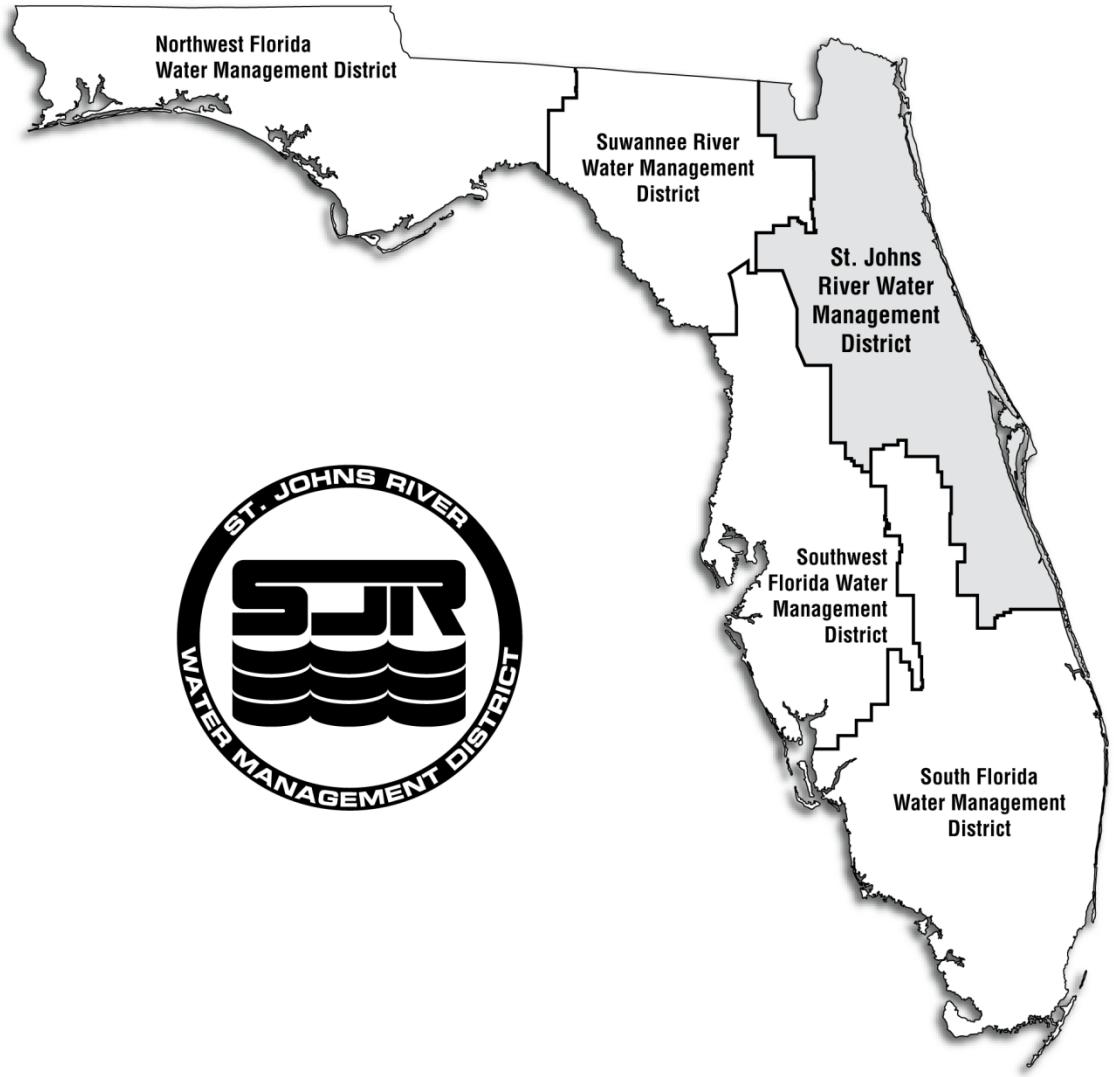
HULL SWAMP CONSERVATION AREA
LAND MANAGEMENT PLAN

FLAGLER COUNTY, FLORIDA

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

MARCH 8, 2022


Northwest Florida
Water Management District
Suwannee River
Water Management
District
St. Johns
River Water
Management
District
Southwest
Florida Water
Management
District
South Florida
Water Management
District

EXECUTIVE SUMMARY

MANAGEMENT AREA SIZE: 2,386 acres

DATE OF ACQUISITION: Hull Swamp Conservation Area (Hull Swamp) consists of one parcel acquired on June 19, 2013.

DATE OF PLAN: March 8, 2022
MAJOR BASIN: Lower St. Johns River and Northern Coastal
PLANNING BASIN: Crescent Lake and Halifax River

LOCATION: Hull Swamp is in Flagler County, approximately 10 miles south of the City of Bunnell. The property lies approximately 5 miles east of SR 11 and 3 miles north of SR 40.

FUNDING SOURCE: Florida Department of Transportation (FDOT) mitigation funds were utilized in the acquisition of Hull Swamp.

MANAGEMENT PARTNERS: The St. Johns River Water Management District (District) serves as lead manager for Hull Swamp.

VISION STATEMENT: The management focus for Hull Swamp is the continued protection of the water resources of Hull Cypress Swamp, Middle Haw Creek Tributary, Crescent Lake and Halifax River basins, and the Northern Coastal and Lower St. Johns River watersheds. This includes protection of more than 1,200 acres of diverse wetlands such as basin swamp, dome swamp, wet prairie, and basin marsh. Management activities within the uplands of Hull Swamp will be focused on forest management and restoration activities to maintain or improve natural communities that support a diverse assemblage of native wildlife species.

RESOURCE PROTECTION AND MANAGEMENT:

- **WATER RESOURCES** – Hull Swamp protects more than 1,200 acres of diverse wetlands such as basin swamp, dome swamp, wet prairie, and basin marsh. Conservation of this property protects water storage for the Hull Cypress Swamp system which is associated with the headwaters of the Little Tomoka River.
- **FOREST MANAGEMENT AND RESTORATION** – Prior to acquisition, commercial timber companies owned much of the acreage within Hull Swamp, and the property was managed for silviculture. While tailored to meet silvicultural management goals, the primary objectives of harvesting on Hull Swamp are restorative in nature and are intended to improve species diversity and the overall natural community health and vigor. The District will utilize a combination of pine harvesting, pine planting, mechanical vegetation management, herbicide treatments, and prescribed burning to encourage optimal forest health during the 10 year scope of this plan.
- **FIRE MANAGEMENT** – Implementation of prescribed burns occurs in accordance with annual burn plans and individual unit prescriptions.

- **FLORA AND FAUNA** – Hull Swamp provides habitat for numerous wildlife species, including listed species, such as the Gopher tortoise (*Gopherus polyphemus*), Southern fox squirrel (*Sciurus niger*) and Wood stork (*Mycteria americana*). The conservation area lies within a critical movement corridor for the Florida black bear (*Ursus americanus floridanus*) providing crucial east/west linkage through Volusia and Flagler counties for the Ocala sub population of the species. Invasive and exotic plant and animal species occur on the property. The District regularly monitors for the presence of exotic and invasive plants and animals and executes appropriate management actions, as necessary.
- **CULTURAL AND HISTORICAL RESOURCES** – A review of the Department of State, Division of Historical Resources does not indicate the presence of any registered cultural sites within the boundaries of the conservation area. If any sites are located, District staff will document and report the sites to the Division of Historical Resources.

LAND USE MANAGEMENT:

- **ACCESS** –The District has an access easement from Relay Timberlands/American Forest Management which provides District staff access from SR 11 to the property for land management purposes. The access easement is gated, limiting public vehicle access.
- **RECREATION** – Due to limited public access, there is no developed recreation at Hull Swamp.
- **SECURITY** – Maintenance of gates, locks, and boundary signage is conducted as needed. The District maintains contact with Florida Fish and Wildlife Conservation Commission (FWC), local law enforcement, and a private security firm for any potential security needs.

ADMINISTRATION:

- **REAL ESTATE ADMINISTRATION** – The District may consider purchasing parcels near Hull Swamp that become available and that will aid in the conservation of water resources within the Halifax River and Crescent Lake Basins. The District may pursue acquisition of small parcels or property exchanges with neighbors to improve and provide additional access to the conservation area.
- **COOPERATIVE AND SPECIAL USE AGREEMENTS, LEASES, AND EASEMENTS** –The District administers numerous leases, agreements, easements, special use authorizations (SUAs) and concessions. In addition to two access SUA's and an apiary lease, Hull Swamp is subject to a lease for the exploration, drilling, and production of water. This lease was in effect at the time the District took title to the property and will expire April 17, 2027. Additionally, as part of the sale of the Hull Swamp property to the District, the previous owner reserved the right to use the property to develop potable and raw water for commercial use.
- **MANAGEMENT COSTS AND REVENUES** – Management costs at Hull Swamp were $106,180 from 2013–2021 and are projected at $196,052 from 2022–2032. Revenues from forest management and apiary lease at Hull Swamp were $230,930 from 2013–2021 and are projected at $513,337.30 from 2022–2032.

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VISION STATEMENT

The management focus for Hull Swamp is the continued protection of the water resources of Hull Cypress Swamp, Middle Haw Creek Tributary, Crescent Lake and Halifax River basins, and the Northern Coastal and Lower St. Johns River watersheds. This includes protection of more than 1,200 acres of diverse wetlands such as basin swamp, dome swamp, wet prairie, and basin marsh. Management activities within the uplands of Hull Swamp will be focused on forest management and restoration activities to maintain or improve natural communities that support a diverse assemblage of native wildlife species.

OVERVIEW

This document provides the goals and strategies to guide land management activities at the Hull Swamp Conservation Area (Hull Swamp) over the next 10 years. This land management plan was developed in accordance with Section 373.1391, and Section 373.591, Florida Statues. This is the first land management plan for the property.

The St. Johns River Water Management District (District) owns an interest in nearly 780,000 acres of land, acquired for the purposes of water management, water supply, and the conservation and protection of water resources. The District is the lead manager of approximately 428,000 acres.

LOCATION

Hull Swamp covers approximately 2,386 acres in Flagler County within the Halifax River and Crescent Lake Basins, sub-basins of the Northern Coastal and Lower St. Johns River Basins, respectively. Hull Swamp is in Section 36, Township 13 South, Range 30 East, and Sections 1, 11, 12, and 14, Township 14 South, Range 30 East. The property is situated 10 miles south of the city of Bunnell and lies approximately 5 miles east of SR 11 and 3 miles north of SR 40 (Figure 1). The northern and western boundaries of the property are adjacent to District and Board of Trustees of the Internal Improvement Trust Fund of the State of Florida (Trustees) conservation easements. Figure 2 provides aerial imagery from 2020 of Hull Swamp.

