Graham Swamp Conservation Area

Land Management Plan
Governing Board Approved
March 2010

Graham Swamp Conservation Area
Land Management Plan Summary

Management Area Size: 3,170 acres
Date of Acquisition: Acquisition of parcels within Graham Swamp Conservation Area began in 1995.
Date of Plan: March 2010
Date of Previous Plan: August 2004
Major Basin: Northern Coastal Basin **Planning Basin:** Pellicer Creek
Halifax River

Location: Graham Swamp Conservation Area (GSCA) is located south of the City of Palm Coast in Flagler County.

Funding Source: The acquisition funding sources for GSCA include Preservation 2000 (P2000) and mitigation donation.

Management Partners: The District is lead managing agency for natural resource-related management activities. Flagler County serves as lead managing agency for security, public access, and recreation related activities.

Key Resource Issues:

Resource Management Issues:

- **Water Resources** – Most protection was accomplished through acquisition. Disturbances include Lehigh Trail/rail bed, Lehigh and numerous other canals and ditches, roads, and trails.
- **Fire Management** – The proximity of this conservation area to developed, smoke sensitive areas and the predominance of non-pyric plant communities considerably limits the practicality and ability to implement prescribed burning.
- **Forest Management**- Primary forest management activities will include monitoring pine areas for insect infestation and disease.
- **Exotics** - Invasive exotic pest plant and animal species occur on the property. The District regularly monitors for the presence of invasive plants and animals and implements appropriate control action.
- **Cultural & Historical Resources** – A review of the Department of State, Division of Historical Resources indicates two registered cultural sites within the boundaries of the conservation area.

Key Land Use/Recreation Issues: The conservation area includes two public parking areas with trailheads and kiosks and an additional public walk through. The conservation area is open to the public for bicycling, hiking, fishing, and wildlife viewing. The conservation area supports several miles of off road/mountain bike trails, hiking trails, a paved rail trail and a boardwalk connector trail that utilizes portions of the abandoned Lehigh rail bed. Additionally, the City of Palm Coast is preparing to install a trail system along portions of the north and west boundaries.

Land Use Management Issues:

- **Access** – Three public access points are located on the conservation area.
- **Recreation** – The conservation area is open to the public for hiking, bicycling, mountain biking, skating, fishing, and wildlife viewing. Fishing platforms, paved trails, boardwalks, footpaths, and mountain bike trails are available for public use.
- **Security** – Maintenance of fence lines, parking areas, gates, locks, and trash pick up is conducted by the County. The District utilizes a contract security firm as necessary to augment security on the conservation area.

Administration:

- **Acquisition** – Although no parcels are uniquely identified, the District may consider purchasing parcels near the GSCA that become available and that will aid in the conservation of water resources within the Pellicer Creek and Halifax River basins.
- **Leases, Easements, Special Use Authorizations, and Agreements** -
    - The District administers the following leases, agreements, easements, special use authorizations (SUAs) and concessions:
        - An interlocal agreement between the District, the County, and the City of Palm Coast for the construction of a multi-use trail, possible annexation of the conservation area into the City of Palm Coast, future connections to the Lehigh Trail, and maintenance access to seven culverts under the Lehigh trail.
        - An SUA for the maintenance of mountain bike trails in support of group riding activities.*
        - An intergovernmental agreement between the District and the County authorizing the County to construct a portion of the Lehigh Trail through the conservation area.
        - An intergovernmental management agreement designating lead management responsibilities for recreation, security, and public access to the County.
        - An SUA for the removal of feral hogs.*

***administered by Flagler County**

INTRODUCTION

This document provides the guidelines and goals for implementation of land management activities at the Graham Swamp Conservation Area (GSCA) over the next five years. This is a revision of the August 2004 board approved land management plan.

The GSCA covers approximately 3,170 acres in eastern Flagler County within the Pellicer Creek and Halifax River basins, sub-basins of the Northern Coastal basin. This conservation area includes two (2) parcels and is located in numerous sections of Townships 11 and 12 South and Range 31 East.

The property is located southeast of the City of Palm Coast. GSCA is bordered on the north, west, and east by intense residential development. The conservation area is bound to the east, in part, by Colbert Lane. Additionally, Old Kings Road is located to the west of the conservation area forming portions of that boundary. SR 100 is located less than one mile from the south boundary and I-95 is approximately one half mile to the west. The Flagler County Airport is approximately one half mile to the southwest of the conservation area. Figure 1 depicts the location of the conservation area and Figure 2 is an aerial image of the GSCA.

The purchase of the parcels that comprise the GSCA is consistent with the goals of the Northern Coastal Basin project as set forth in the District's Land Acquisition and Management Five Year Plan, and the District's Water Management Plan. These goals include:

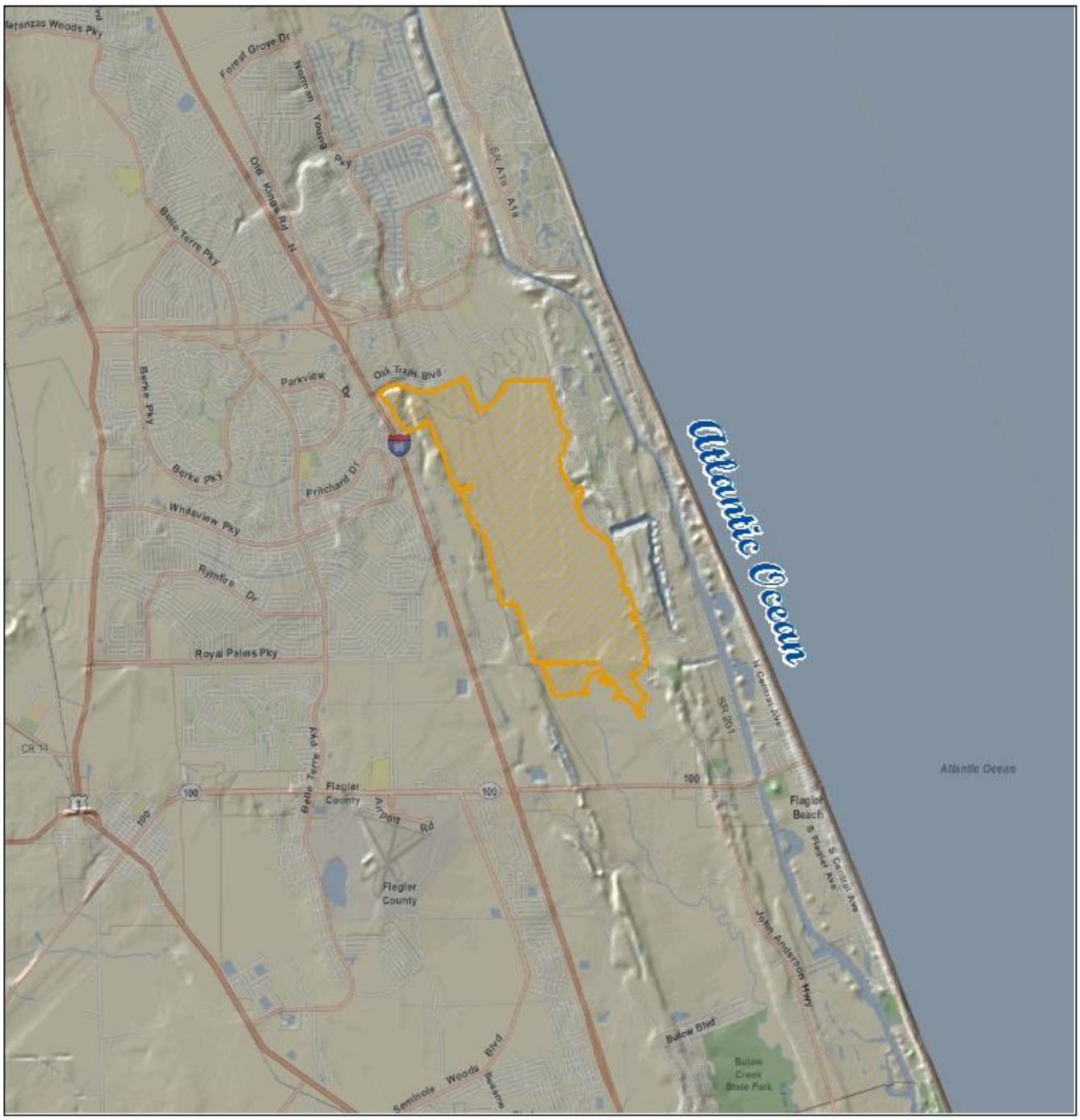
- Protect natural lands surrounding shoreline, creeks, wetlands and coastal natural communities.
- Reduce flooding damage, increase water quality, and maintain natural hydrological regime through acquisition and protection of floodplain wetlands.
- Provide opportunities for recreation where compatible with the above listed goals.

The above are general goals and objectives for Graham Swamp Conservation Area. The following plan outlines specific goals and strategies regarding both natural and cultural resources and recreation management over the next five years.

CONSERVATION AREA OVERVIEW

Regional Significance

The GSCA is one of several publicly owned conservation lands within the Northern Coastal Basin Project Area that includes Pellicer Creek Conservation Area/Princess Place Preserve, Bulow Creek State Park, North Peninsula State Park, and the Betty Steflik Memorial Preserve. The conservation area also provides an important connection to the Lehigh Greenway. Figure 3 illustrates the regional significance of the conservation area. These lands provide for the protection of water quality and storage, indigenous floral and faunal species, as well as numerous natural resource-based recreational opportunities.



Graham Swamp Conservation Area

Figure 1 - Location Map

1 0.5 0 1 Miles

1 = 100000

Boundary

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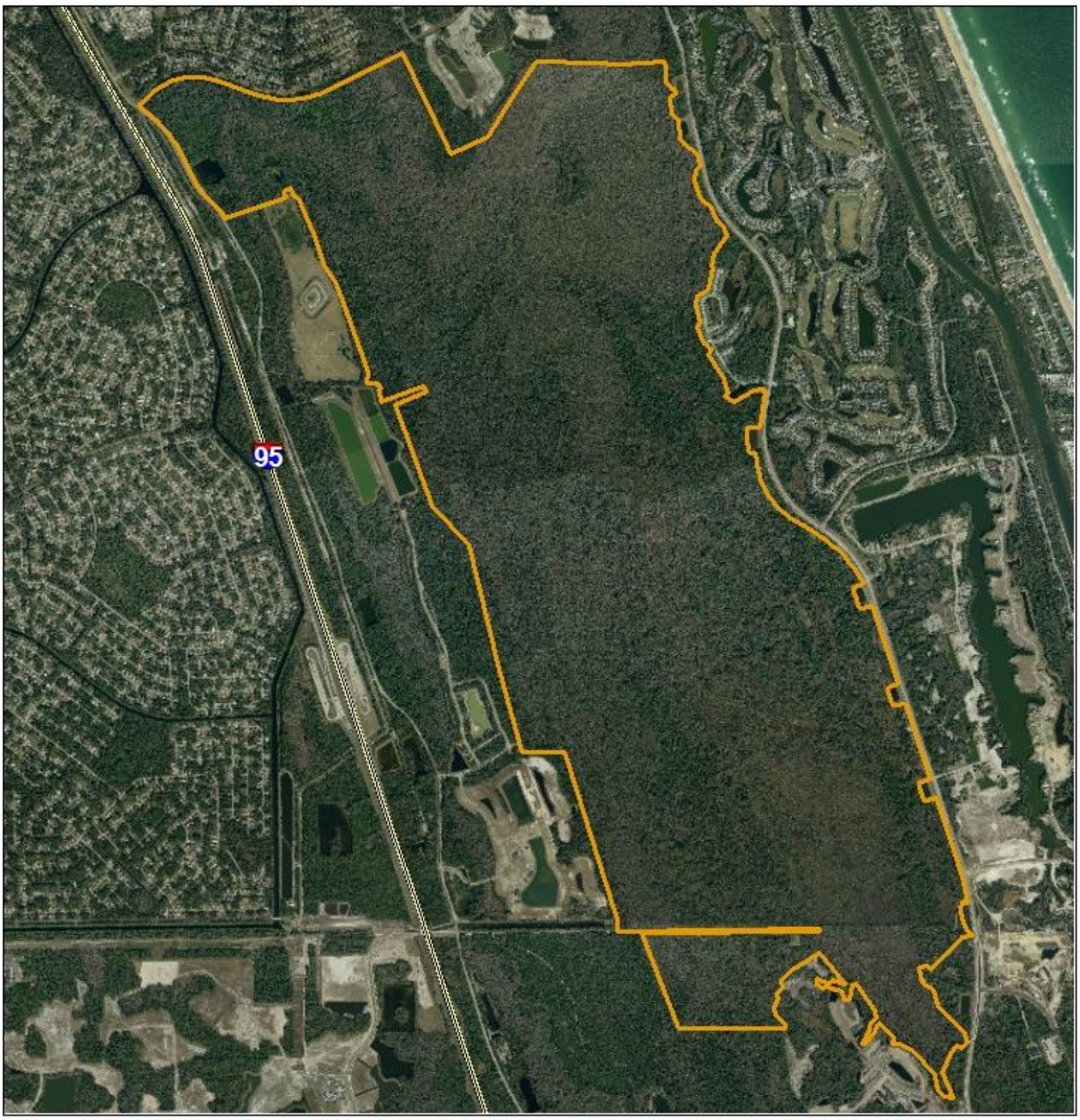

