoppy Railroad Depot	County Road 375 Rd
WA00771	CRAS Silver Glen Phase II, Wakulla Count	Pelican Way UNSP
WA00810	Townsend Residence	-1 SR 61 RD
WA00811	Shell Point C. G. Aux. Bldg.	105 Beaty Taff Dr
WA00814	Hyde Park School	223 Triplett Rd
WA00816	3723 Crawfordville Highway	3723 Crawfordville Hwy
WA00817	3976 Crawfordville Highway	3976 Crawfordville Hwy
WA00818	4041 Crawfordville Highway	4041 Crawfordville Hwy
WA00819	Lake Ellen Baptist Church	4495 Crawfordville Hwy
WA00825	Old Pararo House	200 Church St

Historic Cemetery			
Site ID	**Site Name**	**Survey Num**	**City**
CI00555	Crystal Gardens Cemetery	3171	Crystal River
CI01008	Johns Family Cemetery	4732	Red Level
DI00203	Hodge Cemetery	0	Suwannee
DI00235	Butler Cemetery		Horseshoe Beach
FR00873	Thompson Cemetery		Carrabelle
LV00136	Seahorse Key Cemetery	0	none
LV00227	Cedar Key Cemetery	0	Cedar Key
LV00238	Atsena Otie Cemetery	8201	Cedar Key
LV00416	Old Atsena Otie Cemetery	8201	Cedar Key
LV00539	McGrew Family Cemetery	5842	Fanning Springs
LV00623	Jubb Island Cemetery		Yankeetown
LV00641	Antioch Cemetery		
LV00642	Drummond Family Cemetery		none listed
LV00643	Hodges Family Cemetery		Yankeetown
LV00654	Chiefland Community Cemetery		Chiefland
LV00655	Hearn Family Cemetery		Cedar Key
LV00656	Bishop Point Cemetery		Cedar Key
LV00659	King Family Cemetery		unsp
LV00660	Priest Family Cemetery		unsp
LV00661	Robinson Family Cemetery		Inglis
LV00663	Six Mile Turpentine Still Cemetery		Chiefland
LV00665	Hearn Family Cemetery		Cedar Key
LV00673	Galilee Cemetery		none
LV00674	Ellzy Cemetery		Ellzy
LV00675	Hawthorne Cemetery		Ingalis
LV00676	Kirkland Cemetery		none
LV00677	MT. Erie Cemetery		none
LV00680	Rocky Hammock Cemetery		none
LV00681	Shiloh Cemetery		Cedar Key
LV00712	Hardeetown Cemetery		Chiefland
LV00714	Long Pond Baptist Church Cemetery		none
TA00262	Cutter Three	5065	Perry
WA00108	San Marcos de Apalachee Cemetery	0	St. Marks
WA00462	Richardson Cemetery	0	Crawfordville
WA00538	Whaley Cemetery	0	
WA00617	Lake Ellen Baptist Church Cemetery	12799	Crawfordville
WA00618	Mount Olive Baptist Church Cemetery	12799	Crawfordville
WA00619	Council Cemetery	12799	Crawfordville
WA00620	Crawfordville Cemetery		Crawfordville
WA00665	Syfrett Cemetery	0	N/A
WA00718	Pelt Cemetery	0	Crawfordville
WA00772	CRAS Silver Glen Phase II, Wakulla Count	10039	Panacea
WA00807	Donaldson		Crawfordville

Big Bend Seagrasses Aquatic Preserve
Management Plan

Big Bend Seagrasses Aquatic Preserve
3266 North Sailboat Ave.
Crystal River, FL 34428
352.563.0450
www.dep.state.fl.us/coastal/sites/bigbend

Florida Department of Environmental Protection
Florida Coastal Office
3900 Commonwealth Blvd., MS #235
Tallahassee, FL 32399 • www.FloridaCoasts.org