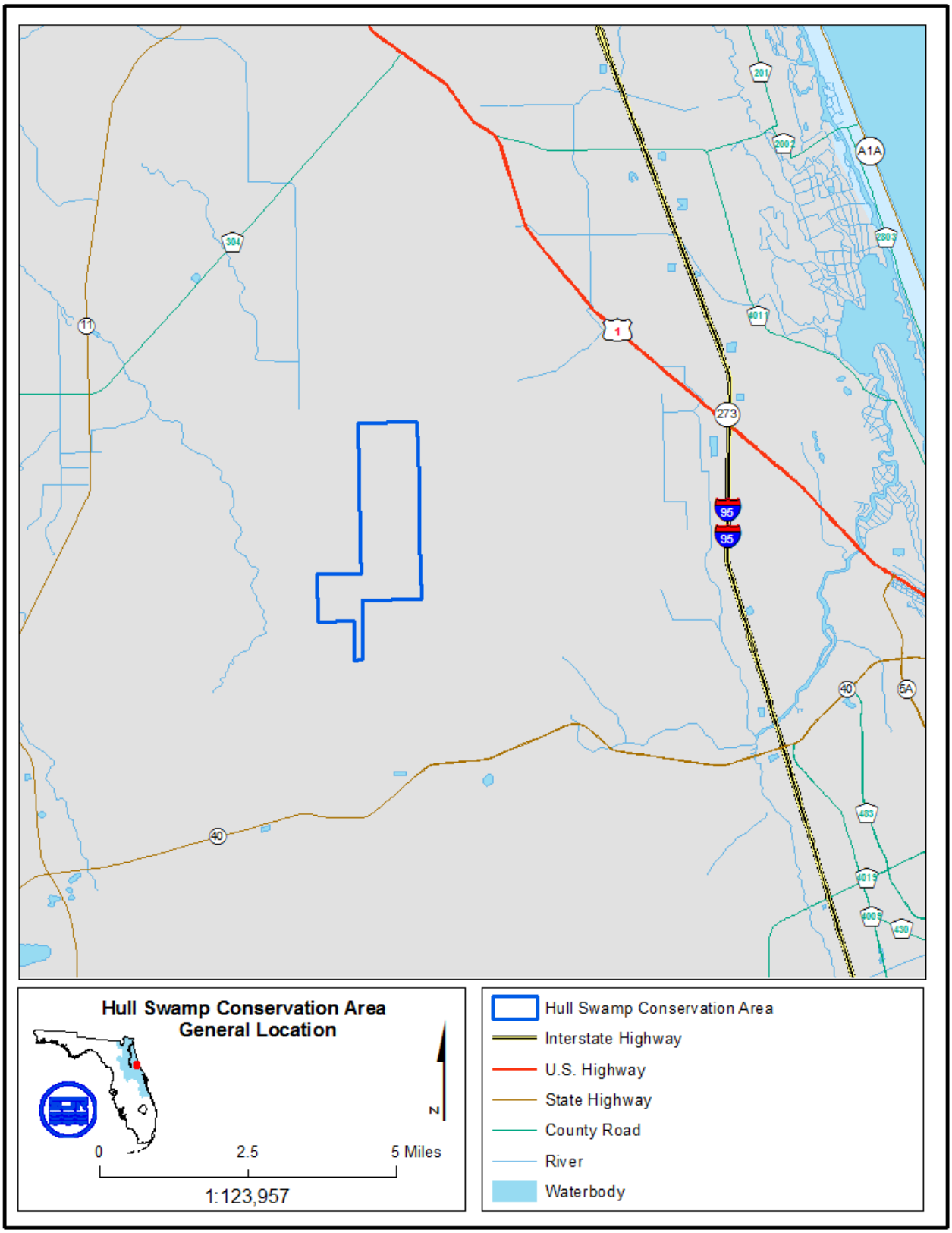

Figure 1: General Location

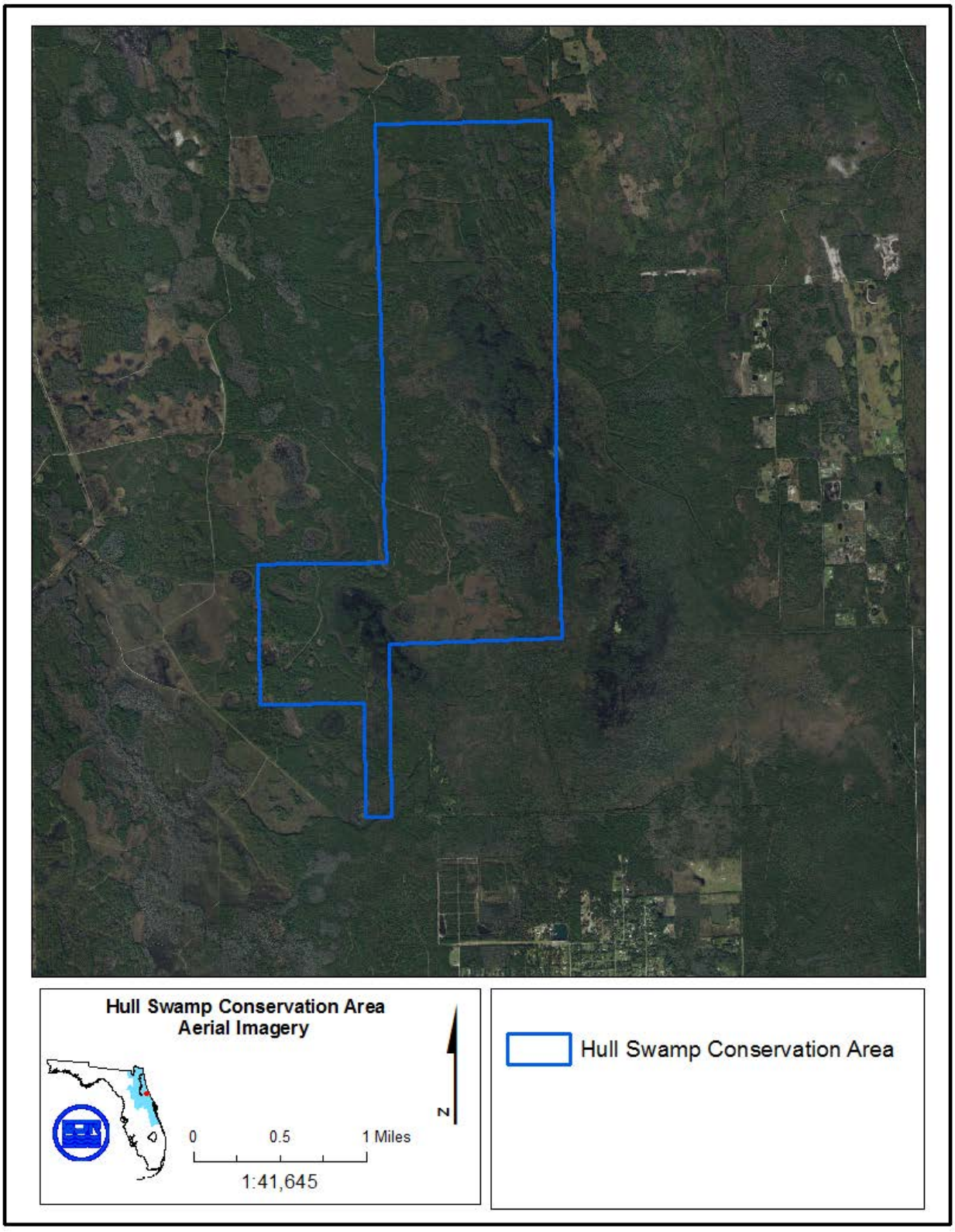

Figure 2: Aerial imagery.

REGIONAL SIGNIFICANCE

Hull Swamp is an integral component of a larger network of publicly owned lands in Flagler County and provides linkage between a multitude of publicly owned land and conservation easements (Figure 3). These interconnected lands include the Ocala National Forest, Lake George State Forest, Lake Woodruff National Wildlife Refuge as well as numerous public and regulatory conservation easements (Table 1). This network of lands provides for the protection of water quality and storage, native plant and wildlife species, as well as numerous natural resource-based recreational opportunities. The Hull Swamp lies within the Volusia Conservation Corridor, a Florida Forever project encompassing over 61,000 acres, which acts as a wildlife corridor around the Orlando area.

Lead Manager	**Conservation Area**
City of Port Orange	Port Orange City Forest
District	Clark Bay Conservation Area
District	Dunns Creek Conservation Area
District	Heart Island Conservation Area
District	Lake George Conservation Area
American Forest Management	Relay Tract Conservation Easements
Florida Department of Environmental Protection (DEP)	Blue Spring State Park
DEP	Bulow Creek State Park
DEP	Haw Creek Preserve State Park
DEP	Lower Wekiva River State Park
DEP	Tomoka State Park
Florida Forest Service (FFS)	Lake George State Forest
FFS	Tiger Bay State Forest
U.S. Fish and Wildlife Service	Lake Woodruff National Wildlife Refuge
U.S. Forest Service	Ocala National Forest
Volusia County	Deep Creek Preserve
Volusia County	Lake George Forest
Volusia County	Longleaf Pine Preserve

Table 1: Proximate conservation areas

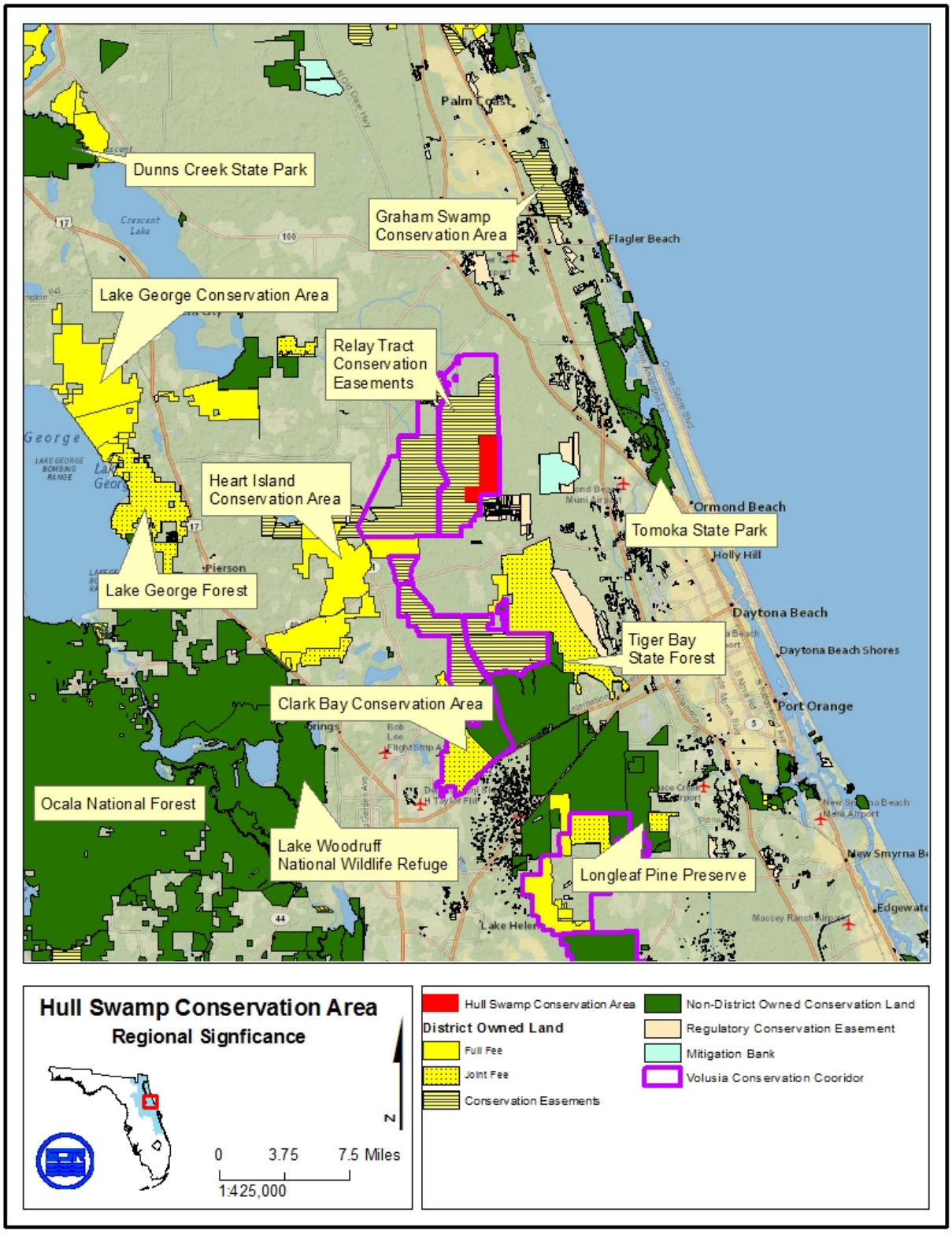

Figure 3: Regional significance.