Graham Swamp Conservation Area
Figure 2 - 2009 Aerial Image

0.3 0.15 0 0.3 Miles

1 = 32500

Boundary

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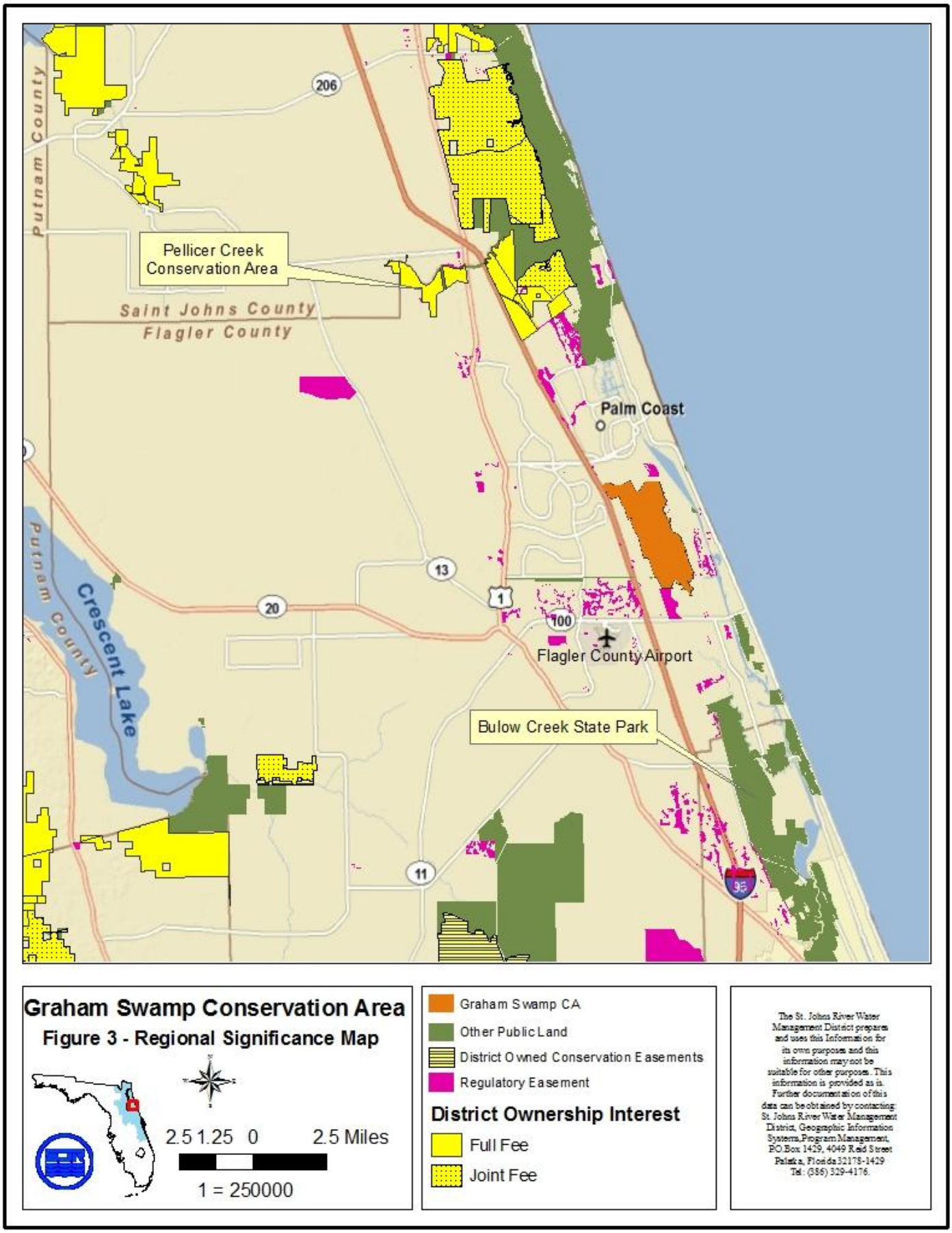
Putnam County
206
Pellicer Creek
Conservation Area
Saint Johns County
Flagler County
Palm Coast
Putnam County
Crescent Lake
13
1
20
100
Flagler County Airport
Bulow Creek State Park
11
95
Graham Swamp Conservation Area
Figure 3 - Regional Significance Map
2.5 1.25 0 2.5 Miles
1 = 250000
Graham Swamp CA
Other Public Land
District Owned Conservation Easements
Regulatory Easement
District Ownership Interest
Full Fee
Joint Fee
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Acquisition History

The GSCA is comprised of two (2) parcels totaling approximately 3,170 acres (Figure 4). The following properties were purchased using funding sources as indicated and were incorporated into the conservation area as they were acquired.

ITT Palm Coast – Graham Swamp (3,055 acres) Land Acquisition number 1995-053

This parcel of the Graham Swamp Conservation Area was acquired on December 27, 1995 using Preservation 2000 funding as part of the ITT Community Development Corporation acquisition. This acquisition consisted of two separate tracts totaling ~6,495-acres. The two tracts were designated as separate conservation areas, Graham Swamp Conservation Area and Pellicer Creek Conservation Area.

ITT Graham Swamp/Colbert Lane (115 acres) Land Acquisition number 1999-031

The ITT Graham Swamp/Colbert Lane parcel was acquired through mitigation donation on February 17, 1999 for the Colbert Lane roadway extension project.

Local Government Land Use Designation

Flagler County

According to the current Flagler County Comprehensive Plan, the Future Land Use designations for the conservation area are Conservation and Recreation and Open Space. The goals of the Conservation land use category include the conservation, protection and management of the natural resources of Flagler County to ensure the highest environmental quality possible. The goals and objectives of the Recreation and Open Space element are to:

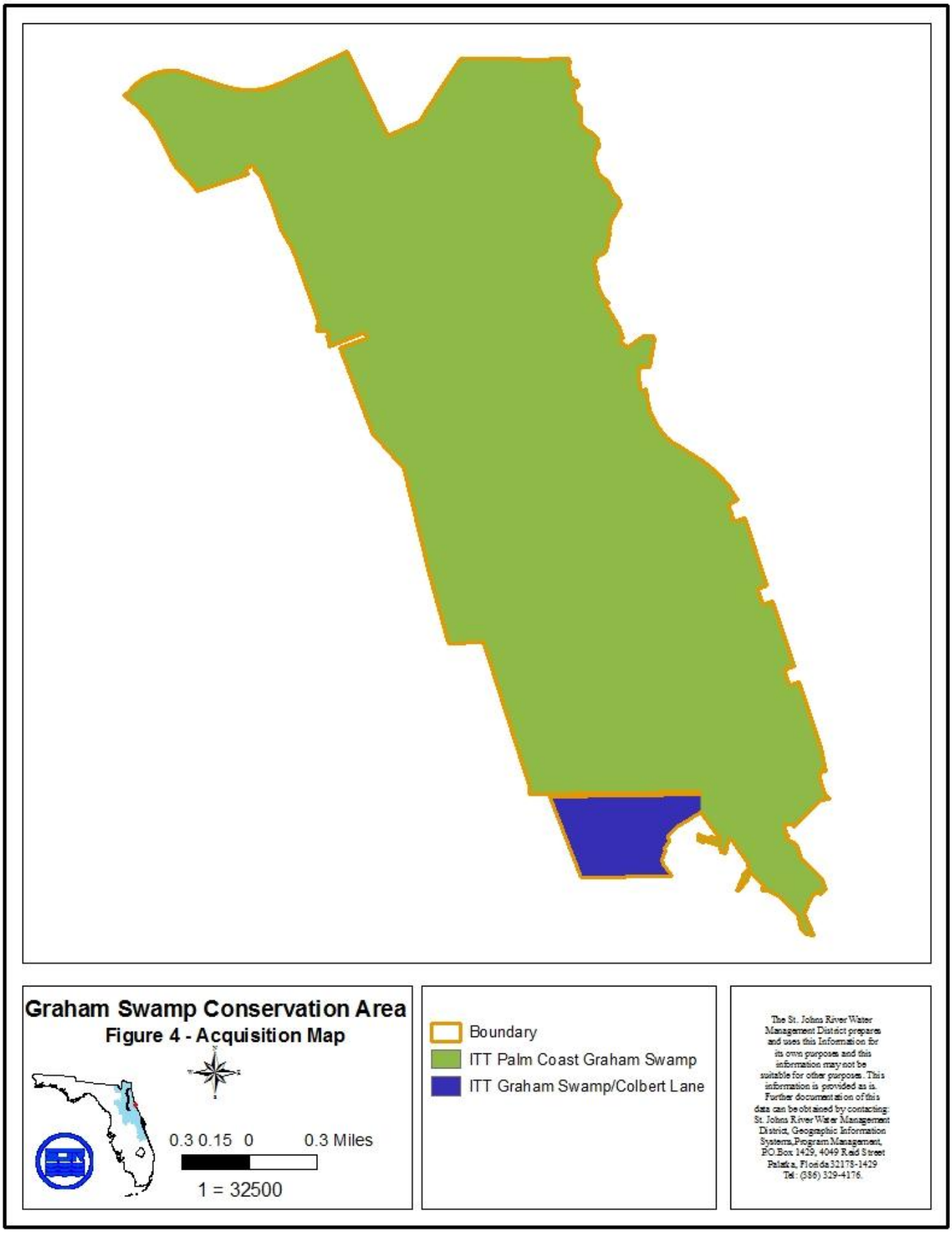
- ensure provision of sufficient parks, open spaces, and recreation facilities and programs
- to preserve and protect open spaces and other natural features with recreation potential
- to provide a system of parks, open space, recreation facilities, trails, and greenways
- to enhance public access to the park system and natural resources of the County.

NATURAL RESOURCES OVERVIEW

Topography and Hydrology

Graham Swamp Conservation Area lies within the St. Augustine-Edgewater Ridge within the Central Atlantic Coastal strip; a subdistrict of the Eastern Flatwoods District.

The Eastern Flatwoods District is also called the coastal lowlands and has elevations generally less than 90 feet (Brooks). The conservation area is generally flat and on


Graham Swamp Conservation Area
Figure 4 - Acquisition Map
0.3 0.15 0 0.3 Miles
1 = 32500
Boundary
ITT Palm Coast Graham Swamp
ITT Graham Swamp/Colbert Lane
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average, elevations within the conservation area range from 5 to 25 feet above sea level, with the highest elevations occurring on the upland fringes of the property.

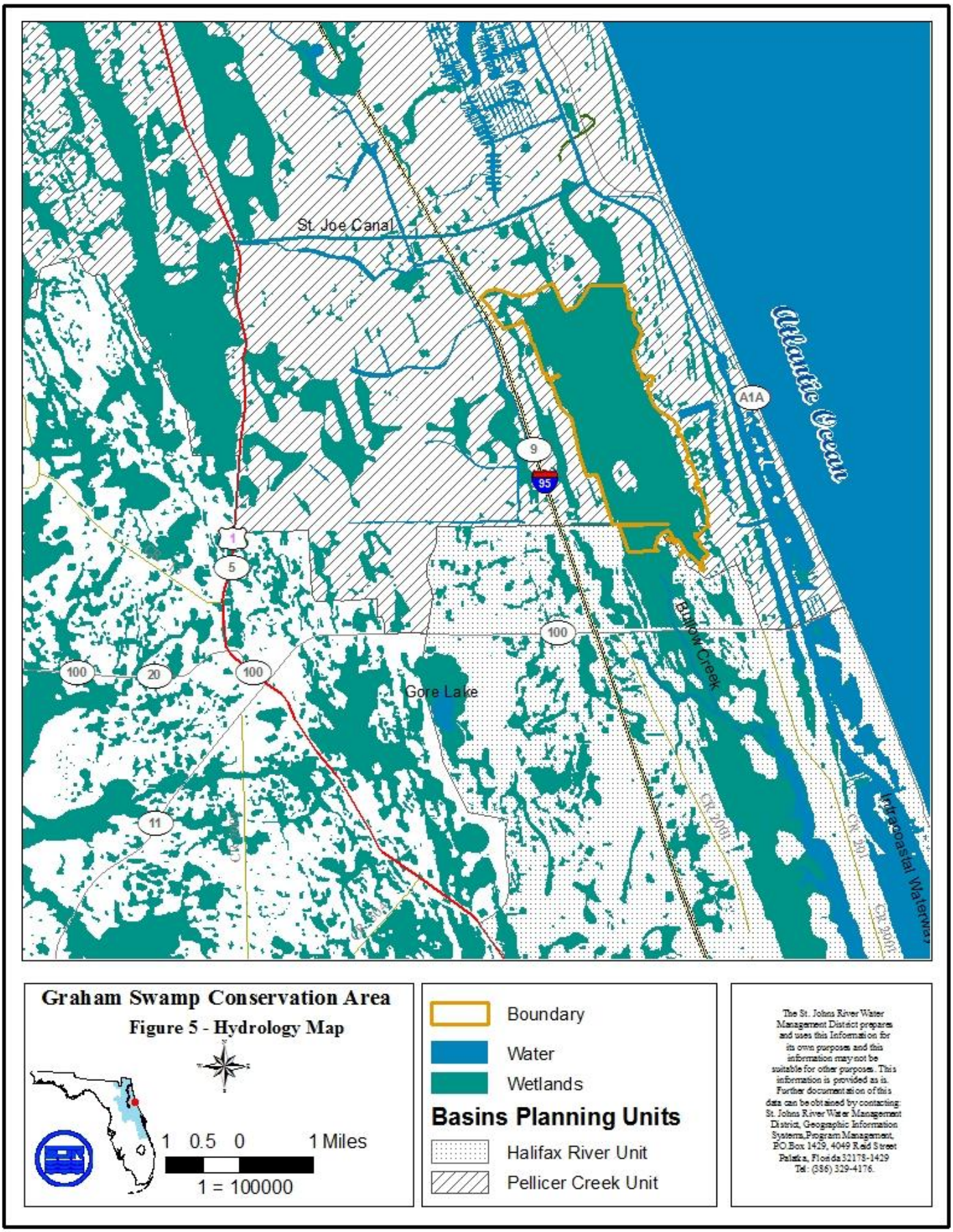
The most significant surface hydrological feature of the conservation area is Graham Swamp. Graham Swamp contributes to the headwaters of Bulow Creek located just south of the conservation area and flows south to the Halifax River. Historically, most of the flow associated with the swamp contributed to Bulow Creek; however, the hydrology of the swamp has been disturbed by construction of the Lehigh Railroad bed, stormwater canals, and road construction. Primary water inputs to the GSCA are received in the southwestern portion of the property via the Lehigh Canal that drains residential areas to the west. Outflows draining directly into the Intercoastal Waterway are located on northeast boundary. Following the construction of the Lehigh Railroad bed, water flow to the south ran via culverts along the bed. At the time of acquisition, these culverts were severely damaged and significantly impeded discharge to Bulow Creek. As part of a mitigation project indentified by the District, the City of Palm Coast, and the Army Corp of Engineers, these culverts have been replaced, increasing outflow to Bulow Creek. Figure 5 depicts the hydrologic features of the GSCA and surrounding area.

Natural Communities

The 3,170 acres that comprise the GSCA consist primarily of basin swamp, floodplain swamp, and mesic flatwoods (Figure 6). Table 1 details the percent coverage associated with each natural community documented within the conservation area. Information relative to the natural communities within the conservation area is derived from several sources including timber stand assessments and personal observations of District staff. Additionally, the general natural community descriptions are characterized using descriptions published in the Florida Natural Areas Inventory's (FNAI) *Guide to the Natural Communities of Florida.* Natural community ranking definitions are listed in Addendum 1.

Table 1 – Natural Community Coverages

Community Type	Acres	Percent Coverage	FNAI Ranking
Basin Swamp	2529	80%	
Floodplain Swamp	187	6%	G4/S4
Mesic Flatwoods	164	5%	G4/S4
Wet Flatwoods	129	4%	
Scrubby Flatwoods	35	1%	
Depression Marsh	13	<1%	G4/S4
Basin Marsh	5	<1%	
Altered Landcover Type			
Spoil Area	91	3%	
Impoundment/Artificial Pond	7	<1%	
Road/Trail	7	<1%	
Utility Corridor	3	<1%	
	3,170	**100%**	


St. Joe Canal
Atlantic Ocean
A1A
9
95
1
5
100
20
100
Gore Lake
Blow Creek
11
Intracoastal Waterway
Graham Swamp Conservation Area
Figure 5 - Hydrology Map
1 0.5 0 1 Miles
1 = 100000
Boundary
Water
Wetlands
Basins Planning Units
Halifax River Unit
Pellicer Creek Unit
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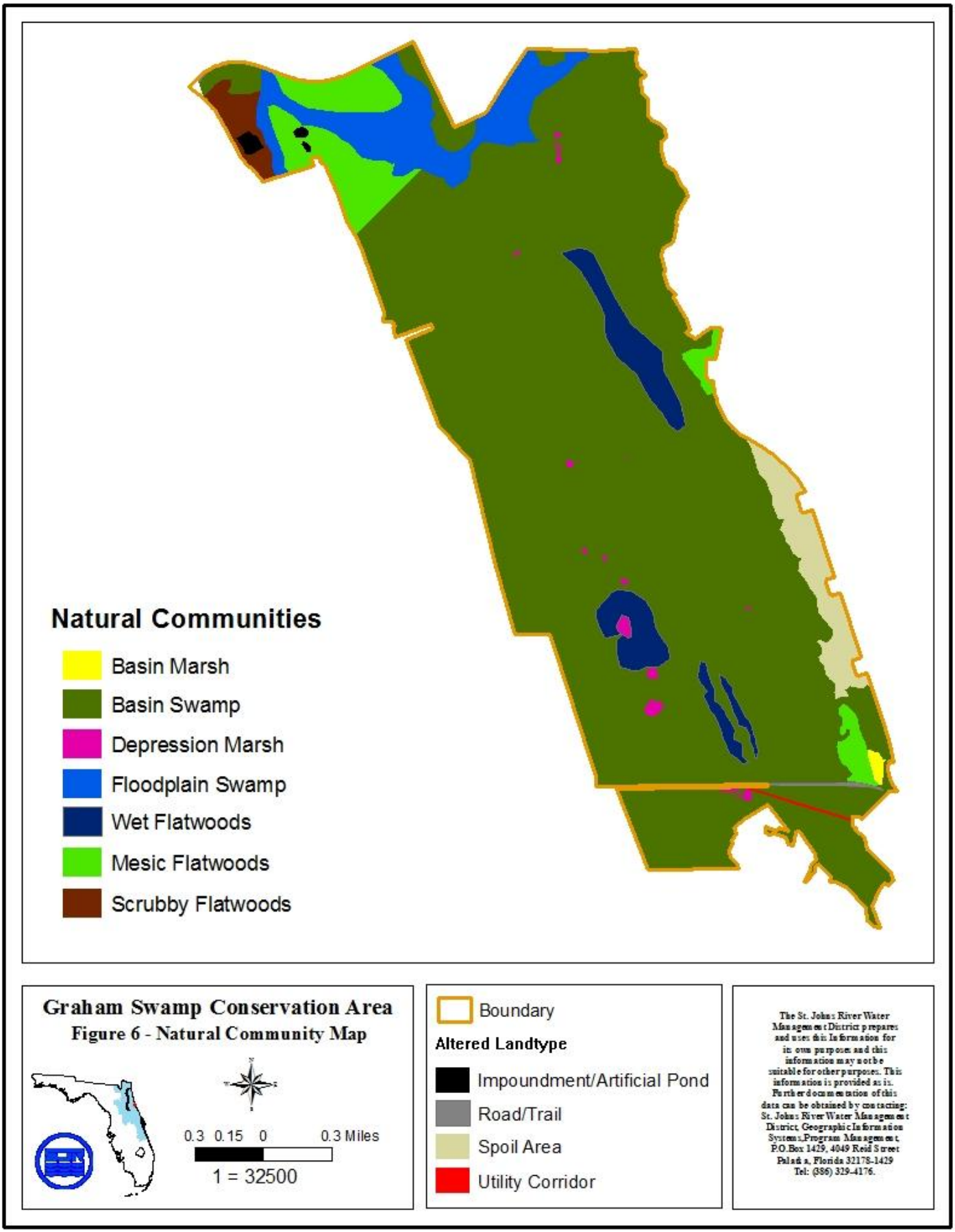
Natural Communities
Basin Marsh
Basin Swamp
Depression Marsh
Floodplain Swamp
Wet Flatwoods
Mesic Flatwoods
Scrubby Flatwoods
Graham Swamp Conservation Area
Figure 6 - Natural Community Map
0.3 0.15 0 0.3 Miles
1 = 32500
Boundary
Altered Landtype
Impoundment/Artificial Pond
Road/Trail
Spoil Area
Utility Corridor
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Pine Flatwoods

Flatwoods communities typically occur in low areas with little topography and may be further classified as wet, mesic, or scrubby. Wet, mesic, and scrubby flatwoods occur within the GSCA. Alterations from past management activities, hydrologic disturbances, and prolonged absence of fire make distinguishing these areas difficult. Natural community reclassification and refinement may occur over time.

Historically, portions of the conservation area were used as spoil deposition sites from mining activities associated with a nearby coquina quarry during the 1960s and 70s. Aside from those activities associated with coquina mining, historic land uses or management practices for the conservation area are unknown.

Mesic Flatwoods (164 acres)

Soils that support mesic flatwoods communities are generally poorly drained, acidic, and sandy soils deposited on ancient, shallow seabeds. Many flatwoods communities have a clay hardpan. Hardpan soils become saturated during the rainy season causing the accumulation of surface water, inversely, during dry periods, the hardpan layer prevents low groundwater from rising, creating dry, droughty conditions. The presence of the hardpan translates to extreme seasonal fluctuations in the amount of water available to support plant life. These seasonal hydroperiods are essential in the maintenance of the flatwoods system.