ACQUISITION HISTORY

Acquisition of the parcel that comprises Hull Swamp provides for the protection of important water resources and ecological functions. This acquisition is consistent with the goals of the Northern Coastal and Lower St. Johns River Basins projects as set forth in the District's Five-Year Strategic Plan and the mitigation goals for the FDOT. These goals, as they apply to Hull Swamp, include:

- Improve water quality, maintain natural hydrological regimes, and maintain flood protection by preserving important wetland areas.
- Restore, maintain, and protect native natural communities and diversity.

Hull Swamp is comprised of one contiguous parcel totaling 2,386 acres (Figure 4). The single parcel that currently comprises Hull Swamp is listed below, and all acreage reported is derived from GIS calculations.

Plum Creek-Relay (2,386 acres) Land Acquisition number 2011-011-P1

The Plum Creek-Relay parcel totals 2,386 acres and was acquired by the District on June 19, 2013, for $2,847,124.80 using FDOT Mitigation funds to assist in meeting mitigation requirements associated with the widening of I-95. Protection of this large contiguous tract provided the best mitigation to offset FDOT I-95 wetland impacts in Regulatory Basin #17. The intent of the mitigation is for the land to be managed for conservation purposes in perpetuity. The property is subject to a lease agreement dated April 17, 2007, for the exploration, drilling, and production of water. This lease is set to expire April 17, 2027. As of the date of this Plan, the Lessee has not utilized the property for its leased purposes.

LOCAL GOVERNMENT LAND USE DESIGNATION

Flagler County

According to the Flagler County Comprehensive Plan 2010-2035, the future land use designation for the area surrounding Hull Swamp within Flagler County is conservation. The goal of this land use designation is to conserve, protect, and appropriately manage the natural resources of Flagler County to ensure the highest environmental quality possible (Flagler County Planning and Zoning, 2010).

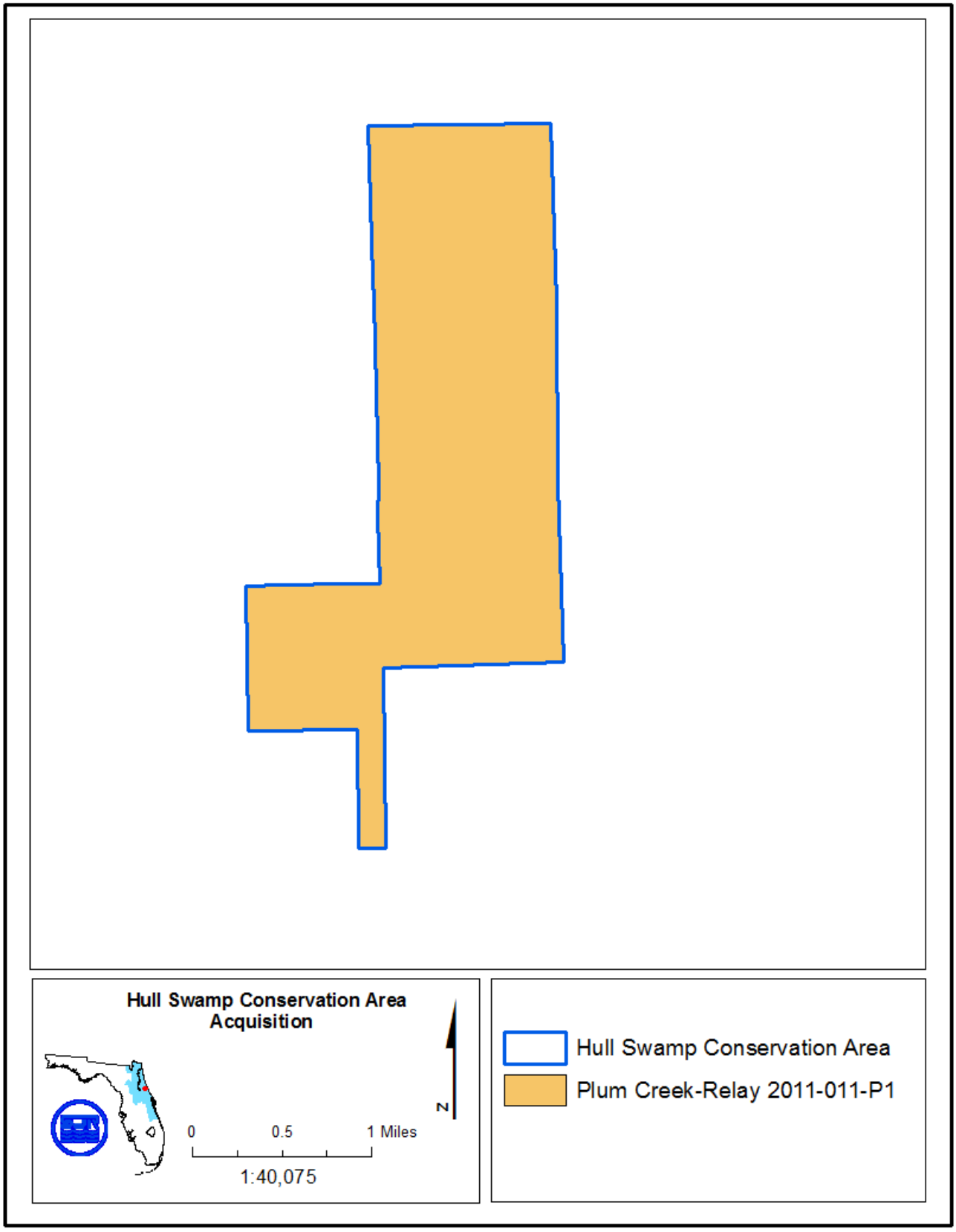

Figure 4: Acquisition.

NATURAL RESOURCES

WATER RESOURCES

Hull Swamp is not located within an Aquatic Preserve or an Area of Critical State Concern pursuant to Section 380.05, Florida Statute. The property is located within the Halifax River and Crescent Lake planning basins of the Northern Coastal and Lower St. Johns River Basins, respectively (Figure 5). The Crescent Lake planning basin covers 605 square miles and is the largest planning basin within the Lower St. Johns River Basin. The major waterbodies of this planning basin include Crescent Lake, Little Haw and Middle Haw Creeks.

The Halifax River planning basin covers 325 square miles and is the largest planning basin within the Northern Coastal Basin. The majority of Hull Swamp falls within the Hull Cypress Swamp sub-basin. The major waterbodies of this planning basin include the Tomoka and Halifax Rivers, and Bulow and Spruce Creeks. Both the Tomoka River and Spruce Creek are listed as Outstanding Florida Waterways (2003 Northern Coastal Basin Surface Water Improvement and Management Plan). The Halifax River basin has several 303(d) listed water bodies, including the Halifax River, Tomoka River, and Spruce Creek. Impairments include dissolved oxygen, nutrients, copper and fecal coliform. Important habitat areas include the Spruce Creek and Tomoka River/Bulow Creek corridors, including the estuarine marshes around Ponce Inlet, Tiger Bay State Forest and Bennett Swamp. Silviculture, wetlands, and flatwoods occur west of Interstate 95; and wetlands, flatwoods, and hardwood forest occur north of the Tomoka and Halifax rivers.

GEOMORPHOLOGY

Hull Swamp lies within the Volusia Ridge Sets subdistrict of the Eastern Flatwoods physiographic district (Brooks, 1981). This portion of the Eastern Flatwood District formed during the Plio-Pleistocene and recent time as a sequence of barrier islands and back barrier lagoonal deposits.

The Volusia Ridge Sets are typical accretionary coastal deposits comprising a flatwoods plain of beach ridges about 40 feet in elevation known as the Talbot Terrace and an eastern boundary sand ridge with a crest at 46 feet elevation. An eastern set of beach ridges form a flatwood plain 25 to 30 feet in elevation known as the Pamlico Terrace (Figure 6). Within these former barrier island deposits, swales lying between the beach ridges are commonly expressed as swamps today.

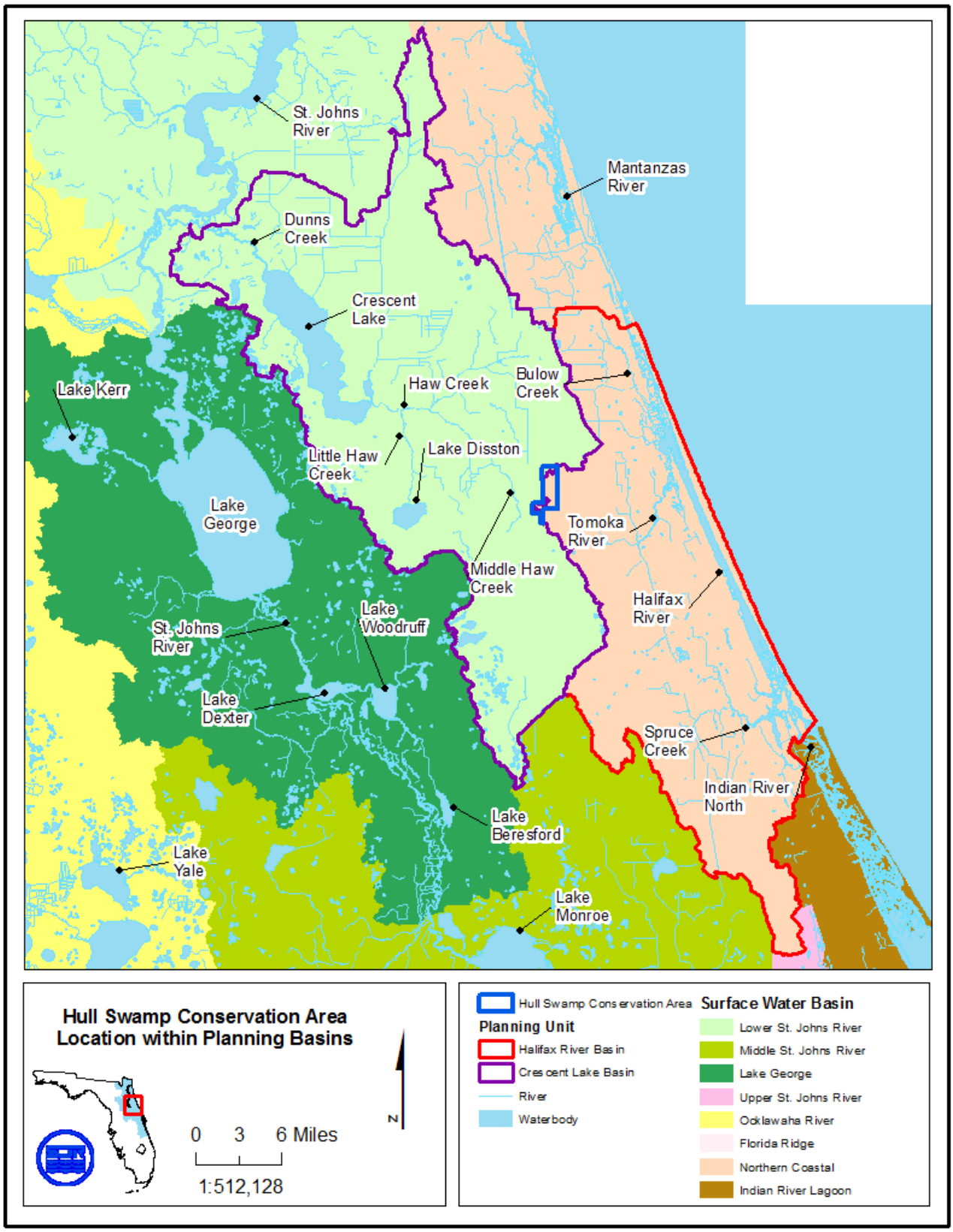

Figure 5: Location within Planning Basins.

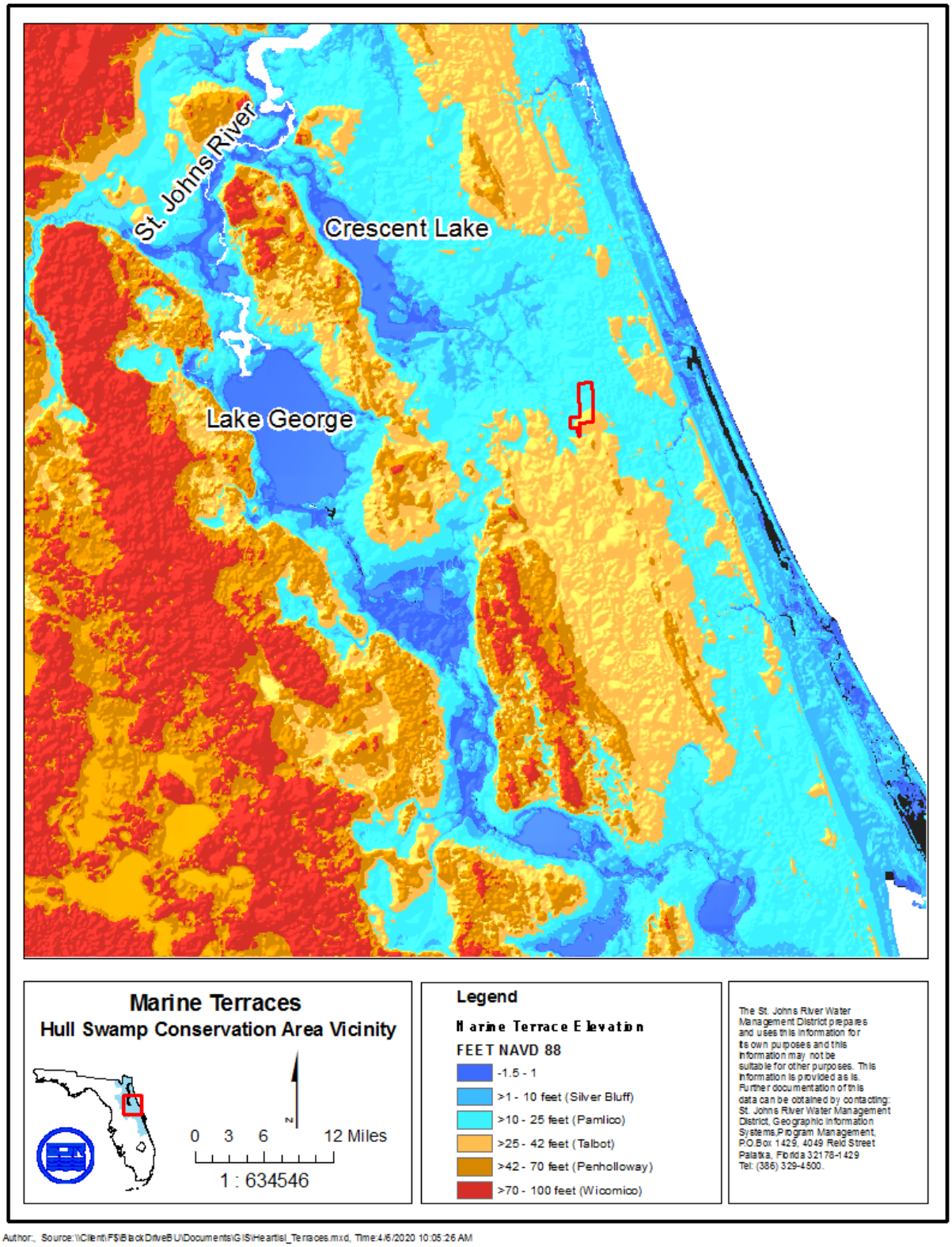

Figure 6: Marine terraces in the Hull Swamp Conservation Area vicinity.

HYDROGEOLOGY

The hydrogeologic characteristics of Hull Swamp are provided to understand surface features and how they may control and interact with surface drainage, and subsurface features that control the occurrence and movement of groundwater. Strategies for protection and management of the groundwater resource can be designed based on a knowledge of the hydrogeologic system of the site and vicinity.

Figure 7 is a north-south oriented cross-section depicting the hydrostratigraphic units that occur approximately 5 miles west of Hull Swamp. No site-specific hydrogeologic information is available from the Hull Swamp property, so the closest District monitoring wells were selected for the cross-section.

A surficial aquifer comprising of mostly quartz sand with varying amounts of silt and clay with interbedded shell beds occurs from land surface to approximately 60 feet deep. Underlying the surficial aquifer is a relatively thin (10 to 20 feet thick) Intermediate Confining Unit consisting of interbedded phosphatic limestone, silt and clay occurring in the Hawthorn Group. This unit is not very transmissive and would retard downward recharge into the Upper Floridan aquifer.

Underlying the Intermediate Confining Unit is the Upper Floridan aquifer. This hydrostratigraphic unit occurs from approximately 70 feet below land surface to 220 feet below land surface and is expected to have potable quality water. A deeper zone within the Upper Floridan aquifer identified as the Avon Park permeable zone is present at the Hull Swamp location as shown at the bottom of the cross-section.

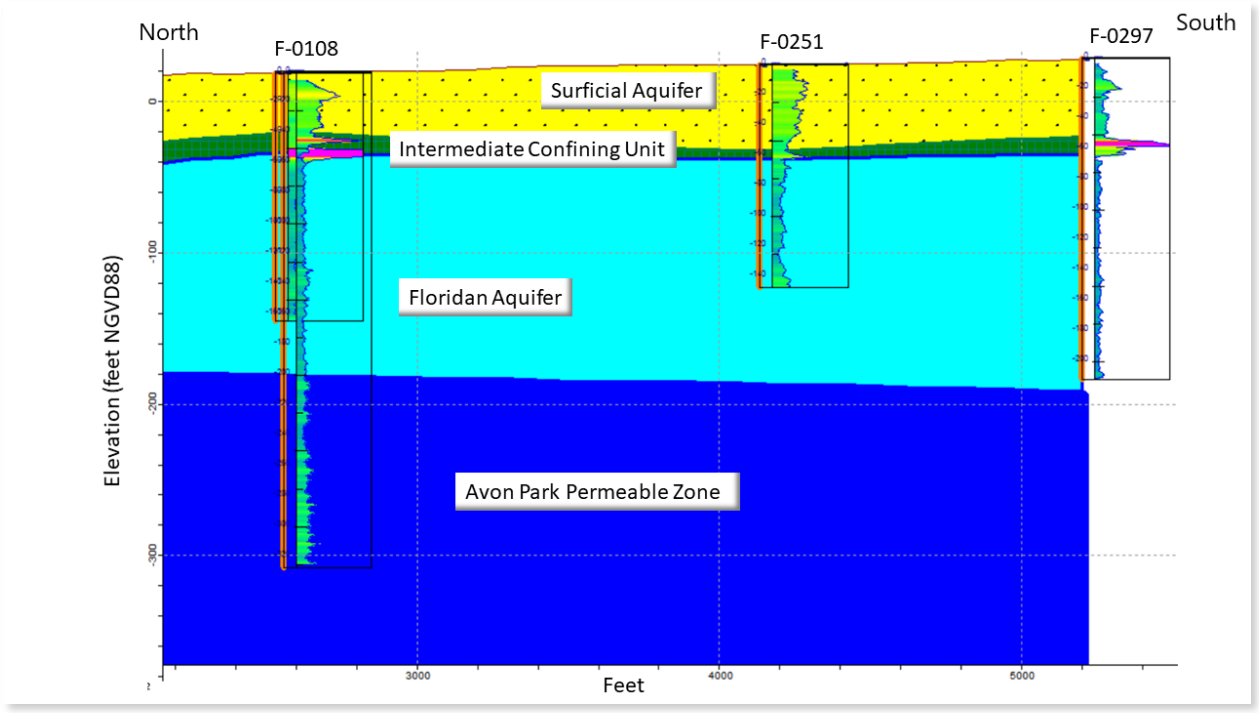

Figure 7: Hydrostratigraphic units from cross-section 5 miles west of Hull Swamp property.

Lithostratigraphic Units

Lithostratigraphic units are the basic units of geologic mapping. These are the bodies of rock characterized by their lithologic properties and stratigraphic relationships. At Hull Swamp the most likely lithostratigraphic units within 200 feet of the surface in descending order are: the Quaternary Beach Ridge and Dunes, the Tertiary Quaternary Dunes, the Hawthorn Group, the Ocala Limestone, and the Avon Park Formation. Detailed descriptions of these units along with maps and cross-sections are provided in the Florida Geological Survey STATEMAP Daytona Beach report (Green et al., 2013).

Areas for Potential Artesian Flow at Land Surface

Land surface elevation is relatively flat in Hull Swamp and ranges from 28 to 26 feet NAVD88 as is depicted on the black contour lines in Figure 8. The highest elevations occur in the southeastern corner of the property.

To evaluate the potential for artesian flow at Hull Swamp, the potentiometric surface elevation contours of the Upper Floridan aquifer (shown in blue on Figure 8) was superimposed on the land surface elevation contour map. The potentiometric surface contours are at an elevation that is approximately 10 feet lower than the land surface elevations, which means that the hydraulic gradient is downward, and no artesian flow would be expected from wells constructed into the Upper Floridan aquifer. These wells would require a pump to lift the water to the surface. See more information about the aquifer water levels in the “Water Levels” discussion below.