Intact mesic flatwoods typically have a layered appearance, with a distinct, high, discontinuous canopy, low shrub layer, and diverse herbaceous layer. The canopy densities are variable and may include (depending on location) longleaf pine (*Pinus palustris*), slash pine (P. *elliottii*), loblolly pine (*P. taeda*), or pond pine (*P. serotina*). Another recognized variation of the flatwoods natural community includes a cabbage palm overstory. The shrub layer may include a mixed palate or be dominated by species such as saw palmetto (*Serenoa repens*), wax myrtle (*Myrica cerifera*), and numerous members of the Ericaceae family. The herbaceous coverage may be dominated by wiregrass, however species abundance and diversity is often dictated by the openness of both shrub and canopy layers.

The mesic flatwoods communities within the conservation area are disturbed, with the most significant alterations being from prolonged fire suppression. Groundcover assemblages are suppressed and in some areas are void of these components completely. Pine species present within the flatwoods communities on the conservation area include longleaf, slash, loblolly, and sand pine.

Fire is an important physical factor associated with the shaping and maintenance of this community type. Natural fire return intervals in mesic flatwoods are approximately every one to eight years. Fires in well-maintained mesic flatwoods tend to burn quickly and at relatively low temperatures. In areas of prolonged fire exclusion, altered

hydrology, or hardwood encroachment higher soil and fuel moistures may require more extreme conditions to facilitate a fire, causing fires to be more catastrophic in nature.

Wet Flatwoods (129 acres)

Soils that support wet flatwoods communities are generally very poorly drained sandy soils that may have a mucky texture in the upper horizons. Wet flatwoods occur as ecotonal areas between the drier mesic flatwoods and wetter areas such as bogs or swamps. They may also occur in broad, low flatlands embedded within these communities.

Well-maintained wet flatwoods exhibit a relatively open-canopy forest of scattered pine trees (longleaf, loblolly, slash, or pond) or cabbage palms (*Sabal palmetto*) with either a thick shrubby understory and sparse groundcover or sparse understory with dense groundcover. Understory species of the subcanopy and shrub layers may include sweetbay (*Magnolia virginiana*), loblolly bay (*Gordonia lasianthus*), and saw palmetto, as well as a suite of ericaceous plants. The groundcover layer may include species such as wiregrass, blue maidencane (*Amphicarpum muhlenbergianum*), and numerous hydrophytic species. The variations in structure and composition may be attributed to subtle edaphic differences as well as hydrologic and fire regimes.

The wet flatwoods plant community is fire dependant with return intervals ranging from three to ten years. Many of the historic wet flatwoods within the conservation area exhibit signs of successional changes, likely due in part to the prolonged absence of fire.

Scrubby Flatwoods (35 acres)

Scrubby flatwoods are characterized as an open canopy forest of widely scattered pine trees with a sparse shrubby understory and numerous areas of barren white sand. The vegetation is a combination of mesic flatwoods and scrub species; scrubby flatwoods often occur on broad transitions or ecotones between these communities.

Plants and animals of this community type, documented within the conservation area, include slash pine, sand pine, myrtle oak (*Quercus myrtifolia*), saw palmetto, and runner oak (*Quercus pumila*).

Fire is an integral component in the perpetuation of this community type. The open areas of bare sand, sparse groundcover vegetation and coverage of largely incombustible oak leaf litter typical of most scrubby flatwoods results in a fire return interval of between 8 and 25 years. Examples of scrubby flatwoods with a higher herbaceous or saw palmetto component may burn at a lower fire return frequency.

The scrubby flatwoods within the GSCA are located on the northwest portion of the property. They exhibit a dense canopy of approximately 20-year-old sand pine with a sparse midstory and groundcover layer and many barren sandy areas.

Basin Swamp (2529 acres)

Basin swamps are large irregularly shaped basins that are thought to have developed in oxbows of former rivers or in ancient coastal swales and lagoons that existed during higher sea levels. Soils that support basin swamp communities are acidic, nutrient-poor peats often overlying a clay lens or other impervious layer. This clay lens or impervious layer may cause a perched water table above that of the adjacent uplands, causing standing water for most of the year. While basin swamps are not associated with rivers, they may contain streams and sloughs that flow during periods of high water.

The basin swamps within the GSCA are either dominated by or have a heavy component of cypress with typical hydroperiods of approximately 200-300 days and though infrequent, fire is essential for the maintenance of these natural communities. Fire return intervals in basin swamps may range from 5 to 150 years, with lower return intervals occurring on the edges.

The expansive basin swamp covers most of the conservation area. The swamp's hydrology has been altered by past disturbances that include an abandoned railroad bed, stormwater canals, and several interior ditches. The species compositions of this natural community type within the conservation area are diverse and are similar to those of the floodplain swamp. Additionally, the presence of cedar and cabbage palm along the slightly higher ridges within the swamp and along the transitional areas may indicate the presence of a hydric hammock community. Further investigation is needed to make this determination and natural community reclassification may occur.

Floodplain Swamp (187 acres)

Floodplain swamp communities typically occur on flooded soils along stream channels and within river floodplains. The floodplain swamp communities within the conservation area occur on the northern end of the conservation area. While these areas are altered from ditches and canals, which were constructed prior to acquisition, these communities are largely intact.

Soils that support floodplain swamp communities are variable, but may include a mixture of sand, organic, and alluvial material. Some floodplain swamps associated with smaller streams or in areas of low stream velocity may have peat present in the soils. The most important physical factor associated with the shaping and maintenance of the floodplain swamp is the hydroperiod. Extended periods of inundation, which may last for most of the year, are common in the floodplain swamp environment. Alterations to the hydrology within the floodplain swamp, particularly a reduction in the duration of inundation periods may have damaging consequences to the entire river system and associated flora and fauna. Since this community type is maintained by hydrologic regimes, it is not fire dependent.

Typical of the floodplain swamp system, the examples of this community type within the conservation area include a closed-canopy forest of hydrophytic, buttressed trees

including bald cypress (*Taxodium distichum*) and water tupelo (*Nyssa aquatica*). These areas are located in the northern reaches of the property.

Spoil Areas (91 acres)

Spoil areas are an altered land type. They include areas where dredge or spoil material is deposited and may be re-colonized by plants. Spoil areas within the conservation area are located along the eastern boundary. The spoil is from an adjacent coquina quarry and was deposited during the 1960s and 70s. The Spoil areas were planted in slash pine and have been subsequently thinned. Groundcover and shrub layers are sparse and discontinuous but include broomsedge (*Andropogon glomeratus*), coontie (*Zamia pumilia*), prickly pear (*Opuntia humifusa*), and rusty staggerbush (*Lyonia ferruginea*). The primary carrier of fire in these areas is leaf litter from pines.

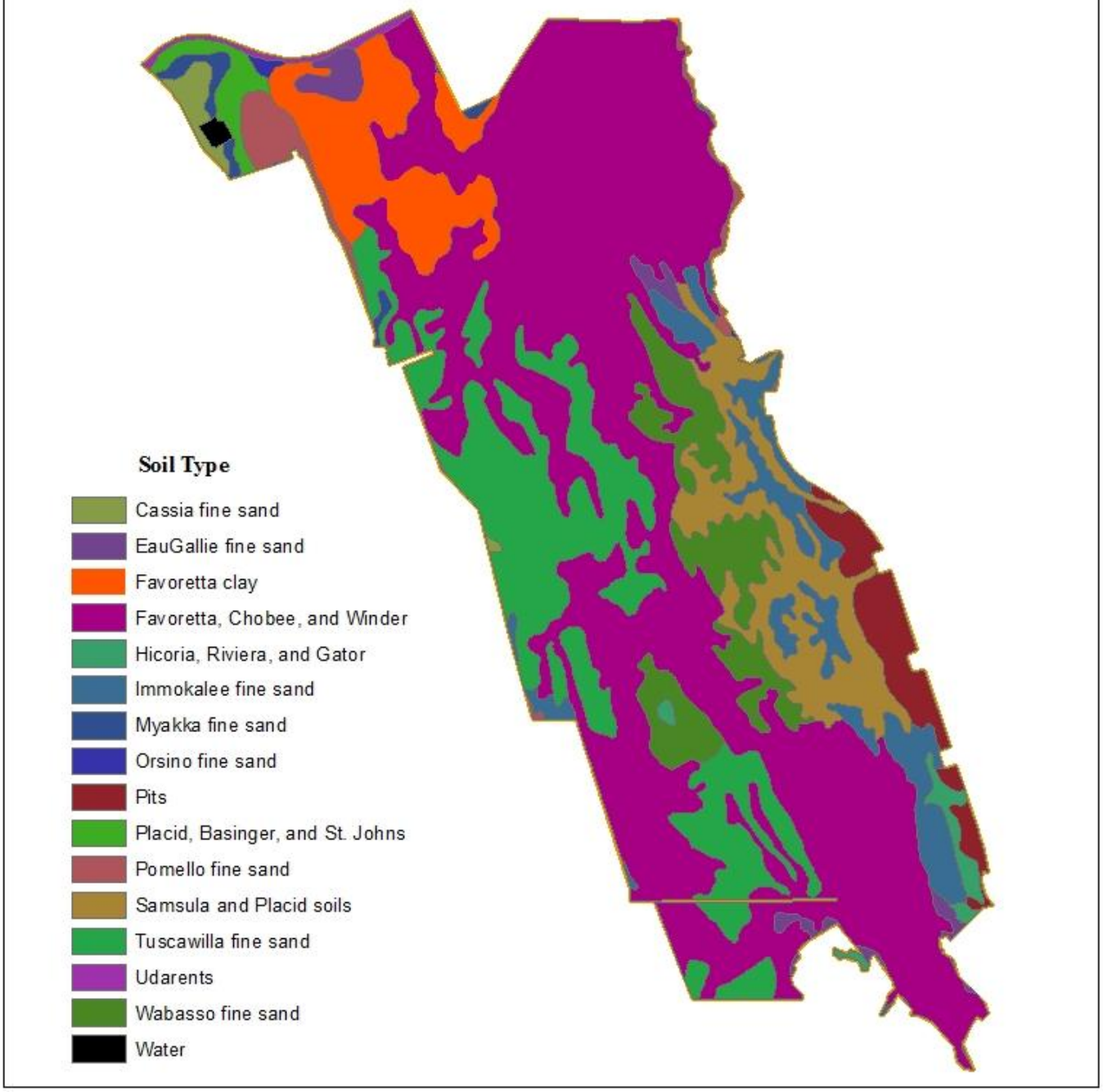
Depression Marsh (*13 acres*)

Depression marsh communities typically occur embedded within a matrix of well-maintained pyric plant communities. Depression marshes are typically found on flat landscapes throughout Florida. They develop when the overlying sand has slumped into a depression in the limestone underlayment. Soils are typically depressional phases of fine sands. An important physical factor associated with the shaping and maintenance of the depression marsh is the hydroperiod. Depression marshes are maintained in part against woody shrub invasion by fluctuations in water levels associated with rainfall. These seasonal ponds are important feeding grounds for numerous species of wildlife, but are particularly important for many amphibians that require breeding sites that are free of predatory fish. (Moler, 1987)

Many of the areas delineated as depression marsh within the conservation area may in fact be remnants of a large herbaceous basin marsh evident on the 1940s aerial imagery. The majority of this large basin marsh has succeeded to basin swamp, with the isolated ponds remaining. These areas are not typical of a depression marsh in that they are imbedded within a basin swamp and not a pyric plant community. Reclassification of these areas may occur.

Soils

According to data produced by the United States Department of Agriculture, Soil and Conservation Service, 22 different soil types are within the GSCA. Figure 7 contains a soils map of the conservation area. The Flagler County Soil Survey provided information used to develop descriptions of the predominant soil series found within the GSCA. The soil descriptions are located in Addendum 2.