Sinkhole Recharge Potential

A desktop evaluation was conducted on the Hull Swamp property for the presence of sinkholes that could have the potential to be used for groundwater recharge (Davis and Mouyard, 2017). Closed topographic depressions on the property were mapped for use as a recharge sink. Ranking criteria were developed based on the thickness of the Intermediate Confining Unit, the elevation difference between the base of the sinkhole and the potentiometric surface of the Upper Floridan aquifer, shape, volume, and depth of the sinkholes. All the sinkholes on the property have the low and lowest potential ranking for recharge and are clustered in the northeast corner of the property (Figure 9). This low ranking is likely related to sinks on the site having been filled by sediment during sea level high stands.

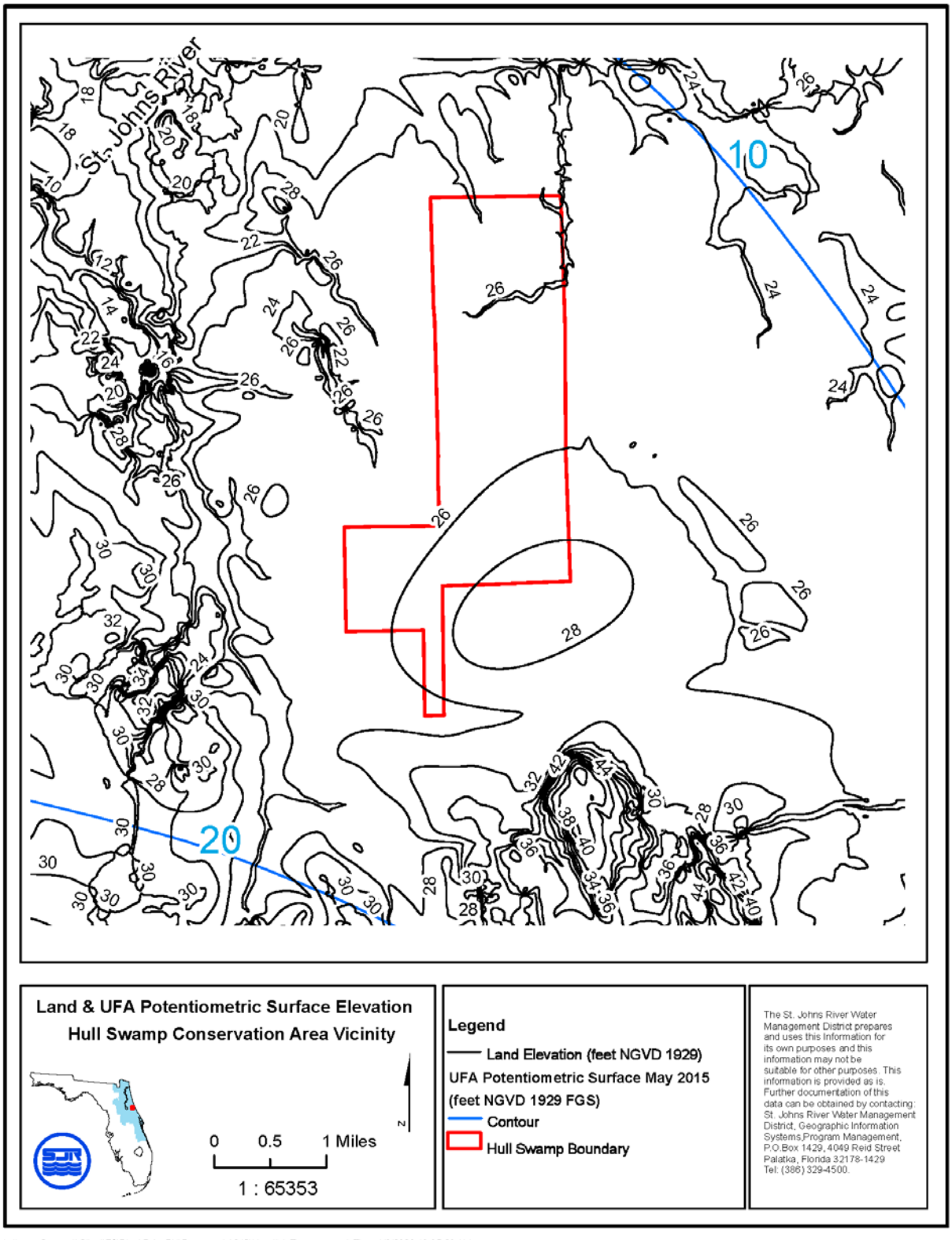

Figure 8: Detailed elevation of land surface in Hull Swamp with Upper Floridan aquifer potentiometric surface elevations shown superimposed in blue.

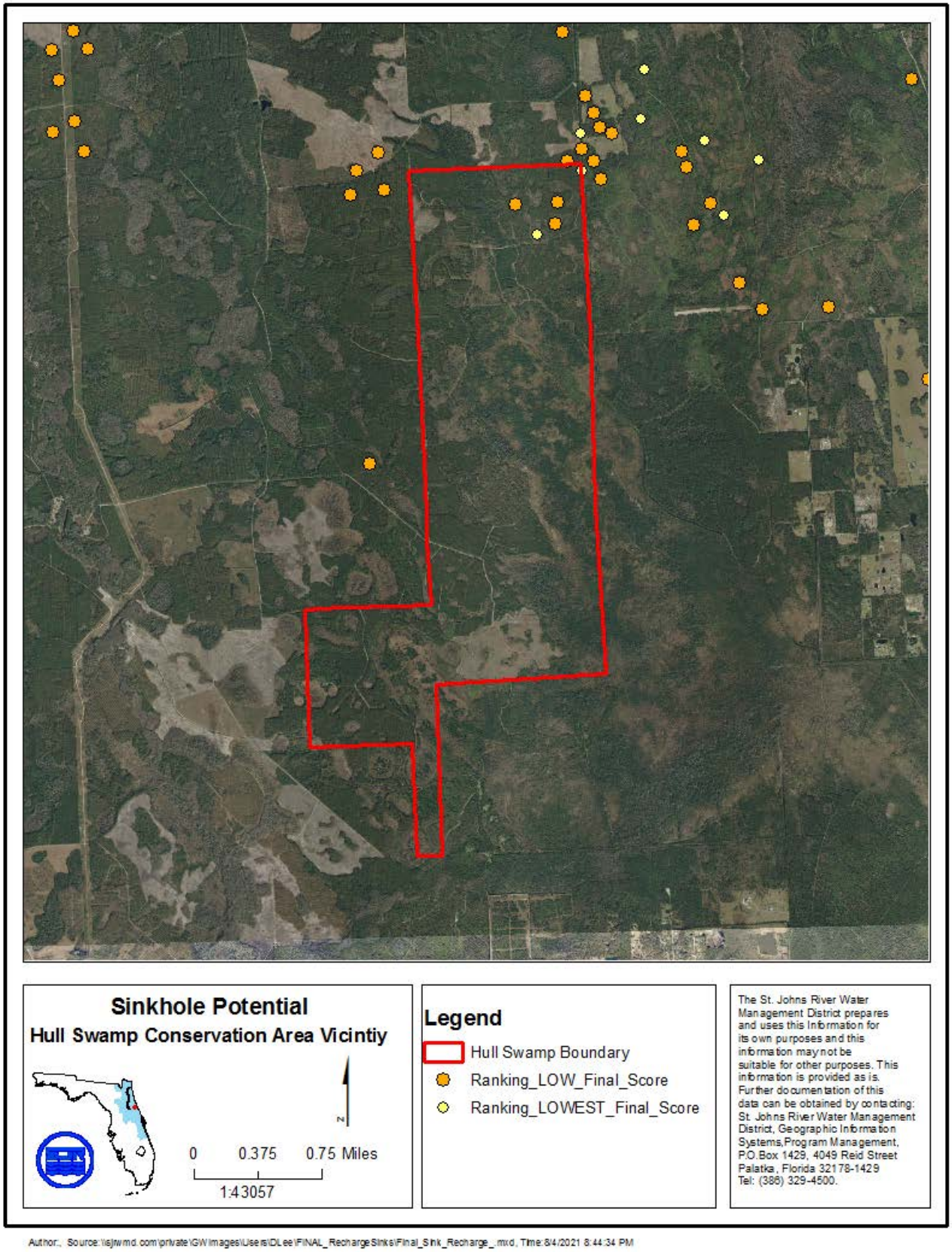

Figure 9: Ranking of closed topographic depressions that may have the potential for sinkhole recharge.

WATER LEVELS

The District has active groundwater monitor well sites located approximately 5 miles west of the Hull Swamp, which are identified as F-0251 (Upper Floridan aquifer) and F-0252 (Surficial Aquifer System).

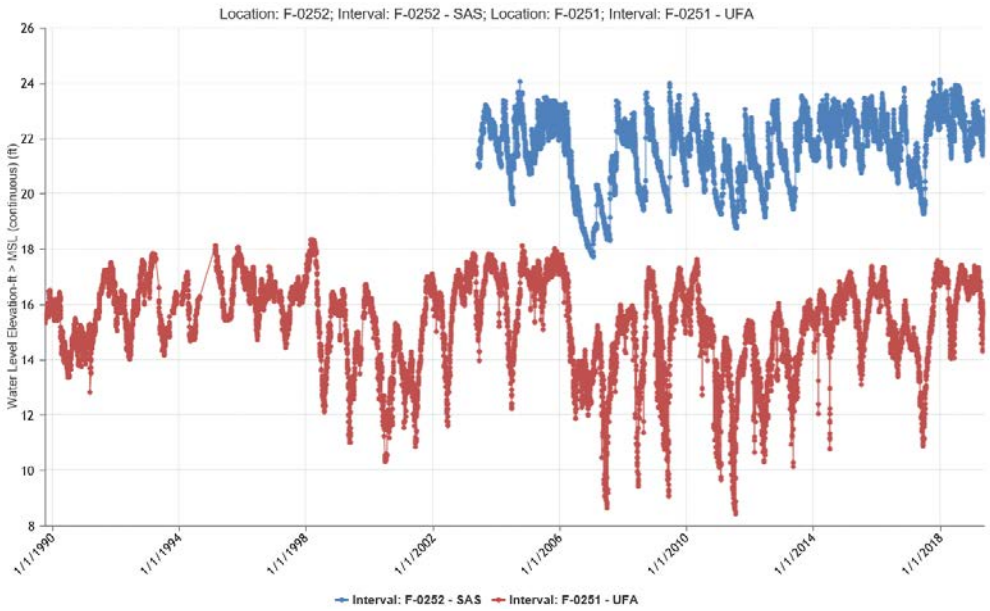

Figure 10: Hydrographs from Upper Floridan Aquifer monitor well F-0251 and Surficial Aquifer System monitor well F-0252.

Historic water levels for both sites are depicted in Figure 10. Both the SAS and the UFA water levels are plotted together to show the relative elevations (NAVD 1988) of the water levels in each aquifer. The water elevations are higher in the SAS than in the UFA for the sites located 5 miles west of Hull Swamp. These water level elevations indicate downward flow from the SAS towards the UFA.

WATER CHEMISTRY

The District monitors surface water quality at over 200 long-term sampling stations at rivers, streams, lakes, canals, and estuaries throughout the 18-county service area. Water quality status is an indication of the condition of a water body. The District's 2020 Status and Trends Report is a 15-year assessment that uses data from January 1, 2005 to December 31, 2019. Water quality trends indicate whether a water quality parameter is increasing or decreasing over time. (SJRWMD, 2020 https://floridaswater.maps.arcgis.com).

Basic water chemistry data are collected at three sites connected to Hull Swamp's watershed: (1) Station 27010579, located upstream in Tomoka River, (2) Station 27010024, located downstream in Tomoka River, and (3) MHC, located in Middle Haw Creek (Figure 11). Water chemistry data were typically collected on a bi-monthly basis. Field data including water temperature, pH, specific conductivity, and dissolved oxygen were collected, as well as grab samples analyzed for nutrients, minerals, and metals. Water chemistry parameters discussed in this section include Total Nitrogen (nitrogen), Total Phosphorus (phosphorus), Specific conductivity, Salinity, Dissolved Oxygen (DO), potential of Hydrogen (pH), color and Chlorophyll-*a* (Chl-a).

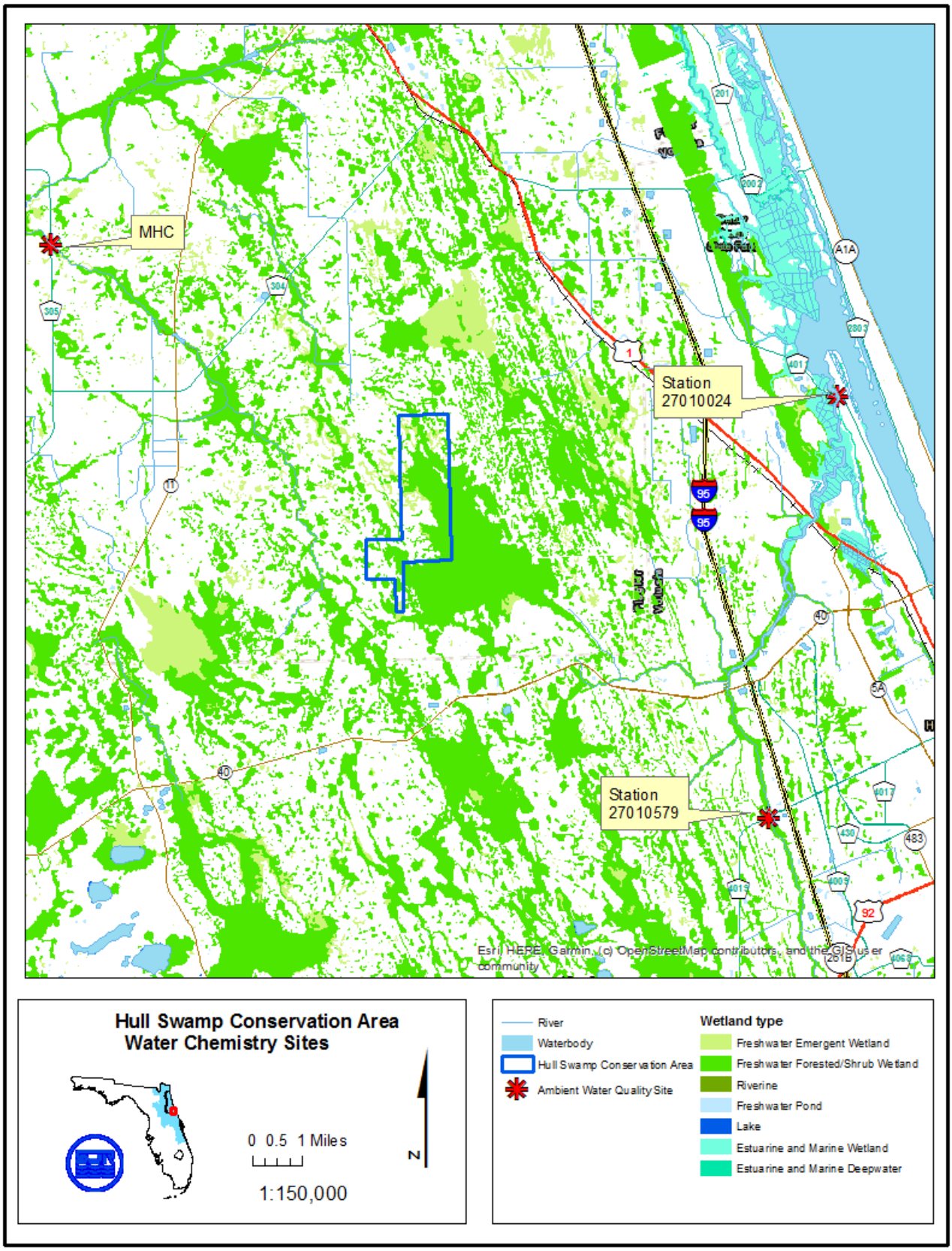

Figure 11: Water Chemistry Sites.

The following parameters are discussed in relative terms for the past 15-year period as described in the 2020 Status and Trends Report.

Station 27010579
Phosphorous is in the low-range and stable. Nitrogen, DO, pH, salinity, and specific conductivity is in the mid-range and stable. Color is in the high range and has insufficient data to detect a trend. Chl-a is in the low-range and increasing at 4.5% per year.

Station 27010024
Phosphorous is in the high-range and stable. Nitrogen, DO, Chl-a, salinity, specific conductivity, color, and pH are in the mid-range and stable.

Station MHC
All parameters at this station have insufficient data to detect a trend. Currently, Chl-a, salinity, DO, pH, and specific conductivity are in the low-range; phosphorous is in the mid-range; and nitrogen and color are in the high-range.

Water chemistry data do not exist within the conservation area itself, but these sites provide insight to water quality conditions upstream and downstream. These data could have implications for the ecosystem health within Hull Swamp, and the extensive wetlands within the property. Acquisition and protection of Hull Swamp helps protect water storage for the Hull Cypress Swamp system which is associated with the headwaters of the Little Tomoka River.

NATURAL COMMUNITIES

The 2,386 acres that comprise Hull Swamp consist primarily of mesic flatwoods, basin marsh, basin swamp, dome swamp and wet flatwoods (Figure 12). Information relative to the natural communities within the conservation area is derived from several sources including timber stand assessments, land cover codes, and personal observations by District staff. Additionally, the general natural community descriptions are characterized using descriptions published in the Florida Natural Areas Inventory's (FNAI) 2010 *Guide to the Natural Communities of Florida.*

Over ninety percent of the conservation area was impacted by wildfires in 1998, with landscape altering effects. The wildfires burned a large percentage of the mesic flatwoods, which resulted in over 700 acres of slash and loblolly pine reforestation between 1998 and 2001.
Fire-damaged cypress trees were evident in the 2013 Environmental Site Assessment of the property. Natural regeneration of cypress has since occurred in the basin and dome swamp communities.

Pine Flatwoods

Flatwoods communities are distinguished by very flat, level topography, and may be further classified as wet, mesic, or scrubby. Wet and mesic flatwoods occur within Hull Swamp. Alterations from past management activities and prolonged absence of fire can make distinguishing wet and mesic flatwoods difficult. Additionally, the pine dominated communities within Hull Swamp have long been managed for silviculture. Natural community reclassification and refinement may occur as silviculture, restoration, and fire management activities progress.

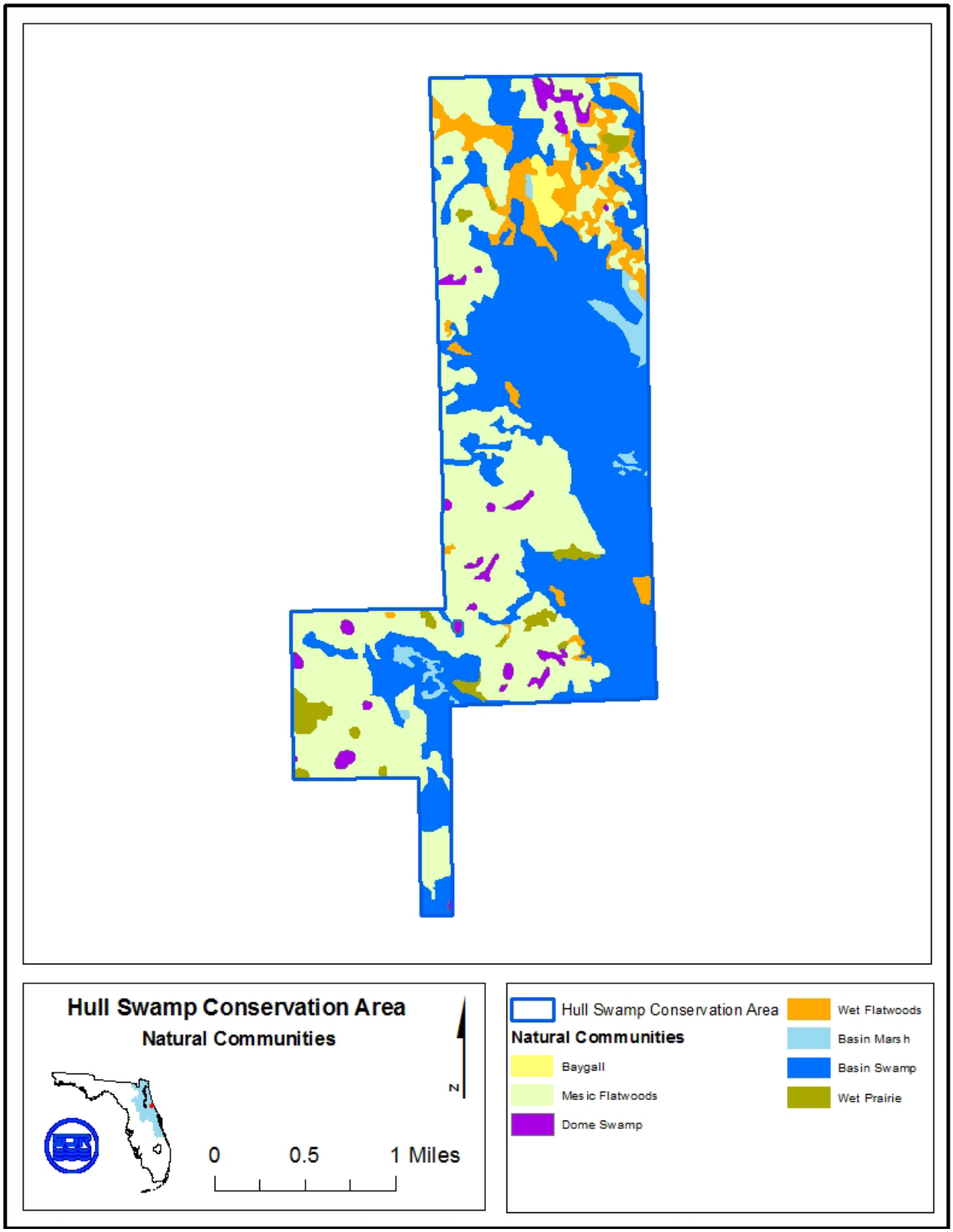

Figure 12: Natural Communities.

Mesic Flatwoods (1,001 acres, 42%)
Soils that support mesic flatwoods communities are generally poorly drained, acidic, and sandy soils deposited on ancient, shallow sea-beds. Many flatwoods communities have a clay or organic hardpan. Hardpan soils become saturated during the rainy season causing the accumulation of surface water. These soils are often droughty during dry periods. 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 (*Pinus elliottii*), loblolly pine (*Pinus taeda*), or pond pine (*Pinus serotina*). The shrub layer may include a mixture of species or be dominated by species such as saw palmetto (*Serenoa repens*), wax myrtle (*Myrica cerifera*), and numerous Ericaceous plants. The herbaceous coverage may be dominated by wiregrass (*Aristida stricta*); however, species abundance and diversity are often dictated by the openness of both shrub and canopy layers.