Graham Swamp Conservation Area

Figure 7 - Soils Map

0.3 0.15 0 0.3 Miles

1 = 32500

Boundary

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PAST MANAGEMENT SUMMARY

This section describes management strategies outlined in the 2004 land management plan and provides the status of each item.

Forest Management 2004 Plan Strategy	Status
Monitor for disease of pest infestations.	District staff regularly monitors for the presence of insect/pest infestations and disease in pine dominated systems within the conservation area. Small areas of pine trees infected with Ips beetles were felled with chainsaws in 2006.

Cultural Resources 2004 Plan Strategy	Status
Identify and report any new sites to Florida Division of Historical Resources.	No new sites have been identified.

Access 2004 Plan Strategy	Status
Maintain two existing parking areas.	The County maintains the existing parking areas.
Coordinate with Flagler County on appropriate location of Lehigh Rail Trail parking area.	The connection to the Lehigh Rail Trail has been implemented; however, no parking area has been installed. Discussions continue as to the best location.

Recreation 2004 Plan Strategy	Status
Seek an agreement with an agency or organization that would be responsible for assisting with the promotion of proper usage of trails.	The County and District have coordinated with private cycling clubs for the proper maintenance and promotion of the trails.
Coordinate with Flagler County on development of Lehigh Rail Trail.	District staff coordinated with Flagler County on the development and implementation of a connector trail through GSCA to the Lehigh Trail.
Maintain kiosk, entrance sign, and current trails.	Kiosks, entrance signage, and trails are maintained by both County and District staff.

Security 2004 Plan Strategy	Status
Regularly conduct site visits.	The County and District staff conduct security site visits on a regular basis. Additionally, the District coordinates with a contract security firm to augment security on the conservation area.

Cooperative Agreements 2004 Plan Strategy	Status
Complete the Lehigh Trail agreement.	This agreement was completed on August 3, 2004. Trail construction was complete in 2009.

IMPLEMENTATION

The following sections outline land management strategies for resource protection, land use, and administration on the conservation area for the next five years.

RESOURCE PROTECTION AND MANAGEMENT

Water Resource Protection

While most wetlands protection was accomplished through acquisition, portions of the wetlands and surface waters within the conservation area are disturbed. Hydrologic disturbances within the conservation area include roads, tram roads, abandoned rail beds ditches, culverts, and canals.

A stormwater canal that drains water from developed areas to the west flows into the conservation area near the southwest corner of the property, just north of the abandoned railroad bed. The property encompasses most of Graham Swamp, which through a series of culverts is connected to the Bulow Creek slough to the south. There are several small canals and ditches within the conservation area that appear to have little effect on the functioning of the swamp, and have been colonized by site appropriate species. It is the thinking of the District that any restoration attempts would prove to be more detrimental than the existing disturbance.

Roads and associated ditches exist on all parcels within the conservation area, providing access for both management and recreation. The District may make improvements to roads and trails within the conservation area, helping to reduce the potential for erosion.

Water Resource Strategies

- Regularly inspect roads, canals, ditches, culverts, fire lines, and trails for erosion problems.
- Locate and GPS all culvert locations and incorporate into conservation area database. Include type, length and diameter of each culvert.

Flora and Fauna

The Graham Swamp Conservation Area protects important habitat for a variety of floral and faunal species. Species such as Florida gopher tortoise, river otter, pigmy rattle snake, grey squirrel, white-tailed deer, and osprey are known to occur within the conservation area.

While there are no listed species requiring special management known to occur within the conservation area, two active American bald eagle nests occur within ½ mile or less of the conservation area boundaries.

Floral and Faunal Strategies

- Conduct diversity surveys and develop species lists.
- Continue to monitor for the presence of listed species.

Forest and Fire Management

Forest Management

The upland portions of the conservation area are limited to small fringes along the edge of the swamp. These areas are remnants of pine dominated pyric plant communities. Portions of these upland areas located along the eastern edge of the property were utilized as spoil deposition sites during the 1960s and 70s. Spoil from the nearby coquina quarry was deposited and remains in mounds on the conservation area. These spoil mounds have since colonized with upland plant species and include a canopy of planted slash pine. The District conducted a thinning operation in the area of the spoil mounds in 2005, bringing the residual basal area of the slash pine to approximately 55 sq. ft/acre.

Chapter 253.036, Florida Statutes requires the lead agency of state lands to prepare a forest resource analysis, "…which shall contain a component or section…which assesses the feasibility of managing timber resources on the parcel for resource conservation and revenue generation purposes through a stewardship ethic that embraces sustainable forest management practices if the lead management agency determines that the timber resource management is not in conflict with the primary management objectives of the parcel." The management objectives of this property may require pine harvesting. Primary objectives of harvesting on the GSCA will be in response to disease, insect infestation, or mortality from wildfire or wind events. Additional, select harvesting may also be required to remove hazardous trees and snags. All revenue generated through forest management is applied towards the District's Land Management Division budget to offset management costs for the property.

While this area is a low priority for harvest operations, forest management activities anticipated during the scope of this plan include evaluating the potential for conducting a harvest of approximately 85 acres of pine located in the east central and northwestern portions of the property (Figure 8.) Any harvest operations in these portions of the conservation area will need to be coordinated with Flagler County and/or the City of Palm Coast where possible impacts or closures to recreational trails may occur or where crossing County or City property may be necessary.

The District will abide by Florida Silviculture Best Management Practices and will target the achievement of appropriate overstory species in proper stand densities as described in The District Forest Management Plan. In addition to planned forest management activities, the District will harvest trees as needed in the case of insect infestations, disease, and damage from severe weather, wildfire, or other occurrences that could jeopardize the health of natural communities.

Graham Swamp Conservation Area

Figure 8 - Potential Harvest Areas

0.30.15 0 0.3 Miles

1 = 32500

Boundary

Potential Harvest Areas

The St. Johns River Water Management District prepares and uses this information for its own purposes and this information may not be suitable for other purposes. This information is provided as is. Further documentation of this data can be obtained by contacting: St. Johns River Water Management District, Geographic Information Systems,Program Management, P.O.Box 1429, 4049 Reid Street Palatka, Florida 32178-1429 Tel: (386) 329-4176.

Fire Management

The proximity of this conservation area to developed, smoke sensitive areas and the predominance of non-pyric plant communities considerably limits the practicality and ability to implement prescribed burning. Critical smoke sensitive areas include Colbert Lane, Old Kings Road, SR 100, the Flagler County Airport, and intensively developed residential, commercial, and industrial areas. Smoke management concerns and smoke radii for the GSCA are depicted in Figure 9.

The application of prescribed fire is not a priority on this property, however, with the assistance of the Florida Division of Forestry (FDOF), the mesic flatwoods on the northern portions of the property may be considered for prescribed fire. No prescribed fire activities are forecast elsewhere on the property during the scope of this plan.

The impracticality of implementing prescribed fire as a maintenance or restoration tool may cause it to be necessary to implement alternative management methods. In an effort to mimic the effects of fire on natural systems, the District may employ management methods such as selective herbicide treatments, mowing, roller chopping, and overstory manipulation.

Forest and Fire Management Strategies

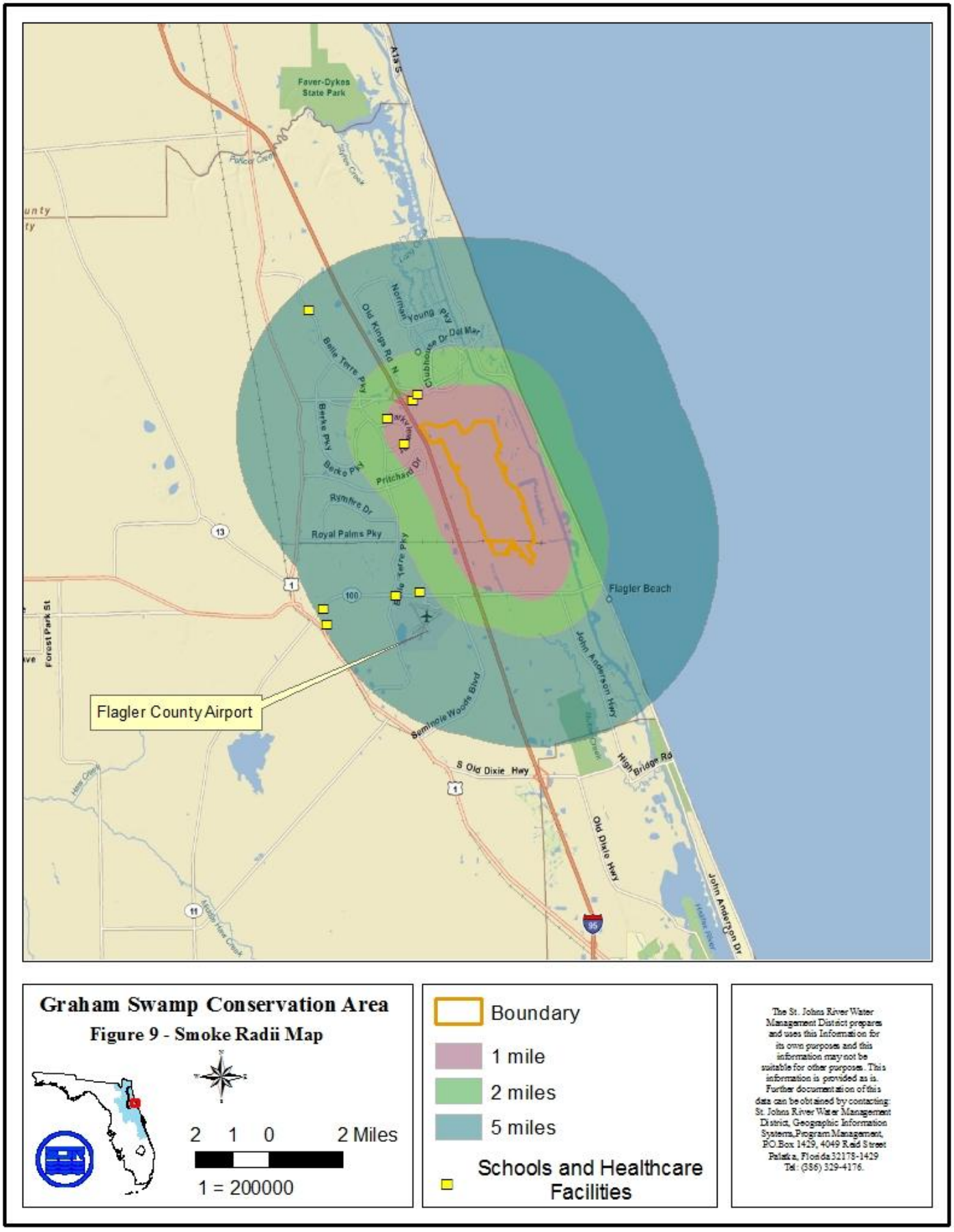
- Evaluate the harvest potential for natural pine located along the north and northwest boundaries.
- Evaluate the potential for cooperative burning with FDOF in the natural pine areas along the north and northwest boundaries.

Exotic Species

Several exotic pest plants occur within the conservation area including Caesar weed (*Urena lobata*), Chinese tallow tree (*Sapium sebiferum*), and Brazilian pepper (*Schinus terebinthifolius*). The GSCA is part of the District's invasive plant management program. Exotic species control is necessary to inhibit the continued proliferation of exotic plants and integral in the maintenance and restoration of natural plant communities. While it is unlikely that the District will entirely eradicate invasive plants within the conservation area, achieving maintenance control of such species is targeted within the scope of this plan. At this level, the property is regularly monitored and treated as necessary.

Exotic wildlife species known to occur within the conservation area include feral hogs (*Sus scrofa*), brown anole (*Anolis sagreii*), and nine-banded armadillos (*Dasypus novemcinctus*). The County administers a special use authorization for the removal of feral hogs from the conservation area. The United States Department of Agriculture may be contracted to assist in the removal of feral hogs from the conservation area.