The mesic flatwoods communities within Hull Swamp are disturbed, with the most significant alterations attributed to historic silvicultural activities combined with alteration of the natural fire regime. The majority of these natural communities remain in pine plantation, and successional changes from the prolonged absence of fire are evident. Silvicultural bedding is an additional disturbance within most of the mesic flatwoods. Pine species present within the mesic flatwoods include slash and loblolly pine.

Fire is an important physical factor associated with the shaping and maintenance of this community type. The District targets natural fire frequency intervals of approximately every two to four years within the mesic flatwoods, which is consistent with the FNAI 2010 description. Fires in well-maintained mesic flatwoods tend to burn quickly and at relatively low temperatures. Areas of prolonged fire exclusion and/or altered hydrology typically have higher soil and fuel moistures and hardwood encroachment and may require more extreme conditions to facilitate a fire.

Wet Flatwoods (156 acres, 7%)
Soils that support wet flatwoods communities are generally very poorly drained sandy soils that may have a mucky texture in upper horizons. Wet flatwoods occur as ecotonal areas between the drier mesic flatwoods and wetland areas. 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, and saw palmetto and other shrubs. 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 differences in hydrologic and fire regimes.

Many of the wet flatwoods within the conservation area exhibit signs of successional changes, likely due in part to the prolonged absence of fire. The wet flatwoods plant community is fire dependent and the District targets return intervals ranging from one to three years in grassier sites or five to seven years in sites with higher shrub densities which is consistent with FNAI 2010 descriptions.

Basin Swamp (1,002 acres, 42%)
Basin swamps are large irregularly shaped basins not associated with rivers. Basin swamps are thought to have developed in oxbows of former rivers or in ancient coastal swales and lagoons that existed during higher sea levels. This plant community is generally characterized by the presence of buttressed and hydrophytic trees such as pond cypress (*Taxodium ascendens*) and swamp tupelo (*Nyssa sylvatica* var. *biflora*. Other typical canopy and subcanopy trees include slash pine, red maple (*Acer rubrum*), dahoon (*Ilex cassine*), and loblolly bay (*Gordonia lasianthus*). 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 Hull Swamp 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 are variable, but necessary to restrict peat accumulation and the expansion of hardwoods into adjacent communities. The edges of basin swamps may be exposed to frequent fire, often burning in concert with surrounding natural communities. A majority of the basin swamp communities burned in the high severity wildfires of 1998. This resulted in significant mortality in the overstory trees species of Hull Swamp's basin swamp.

Dome Swamp (95 acres, 4%)
Dome swamp communities typically occur embedded within well-maintained pyric plant communities such as flatwoods. The dome swamp communities within Hull Swamp occur primarily within the mesic flatwoods. Dome swamps are typically found on flat terraces, where they develop when the overlying sand has slumped into a depression in the limestone underlayment. Soils that support dome swamp communities are variable but may include a layer of peat that thickens towards the center. The peat layer is typically underlain with acidic sands or marl and then limestone or a clay lens. An important physical factor associated with the shaping and maintenance of the dome swamp is the hydroperiod. Water levels in dome swamps fluctuate seasonally with rainfall changes. Normal dome swamp hydroperiods are from 180–270 days per year (FNAI, 2010).

Typical of the dome swamp system, many of the examples of this community type within the conservation area include a dome-shaped profile created by the presence of smaller trees growing in the shallow waters of the outer edge with the large trees growing in the deeper center. The canopy of hydrophytic trees is dominated by cypress. Dome swamps are widely distributed at Hull Swamp and can be distinguished from basin swamps by their small size.

Without frequent fire, cypress may become less dominant, being replaced by hardwood or bay species, and may exhibit an increase in peat accumulation. Fire frequency within these communities is greatest around the edges. The longer hydroperiods within the center of most dome swamps will restrict the advance of most fires under normal conditions. Thus, the fire return interval for dome swamps may range from 3 to 5 years along the edges and may be as great as 100 to 150 years in the center (FNAI, 2010).

Basin Marsh (57 acres, 2%)
Basin marshes are herbaceous or shrubby wetlands in large irregularly shaped basins. These marshes typically develop in large solution depressions that were formerly shallow lakes and may be located within non-pyrogenic plant communities. Plant species compositions can be divided into submersed, floating-leaved, emergent, and grassy zones.

Hydroperiods of approximately 200 days are essential to the maintenance of this natural community as is frequent fire. The fire return interval for basin marshes dependent on the hydrology of the marsh and the exposure to fire from surrounding communities.

Wet Prairie (52 Acres, 2%)
Wet prairies are characterized as treeless plains with a sparse to dense ground cover of grasses and herbs. These natural communities typically occur on low, flat, poorly drained areas within the coastal plain and have sandy soils with substantial clay or organic components.

Typical plant species found in wet prairie communities, recorded on the conservation area include wiregrass, and star rush whitetop (*Rhynchospora colorata*).

The most important physical factors in the shaping of the wet prairie natural community are fire and hydrology. Fire is essential for the maintenance of this community type with the most frequent return intervals of 2 to 3 years. Wet prairie communities within Hull Swamp are degraded, likely due to hydrologic alterations associated with past silvicultural activities, and a prolonged absence of fire.

Baygall (22 acres, 1%)
Baygall is an evergreen, forested wetland of bay species situated at the base of a slope or in a depression. Baygalls have organic/peat soils, are acidic, and are typically dominated by a dense overstory of bay trees. This natural community does not burn often, as the peat soils stay relatively wet. When soils dry out, baygalls will readily burn. Typical vegetation within the baygall community present at Hull Swamp includes Loblolly bay (*Gordonia lasianthus*), swamp bay (*Persea palustris*), and wax myrtle (*Morella cerifera*).

SOILS
According to the USDA Soil and Conservation Service, 15 different soil types are within Hull Swamp. The Flagler County Soil Survey provided information used to develop descriptions of the predominant soil series found within Hull Swamp. The soil descriptions are in Appendix 1.

CULTURAL AND HISTORICAL RESOURCES
A review of the Department of State, Division of Historical Resources does not indicate the presence of any registered cultural sites within the boundaries of the conservation area. If any sites are located, District staff will document and report the sites to the Division of Historical Resources.

IMPLEMENTATION

The following sections outline land management strategies for resource protection, land use, and administration on Hull Swamp for the next ten years.

RESOURCE PROTECTION AND MANAGEMENT

Water Resources

Goal: Protect water quality and quantity, restore hydrology to the extent feasible, and maintain the restored condition.

Strategies:

- Maintain roads and culverts to prevent erosion.
- Install water bars, turnouts, and low water crossings.
- Remove silvicultural beds from timber harvest areas if restoration is feasible.

While most wetland protection was accomplished through acquisition, portions of the wetlands within the conservation area have a history of disturbance. Hydrologic disturbances within the conservation area include roads, ditches, culverts, and silvicultural beds.

Roads and associated ditches are located within the conservation area and provide access for land management activities. The District has made improvements to, and conducted maintenance on, many of these roads and ditches helping to reduce the potential for erosion. District staff will continue to inspect roads and culverts for erosion problems and maintenance/repair needs.

The majority of the acreage within the conservation area is former commercial silviculture sites and as such, some of the acreage was bedded prior to planting. Bedding is a method of site preparation which includes a series of linear mounds and alternating trenches designed to improve soil aeration and nutrient concentrations on wet and/or nutrient poor sites. Primary objectives of bedding are to elevate seedling root systems out of the water into mounds where the concentrated nutrients are readily available. Bedding is also used to reduce competition for newly planted trees. The trenches associated with bedding channel water and are detrimental to the sheet flow of water across the property. During the scope of this plan, where restoration is feasible, and when such activities will not produce unacceptable disturbance to existing, desirable groundcover, silvicultural beds will be removed.

Forest Management

Goal: Maintain, improve, and restore forest resources.

Strategies:

- Update forest management database.
- Thin and/or clearcut 929 acres of timber.

The District determined that timber resource management is not in conflict with the primary management objectives of the Hull Swamp property and, therefore, prepared a forest resource analysis which assesses the feasibility of managing timber resources for resource conservation and revenue generation purposes.

On properties like Hull Swamp, where silvicultural management is an intrinsic component of the overall management of the upland portions of the property, timber inventory data are collected, verified, and incorporated into the District's forest management database. Changes that may occur over time within the compartments and stands resulting from growth, harvests, natural disturbances, and reforestation activities are also recorded in the database. This information is used to help land management staff forecast forest management needs. Hull Swamp is partitioned into forest management compartments and each compartment is further divided into stands. Figure 13 illustrates the compartments and stands within the property and Figure 14 illustrates the dominant pine species within each stand.

The primary objectives of harvesting on Hull Swamp are restorative in nature and designed to increase species diversity and overall natural community health and vigor. The District applies all revenue generated through these forest management activities toward the District's land management budget to offset management costs for District properties. Since the purchase of the property in 2013, forestry accomplishments include thinning of approximately 150 acres of slash pine and a 106-acre clearcut and subsequent planting of slash pine (Figure 15). The District will continue to employ several methods of harvest intended to increase diversity and reduce tree density to allow for a healthier, more natural looking forest. Figure 15 illustrates the location of the accomplished harvest and reforestation activities.

Forest management activities anticipated during the scope of this plan include forest inventory evaluations, reforestation, and pine thinning or clearcut operations. Seedling survival monitoring is also conducted to assess the need for replanting an area through the determination of the number of target trees per acre. Reforestation projects may be preceded by various site preparation techniques including mechanical treatments such as disking to remove silvicultural bedding, roller chopping, mowing, herbicide applications, and prescribed fire. These techniques may be used singularly or in combination as site conditions warrant. First thinning operations typically occur in the 16th year and second thinning operations are conducted, on average, 10 years after the first. Third thinning operations generally fall 15-20 years following the second. These times are largely dependent on ecological factors that affect tree growth.