Laurel wilt, a disease of red bays (*Persea borbonia*) and other trees in the laurel family has been observed in red bay populations within the GSCA. Caused by a fungus, laurel wilt is carried and transmitted by the non-native red bay ambrosia beetle (*Xyleborus*


Graham Swamp Conservation Area
Figure 9 - Smoke Radii Map
2 1 0 2 Miles
1 = 200000
Boundary
1 mile
2 miles
5 miles
Schools and Healthcare Facilities
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Flagler County Airport
Flagler Beach
Faver-Dykes State Park
Old Kings Rd N
Belle Terre Pky
Royal Palms Pky
Pritchard Dr
Seminole Woods Blvd
S Old Dixie Hwy
Old Dixie Hwy
John Anderson Hwy
High Bridge Rd
Forest Park St

glabratus.) The beetles generally attack healthy mature trees and the subsequent fungal infection causes the flow of water to be restricted to the leaves and branches, eventually causing mortality. Laurel wilt is devastating to infected populations and there are currently no established methods for controlling the laurel wilt disease in wild populations of *Persea*.

This disease has the potential to have detrimental effects on wildlife populations, including the palamedes swallowtail butterfly (*Papilio palamedes*). The palamedes is relatively common in Florida. Larval host plants for the palamedes swallowtail butterfly include species of *Persea*, but are primarily red bay.

Additional information on laurel wilt disease and the red bay ambrosia beetle can be found at http://www.fl-dof.com/publications/fh_pdfs/Laurel_Wilt.pdf and http://edis.ifas.ufl.edu/HS391.

Exotic Species Strategies

- Continue to monitor for exotic species and implement appropriate action.
- Continue to administer feral hog removal SUA.

Cultural Resources Protection

A review of the Department of State, Division of Historical Resources (DHR) indicates two documented Florida Master Site File cultural sites within the conservation area. If any additional sites are located, District staff will document and report sites to the DHR. Land management activities that may affect or impact these resources will be evaluated and modified to reduce the potential for disturbance of the identified sites. Additionally, detrimental activities discovered on these sites will also be reported to the DHR and appropriate law enforcement agencies. Due to District and State policy, the location of the sites is not identified on public maps.

Cultural Resources Strategies

- Identify and report any newly identified sites to the DHR.
- Identify and report any detrimental activities to the sites to the DHR and law enforcement.
- Modify land management activities that may affect cultural resources to minimize the potential for disturbance.

LAND USE MANAGEMENT

Through an intergovernmental management agreement between the District and the County, the County serves as lead managing agency for all access, security, and recreation related activities. The District cooperates with the County to augment these efforts as needed.

Access

Two public parking areas are located on the conservation area, one off Colbert Lane and the other off Old Kings Road. The parking areas are fenced, and have walkthroughs

providing for recreational access. There is an additional pedestrian access point located between the Lehigh Trail and the designated parking area on Colbert Lane. Informative kiosks are provided at the parking area trailheads. There is a possibility that the County will establish a new parking area off Colbert Lane near the railroad bed and newly established trail connection. The District will coordinate with the County to determine the optimal location for a new parking area that avoids wetland impacts.

There are currently four (4) gates providing management access to and across the property. These gates are monitored regularly for maintenance and/or repair needs from normal wear and tear and vandalism. Figure 10 depicts the location of gates and parking areas on the conservation area.

Access Strategies

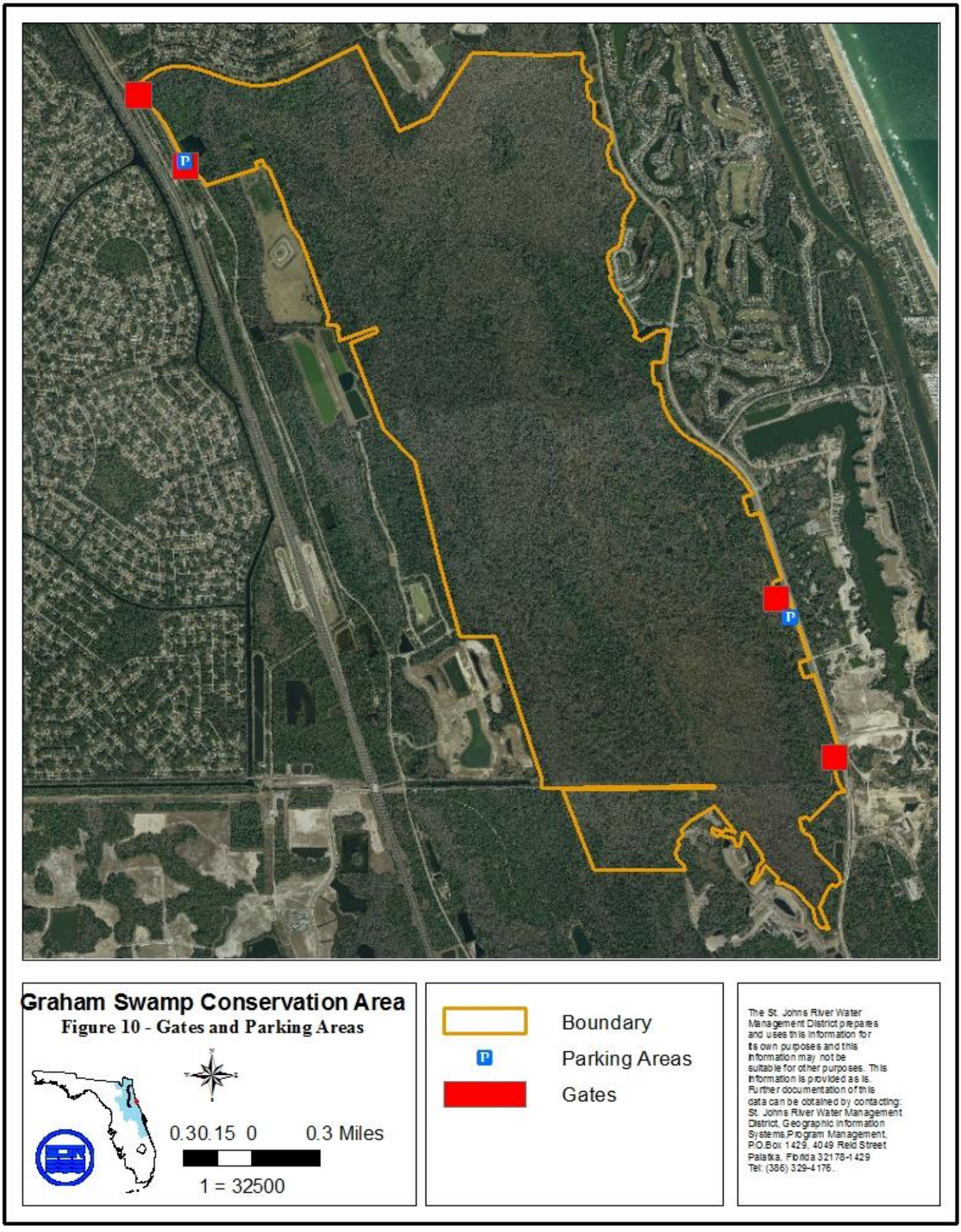
- Maintain parking areas, signs, gates, and trails.
- Coordinate with Flagler County regarding location of new parking area off Colbert Lane.

Recreation

Recreational opportunities available within the conservation area include hiking, bicycling, wildlife viewing, and fishing. This conservation area is also a popular area for geo-caching.

The entire conservation area is open to the public for recreational purposes. An approximately six (6) mile single-track mountain bike trail system is established on the conservation area providing for mountain biking opportunities through the pine forest on the remnant spoil mounds. In an effort to manage for the safety of other users, The County and the District coordinate with a local mountain biking groups to provide maintenance of the intricate trails and the promotion of the proper usage of such trails. The mountain bike trail volunteers also maintain a hiking trail adjacent to the bike trails.

The abandoned Lehigh railroad bed through the GSCA is incorporated into the Lehigh Greenway Trail (LGT), a paved Flagler County trail. This trail provides recreational opportunities, which include hiking, bicycling, and skating. The trail includes a 12' wide paved surface with fixed iron benches and waste receptacles. A raised boardwalk is incorporated into this trail, providing passage through the basin swamp. The LGT is part of a larger network of trails in Flagler County and connects the cities of Flagler Beach, Bunnell, and Palm Coast. Currently, the LGT connects to a County bike trail located on Colbert Lane along the eastern boundary of the conservation area, extending recreational opportunities for several miles to the north. The LGT trailhead on Colbert Lane lacks a parking area; trail users currently park on the road shoulder and right-of-way. The County and the District plan to explore the possibility of constructing a parking area on the conservation area, provided that the construction footprint does not impact any jurisdictional wetlands. The County received funding for the development of the LGT through a grant from the Florida Department of Transportation (FDOT).


Graham Swamp Conservation Area
Figure 10 - Gates and Parking Areas
0.30.15 0
0.3 Miles
1 = 32500
Boundary
Parking Areas
Gates
The St. Johns River Water Management District prepares and uses this information for its own purposes and this information may not be suitable for other purposes. This information is provided as is. Further documentation of this data can be obtained by contacting: St. Johns River Water Management District, Geographic Information Systems,Program Management, P.O.Box 1429, 4049 Reid Street Palatka, Florida 32178-1429 Tel: (386) 329-4176.

Through an interlocal agreement between the City of Palm Coast (City), the County, and the District, the City is currently developing a multi use trail system (City Trail) on the north and west boundaries of the conservation area. Phase I of the trail, currently under construction, is approximately two (2) miles and is planned to span from the GSCA parking area off Old Kings Road north to the canal berm on the north boundary of the conservation area. The trail will then run east along the berm, crossing over the canal into where a spur trail will join from the housing development to the north of the canal. The main trail will continue northeast to Colbert Lane. Upon completion, Phase I of the City Trail will connect to the Flagler County bike path off Colbert Lane. Phase II of the trail development is conceptual, but is anticipated to extend the trail from the Old Kings Road parking area south along the western side of the property to the LGT and will traverse District, City, and private land. This portion of the trail, like Phase I, will be 10' wide constructed of crushed coquina, include two bridges, several sections of boardwalk, and will be compliant with the Americans with Disabilities Act (ADA). Completion of Phase I is anticipated in May 2010. Phase II is subject to FDOT funding.

The District constructed two elevated fishing platforms on the borrow pit pond located near the northwest corner of the property. These platforms are accessible from the Old Kings Road parking area. District staff maintain the information kiosks located at each parking area.

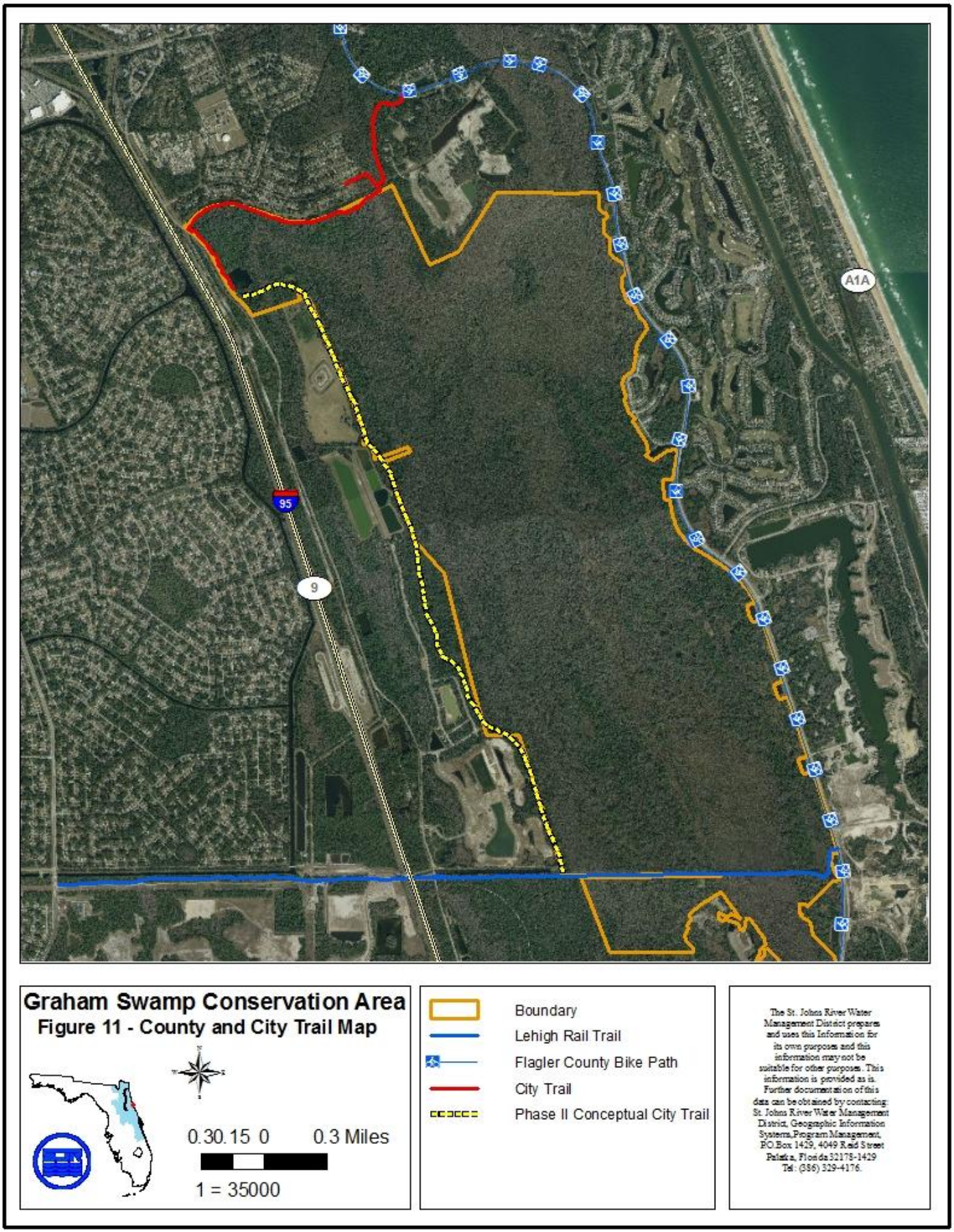
The County maintains trails within the conservation area by mowing trails and trail shoulders and by trimming low, overhanging branches. The County also provides for the removal of trash from receptacles in parking areas and along trails.

Figure 11 depicts the location of the Lehigh Greenway Trail and both phases of the City Trail as well as the Flagler County/Colbert Lane bike trail. Figure 12 depicts the location of the fishing platforms and interior hiking and mountain biking trails. The Flagler County Bike Routes Major 25 year plan is located in Addendum 3.

Any improvements will be incorporated into the next edition of the District's *Recreation Guide to District Lands*, which can be viewed online at floridaswater.com.

Recreation Strategies

- Continue trail maintenance.
- Continue coordination with City of Palm Coast and Flagler County to facilitate the construction of trails on the north and west boundaries.
- Continue maintenance of kiosks, informative panels, and fishing platforms.
- Include any recreation improvements on the District's web site and in the next edition of the District's *Recreation Guide to District Lands*.


A1A
95
9
Graham Swamp Conservation Area
Figure 11 - County and City Trail Map
0.30.15 0
0.3 Miles
1 = 35000
Boundary
Lehigh Rail Trail
Flagler County Bike Path
City Trail
Phase II Conceptual City Trail
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P
A1A
9
95
P
Graham Swamp Conservation Area
Figure 12 - Recreation Amenities
0.30.15 0
0.3 Miles
1 = 32500
Boundary
Hiking Trail
Pedestrian Walk Through
Fishing Platforms
Parking Areas
The St. Johns River Water Management District prepares and uses this information for its own purposes and this information may not be suitable for other purposes. This information is provided as is. Further documentation of this data can be obtained by contacting: St. Johns River Water Management District, Geographic Information Systems Program Management, P.O.Box 1429, 4049 Reid Street Palatka, Florida 32178-1429 Tel: (386) 329-4176.

Environmental Education
The District offers numerous educational opportunities in the form of online materials and workshops. Programs include Project Wet and the Great Water Odyssey. The former, available in Flagler County is a program designed to teach educators about water resources and is based on FCAT standards while the latter is an interactive, multidisciplinary educational experience offered free of charge to educators within the District. The Flagler County Legacy program is offered north of GSCA at the Princess Place Preserve.

Environmental Education Strategies
- Continue to offer environmental education opportunities.

Security
The boundaries of the GSCA were marked and posted soon after the original survey work was complete. While portions of the boundary were fenced prior to acquisition, some of the conservation area boundary, particularly through the forested wetlands, remains unfenced. District staff will evaluate the need for fencing in unfenced areas and incorporate all new fencing into future budget and annual work plans.

Security concerns include illegal motorized vehicle access, poaching, paintball activities, vagrancy, and other undesirable activity. Law enforcement for the property is administered by both the District and the County through a contract security firm as well as coordination with FWC, and local law enforcement. There is no security residence onsite.

Security Strategies
- Maintain signage, fencing, gates, and locks.
- Evaluate the need for new fencing.
- Continue coordination with private security firm, FWC, and local law enforcement.

ADMINISTRATION

Acquisition
There are no anticipated surpluses or acquisitions associated with the Graham Swamp Conservation Area in the next five years.

Acquisition Strategies
- Evaluate adjacent properties for potential acquisition.

Cooperative Agreements, Leases, Easements, and SUAs
In accordance with District Policy #90-16, the District promotes entering into agreements with other agencies and private parties for cooperation and coordination of management of the District's lands. These cooperative agreements serve to protect the District's water management interests and to enhance the management and public value of the land.

Table 2 – Agreements, Easements, and SUA Table

Agreement ID	Name	Type	Term
618	Graham Swamp Interlocal Agreement/Palm Coast Trail Project	Intergovernmental	20 years – auto renewal
549*	Mickey Lee Garrett/Trail Maintenance	SUA between County and Mr. Garrett	1 year – auto renewal
33	Intergovernmental Agreement – Flagler County	Management Designation	10 years - auto renewal
162*	Rodney E. Ryan – Feral Hogs	SUA between County and Mr. Ryan	1 year Auto Renewal
506	Intergov. Agreement SJRWMD/Flagler County – Lehigh Trail	Management Designation	5 year Auto Renewal

*Administered by Flagler County

Cooperative Agreements, Leases, Easements, and Special Use Authorization Strategies

- Coordinate with the County to ensure continued administration of feral hog SUA.
- Continue to administer the Trail Maintenance SUA.
- Continue to administer the Intergovernmental Agreement designating Flagler County lead managing agency.
- Continue to administer the Interlocal Agreement to facilitate the Palm Coast trail development project.
- Continue to administer the intergovernmental management agreement with Flagler County regarding the Lehigh Trail construction and maintenance.

IMPLEMENTATION CHART

Graham Swamp Conservation Area - Management Implementation Chart- 2010

TASK	RESPONSIBLE LEAD	DUE DATE	COOPERATORS
RESOURCE PROTECTION AND MANAGEMENT			
Water Resources			
o Regularly inspect roads, ditches, turnouts, culverts, fire lines, and trails for erosion problems.	DLM	Annually by September 1	CPC, FC
o Locate and GPS all culvert locations and incorporate into conservation area database. Include type, length and diameter of each culvert.	DLM	2010	
Flora and Fauna			
o Conduct diversity surveys and develop species lists.	DLM	Upon discovery	
o Continue to monitor for the presence of listed species.	DLM		
Forest and Fire Management			
o Evaluate the harvest potential for natural pine located along the north and northwest boundaries.	DLM	2014	CPC
o Evaluate the potential for cooperative burning with FDOF in the natural pine areas along the north and northwest boundaries.	DLM	2010	FDOF, FC, CPC
Exotic Species			
o Continue to monitor for exotic species and implement appropriate action.	DLM	Upon discovery	
Cultural Resources			
o Identify and report any newly identified sites to the DHR.	DLM	Upon discovery	CPC, FC, FDHR
o Identify and report any detrimental activities to the sites to the DHR and law enforcement.	DLM	Upon discovery	CPC, FC, FDHR
o Modify land management activities that may affect	DLM		CPC, FC, FDHR

TASK	RESPONSIBLE LEAD	DUE DATE	COOPERATORS
cultural resources to minimize the potential for disturbance.			
LAND USE MANAGEMENT			
Access			
○ Maintain parking areas, signs, gates, and trails.	FC		DLM
○ Coordinate with Flagler County regarding location of new parking area off Colbert Lane.	DLM		FC
Recreation			
○ Continue trail maintenance.	FC, CPC	Monthly	DLM
○ Continue coordination with City of Palm Coast and Flagler County to facilitate the construction of trails on the north and west boundaries.	CPC, FC	2015	DLM
○ Continue maintenance of kiosk, informative panels, and fishing platforms.	DLM	Annually by September 1 or as needed.	FC
○ Include any recreation improvements on the District's web site and in the next edition of the District's *Recreation Guide to District Lands*.	DLM	October 2010	OC
Environmental Education			
○ Continue to offer environmental education opportunities.	DLM		OC, CPC, FC
Security			
○ Maintain signage, fencing, gates, and locks.	FC		DLM
○ Evaluate the need for new fencing.	FC	Annually by September 1	DLM
○ Continue coordination with private security firm, FWC, and local law enforcement.	FC	Monthly	DLM
ADMINISTRATION			
Acquisition			
○ Evaluate adjacent properties for potential acquisition.	DLA	Annually by September 1	DLM,

TASK	RESPONSIBLE LEAD	DUE DATE	COOPERATORS
Cooperative Agreements			
o Coordinate with the County to ensure continued administration of feral hog SUA.	FC	Annually by September 1	DLM
o Continue to administer the Trail Maintenance SUA.	FC	Annually by September 1	DLM
o Continue to administer the Intergovernmental Agreement designating Flagler County lead managing agency.	DLM		FC
o Continue to administer the Interlocal Agreement to facilitate the Palm Coast trail development project	DLM		CPC, FC

IMPLEMENTATION CHART KEY

CPC	City of Palm Coast
DLA	Division of Land Acquisition
DLM	Division of Land Management
DWR	Department of Water Resources
FC	Flagler County
FDOF	Florida Division of Forestry
FDOT	Florida Department of Transportation
FDHR	Florida Division of Historical Resources
FWC	Florida Fish and Wildlife Conservation Commission
OC	Office of Communication

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ADDENDUM 1 – RANKING DEFINITIONS

FNAI GLOBAL RANK DEFINITIONS

G1 = Critically imperiled globally because of extreme rarity (5 or fewer occurrences or less than 1000 individuals) or because of extreme vulnerability to extinction due to some natural or man-made factor.

G2 = Imperiled globally because of rarity (6 to 20 occurrences or less than 3000 individuals) or because of vulnerability to extinction due to some natural or man-made factor.

G3 = Either very rare and local throughout its range (21-100 occurrences or less than 10,000 individuals) or found locally in a restricted range or vulnerable to extinction from other factors.

G4 = Apparently secure globally (may be rare in parts of range).

G5 = Demonstrably secure globally.

GH = Of historical occurrence throughout its range, may be rediscovered (e.g., ivory-billed woodpecker).

GX = Believed to be extinct throughout range.

GXC = Extirpated from the wild but still known from captivity or cultivation.

G#? = Tentative rank (e.g., G2?).

G#G# = Range of rank; insufficient data to assign specific global rank (e.g., G2G3).

G#T# = Rank of a taxonomic subgroup such as a subspecies or variety; the G portion of the rank refers to the entire species and the T portion refers to the specific subgroup; numbers have same definition as above (e.g., G3T1).

G#Q = Rank of questionable species - ranked as species but questionable whether it is species or subspecies; numbers have same definition as above (e.g., G2Q).

G#T#Q = Same as above, but validity as subspecies or variety is questioned.

GU = Unrankable; due to a lack of information no rank or range can be assigned (e.g., GUT2).

GNA = Ranking is not applicable because the element is not a suitable target for conservation (e.g. a hybrid species).

GNR = Element not yet ranked (temporary).

GNRTNR = Neither the element nor the taxonomic subgroup has yet been ranked.

FNAI STATE RANK DEFINITIONS

S1 = Critically imperiled in Florida because of extreme rarity (5 or fewer occurrences or less than 1000 individuals) or because of extreme vulnerability to extinction due to some natural or man-made factor.

S2 = Imperiled in Florida because of rarity (6 to 20 occurrences or less than 3000 individuals) or because of vulnerability to extinction due to some natural or man-made factor.

S3 = Either very rare and local in Florida (21-100 occurrences or less than 10,000 individuals) or found locally in a restricted range or vulnerable to extinction from other factors.

S4 = Apparently secure in Florida (may be rare in parts of range).

S5 = Demonstrably secure in Florida.

SH = Of historical occurrence in Florida, possibly extirpated, but may be rediscovered (e.g., ivory-billed woodpecker).

SX = Believed to be extirpated throughout Florida.

SU = Unrankable; due to a lack of information no rank or range can be assigned.

SNA = State ranking is not applicable because the element is not a suitable target for conservation (e.g. a hybrid species).

SNR = Element not yet ranked (temporary).

FEDERAL LEGAL STATUS

Provided by FNAI for information only.
For official definitions and lists of protected species, consult the relevant federal agency.

Definitions derived from U.S. Endangered Species Act of 1973, Sec. 3. Note that the federal status given by FNAI refers only to Florida populations and that federal status may differ elsewhere.

LE = Endangered: species in danger of extinction throughout all or a significant portion of its range.

LT = Threatened: species likely to become Endangered within the foreseeable future throughout all or a significant portion of its range.

LT,PDL= Species currently listed threatened but has been proposed for delisting.

LT,PE = Species currently listed Threatened but has been proposed for listing as Endangered.

SAT = Treated as threatened due to similarity of appearance to a species which is federally listed such that enforcement personnel have difficulty in attempting to differentiate between the listed and unlisted species.

PE = Proposed for listing as Endangered species.

PT = Proposed for listing as Threatened species.

C = Candidate species for which federal listing agencies have sufficient information on biological vulnerability and threats to support proposing to list the species as Endangered or Threatened.

XN = Non-essential experimental population.

SC = Not currently listed, but considered a "species of concern" to USFWS.

N Not currently listed, nor currently being considered for listing as Endangered or Threatened.

STATE LEGAL STATUS

Provided by FNAI for information only.
For official definitions and lists of protected species, consult the relevant state agency.

Animals: Definitions derived from "Florida's Endangered Species and Species of Special Concern, Official Lists" published by Florida Fish and Wildlife Conservation Commission, 1 August 1997, and subsequent updates.

LE = Endangered: species, subspecies, or isolated population so few or depleted in number or so restricted in range that it is in imminent danger of extinction.

LT = Threatened: species, subspecies, or isolated population facing a very high risk of extinction in the future.

LS = Species of Special Concern is a species, subspecies, or isolated population which is facing a moderate risk of extinction in the future.

PE = Proposed for listing as Endangered.

PT = Proposed for listing as Threatened.

PS = Proposed for listing as Species of Special Concern.

N = Not currently listed, nor currently being considered for listing.

Plants: Definitions derived from Sections 581.011 and 581.185(2), Florida Statutes, and the Preservation of Native Flora of Florida Act, 5B-40.001. FNAI does not track all state-regulated plant species; for a complete list of state-regulated plant species, call Florida Division of Plant Industry, 352-372-3505 or see:
http://www.doacs.state.fl.us/pi/.

LE = Endangered: species of plants native to Florida that are in imminent danger of extinction within the state, the survival of which is unlikely if the causes of a decline in the number of plants continue; includes all species determined to be endangered or threatened pursuant to the U.S. Endangered Species Act.

LT = Threatened: species native to the state that are in rapid decline in the number of plants within the state, but which have not so decreased in number as to cause them to be Endangered.

PE = Proposed for listing as Endangered.

PT = Proposed for listing as Threatened.

N = Not currently listed, nor currently being considered for listing.

ADDENDUM 2 – SOIL DESCRIPTIONS

The Basinger series consists of very deep, poorly drained and very poorly drained, rapidly permeable soils in sloughs, depressions, low flats, and poorly defined drainageways. They formed in sandy marine sediments. The natural vegetation consists of waxmyrtle, St. Johnswort, maidencane, pineland threeawn, cypress, slash pine, longleaf pine, pond pine, and other water tolerant plants.

The Cassia series consists of very deep, somewhat poorly drained, moderately rapid permeable soils on low ridges and knolls that are slightly higher than the adjacent flatwoods. The native vegetation supported by this series generally consists of scattered slash pine, longleaf pine, and saw palmetto.

The Chobee series consists of very deep, very poorly drained, slowly to very slowly permeable soils in depressions, flats, and occasionally on river floodplains in the Lower Coastal Plain. Formed in thick beds of loamy marine sediments. Drained areas are used for citrus, pasture, and range. Most of the soils remain in their natural state and have vegetation consisting of pickerelweed, lilies, sawgrass, and scattered swamp maples in treeless areas. Some areas have a growth of ash, gum, maple and cypress.

The EauGallie series consists of deep or very deep, poorly or very poorly drained, slowly permeable soils in flats, sloughs and depressional areas. They formed in sandy and loamy marine sediments in Peninsula Florida. Natural vegetation may consist of longleaf pine, South Florida slash pine, and saw palmetto, with understory vegetation possibly including inkberry, southern bayberry, and pineland threeawn.

The Favoretta series consists of very deep, very poorly drained, very slowly permeable soils that formed in clayey marine sediments with high silt content. They are on flood plains and on broad low flatwoods areas adjacent to major streams. Natural vegetation may include water oak, red maple, sweet gum, cabbage palm, bald cypress, slash pine, longleaf pine and American hornbeam. Understory may include wax myrtle, inkberry, saw palmetto, sedges, bluestems, maidencane, pineland threeawn, and various other grasses.

The Gator series consists of very poorly drained organic soils that formed in moderately thick beds of hydrophytic plant remains overlying beds of loamy and sandy marine sediments. They are in depressions and on floodplains with slopes less than 1%. Almost all areas are in marsh or swamp wetlands used for wildlife and water storage. Native vegetation is mostly cordgrass or Jamaica sawgrass, maidencane, coastal palmetto, dogwood, or swamp vegetation including bald cypress, sweetgum, red maple, and American hornbeam.

The Hicoria series consists of very deep, very poorly and poorly drained, moderately slowly to slowly permeable soils in seasonally ponded depressions and broad low flats. They formed in thick beds of sandy and loamy marine sediments. Natural vegetation may include cypress, willow, sweet bay, red bay, pickerel weed, arrowhead, maidencane,

saw grass, chalky bluestem, bushy beard bluestem, sand cordgrass, wax myrtle, and other water tolerant plants. Some areas have slash pine and scattered cabbage palms.

The Immokalee series consists of deep and very deep, poorly drained and very poorly drained soils that formed in sandy marine sediments. They occur on flatwoods and in depressions of Peninsular Florida. Principal vegetation is longleaf and slash pines and undergrowth of saw palmetto, gallberry, wax myrtle, and pineland threeawn. In depressions, water tolerant plants such as cypress, loblolly bay, red maple, sweet bay, maidencane, blue maidencane, chalky bluestem, sand cordgrass, and blue joint panicum are more common.

The Myakka series soils are very deep, poorly to very poorly drained soils formed in sandy marine deposits. These soils are on flatwoods, high tidal areas, flood plains, depressions, and gently sloping to barrier islands. Slopes in areas where these soils are found range from 0-8%. Native vegetation includes longleaf and slash pines with an undergrowth of saw palmetto, running oak, inkberry, wax myrtle, huckleberry, chalky bluestem, pineland threeawn, and scattered fetterbush.

The Orsino series consists of very deep, moderately well drained, very rapidly permeable soils that formed in thick beds of sandy marine or aeolian deposits. They are on moderately high ridges in the coastal plain. Native vegetation consists primarily of scrub vegetation with sand live oak, Chapman oak, myrtle oak, and scrub hickory. Scattered sand, slash, and longleaf pines and scattered blue jack, turkey, and post oak are found with a sparse understory.

The Pit series consists of very deep, poorly drained soils that formed in fine-textured alluvium weathered from extrusive and basic igneous rocks. Pit soils are on flood plains and in basins. Vegetation is hair grass, alpine timothy, Baltic rush, sedges, bluegrass, and scattered silver sagebrush in the drier locations.

The Placid series consists of very deep, very poorly drained, rapidly permeable soils on low flats, depressions, poorly defined drainageways on uplands, and flood plains on the Lower Coastal Plain. They formed in sandy marine sediments. Natural vegetation consists of pond pine, bay, cypress, gum, pickerel weed, and coarse grasses.

The Pomello series consists of very deep, moderately well to somewhat poorly drained soils that are sandy to depths of more than 80 inches. Pomello soils formed in sandy marine sediments in the flatwoods areas of Peninsular Florida. Native vegetation is dominated by scrub oak, dwarf live oak, saw palmetto, longleaf pine, slash pine, and wiregrass.

The Samsula series consists of very deep, very poorly drained, rapidly permeable soils that formed in moderately thick beds of hydrophytic plant remains and are underlain by sandy marine sediments. These soils are in swamps, poorly defined drainage ways, and flood plains. Slopes are less than 2%. Natural vegetation is loblolly bay, with scattered

cypress, maple, gum, and trees with a ground cover of greenbriers, ferns, and other aquatic plants.

The St. Johns series consists of very deep, very poorly or poorly drained, moderately permeable soils on broad flats and depressional areas of the lower Coastal Plain. They formed in sandy marine sediments. Principal vegetation of the forested areas is longleaf pine, slash pine, and pond pine with an undergrowth of saw palmetto, gallberry, wax myrtle, huckleberry, and pineland threeawn.

The Tuscawilla series consists of very deep, very poorly drained, moderately permeable soils in hammocks on the lower Coastal Plain. They formed in sandy and loamy marine sediments containing shells and shell fragments. The native vegetation consists of laurel oak, live oak, sweetgum, and pignut hickory with an understory of cabbage palm, southern magnolia, southern red cedar, America hornbeam, wax myrtle, longleaf uniola, and maidencane.

Udarents are somewhat poorly drained soils that have been reworked, cut and filled and smoothed or shaped by man. Most of these soils are in low areas, adjacent to canals from which the soil material has been excavated.

The Wabasso series consists of deep or very deep, very poorly drained, very slowly and slowly permeable soils on flatwoods, floodplains, and depressions in Peninsular Florida. They formed in sandy and loamy marine sediments. Slopes range from 0-2% in areas where these soils are found. Natural vegetation consists of longleaf pine, slash pine, cabbage palm, and live oak with an understory of saw palmetto, laurel oak, wax myrtle, chalky bluestem, and pineland threeawn.

The Winder series consists of very deep, poorly drained, slowly to very slowly permeable soils on broad, low flats, and depressional areas. Formed in loamy marine sediments on the lower coastal plain. Slopes in areas where these soils are found range from 0-2%. Most areas are native vegetation and used for wildlife habitat. Natural vegetation consists of cordgrass, maidencane, cabbage palmetto, saw palmetto, and pineland threeawn.

ADDENDUM 3 – FLAGLER COUNTY BIKE ROUTES PLAN