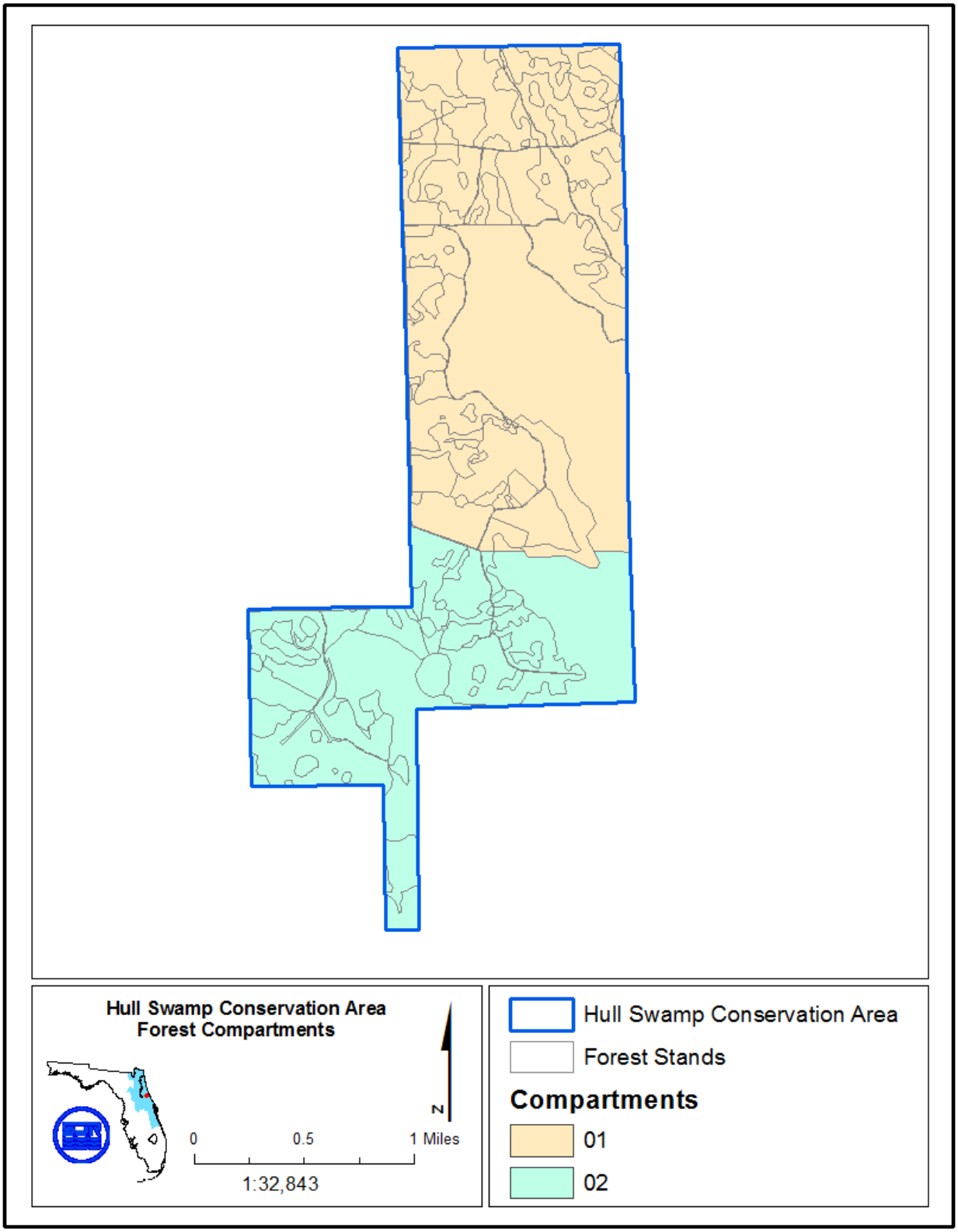

Figure 13: Forestry compartments.

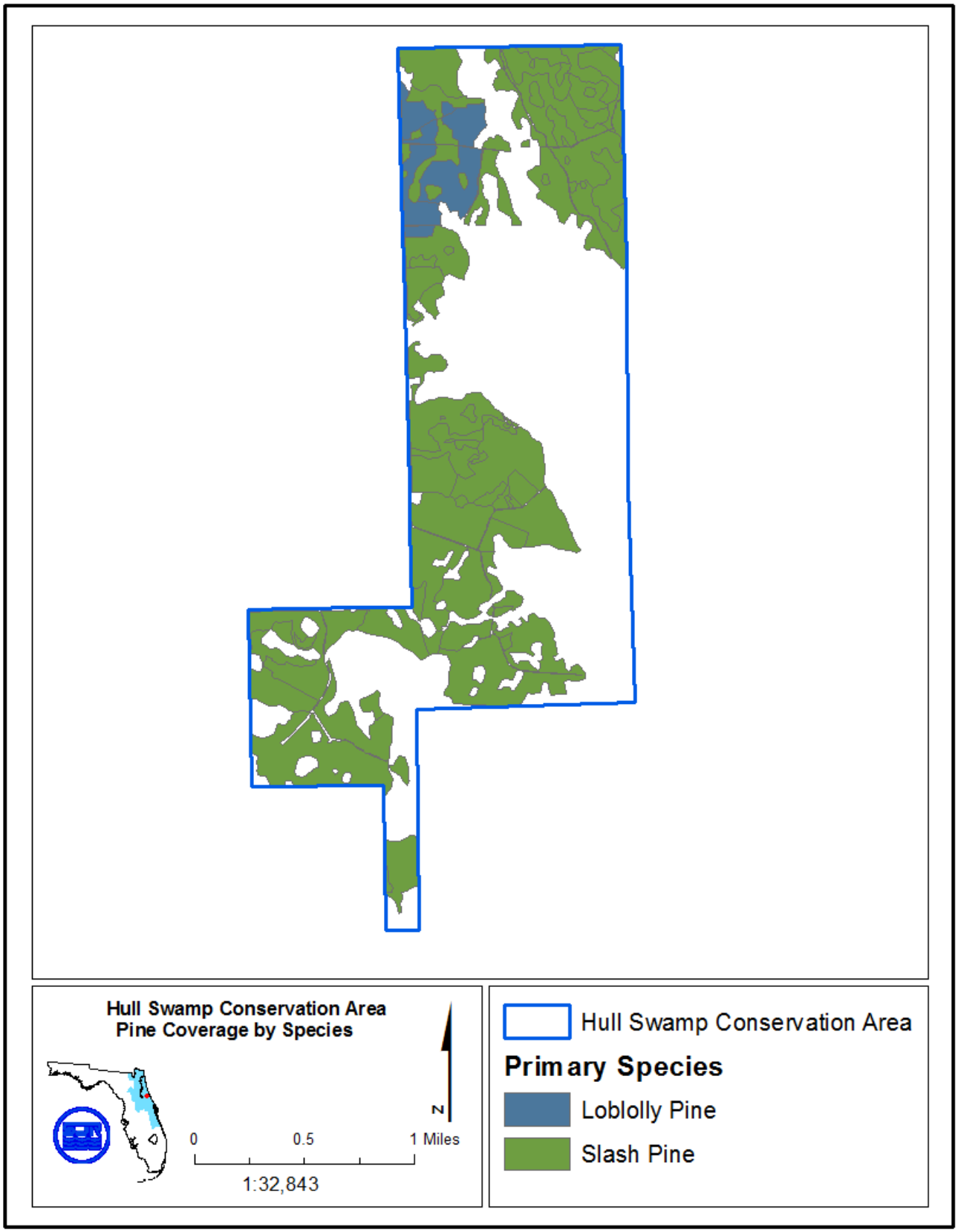

Figure 14: Pine coverage by species.

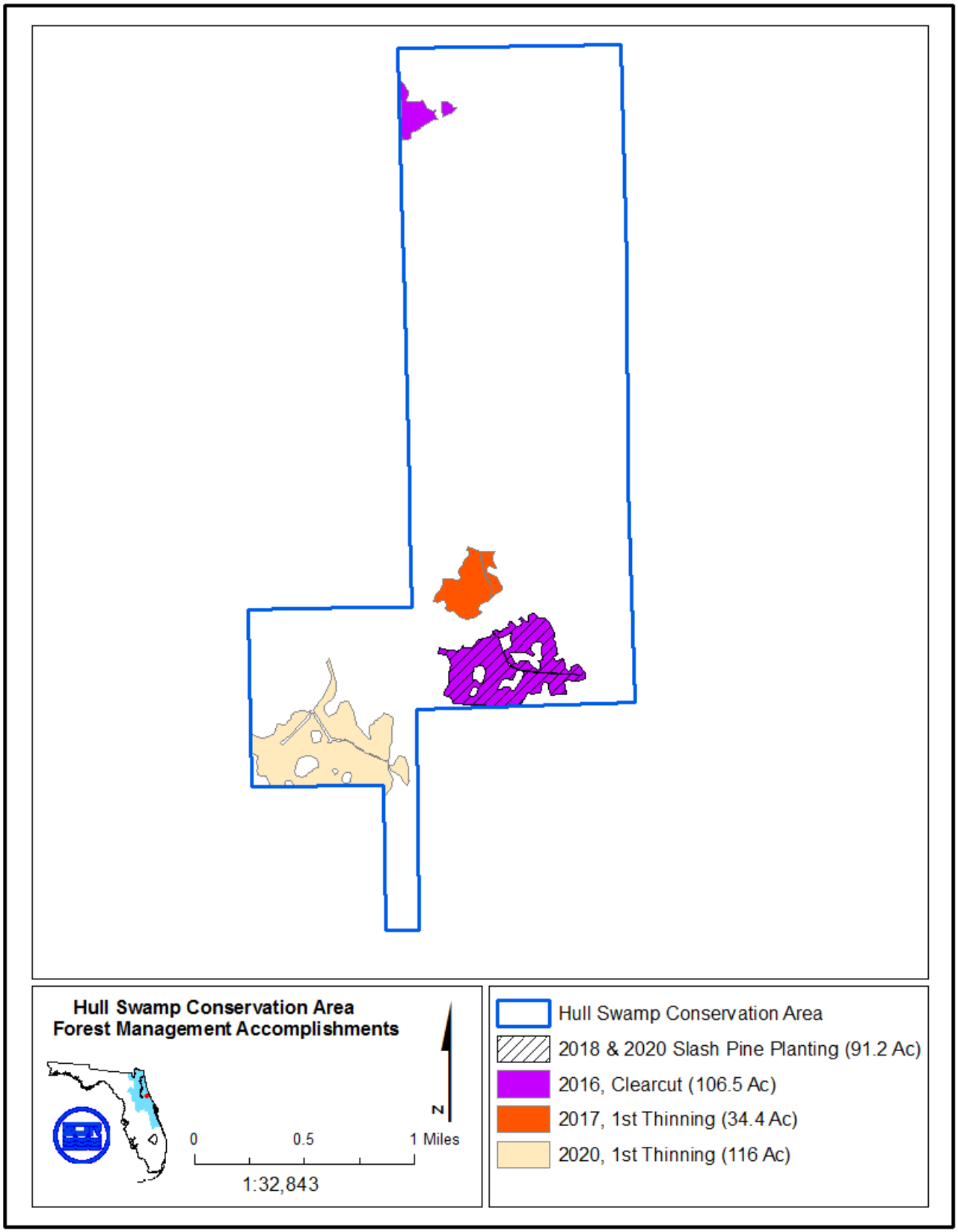

Figure 15: Forest management accomplishments.

Through periodic thinning, the District will remove the poorest trees to reduce crown density and allow the better trees to develop full, vigorous crowns. There are four planned thinning's of pine within Hull Swamp from 2021–2031. Approximately 123 acres of pine were scheduled for a first thinning in 2017; however, wet site conditions prevented harvesting of the area (Figure 16).

The forest management and fire management programs are integrated. If frequent prescribed fire becomes a challenge at Hull Swamp and fuel loads accumulate, clearcut and reforestation will become the principal forest management method. When managing timber stands for long rotations using thinning, prescribed fire or fire surrogates must be applied frequently to maintain ecological diversity as well as protect the stand from destructive wildfires. Shorter rotations using clearcuts allow for flexibility in forest management where frequency of prescribed fires is low.

In addition to planned forest management activities, the District will remove 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. Harvesting may also provide some protection against wildfires and pine beetle outbreaks. The District will abide by Florida Silviculture Best Management Practices, Florida Forestry Wildlife Best Management Practices for State Imperiled Species and will target the achievement of appropriate overstory species in proper stand densities as described in the District Forest Management Plan.

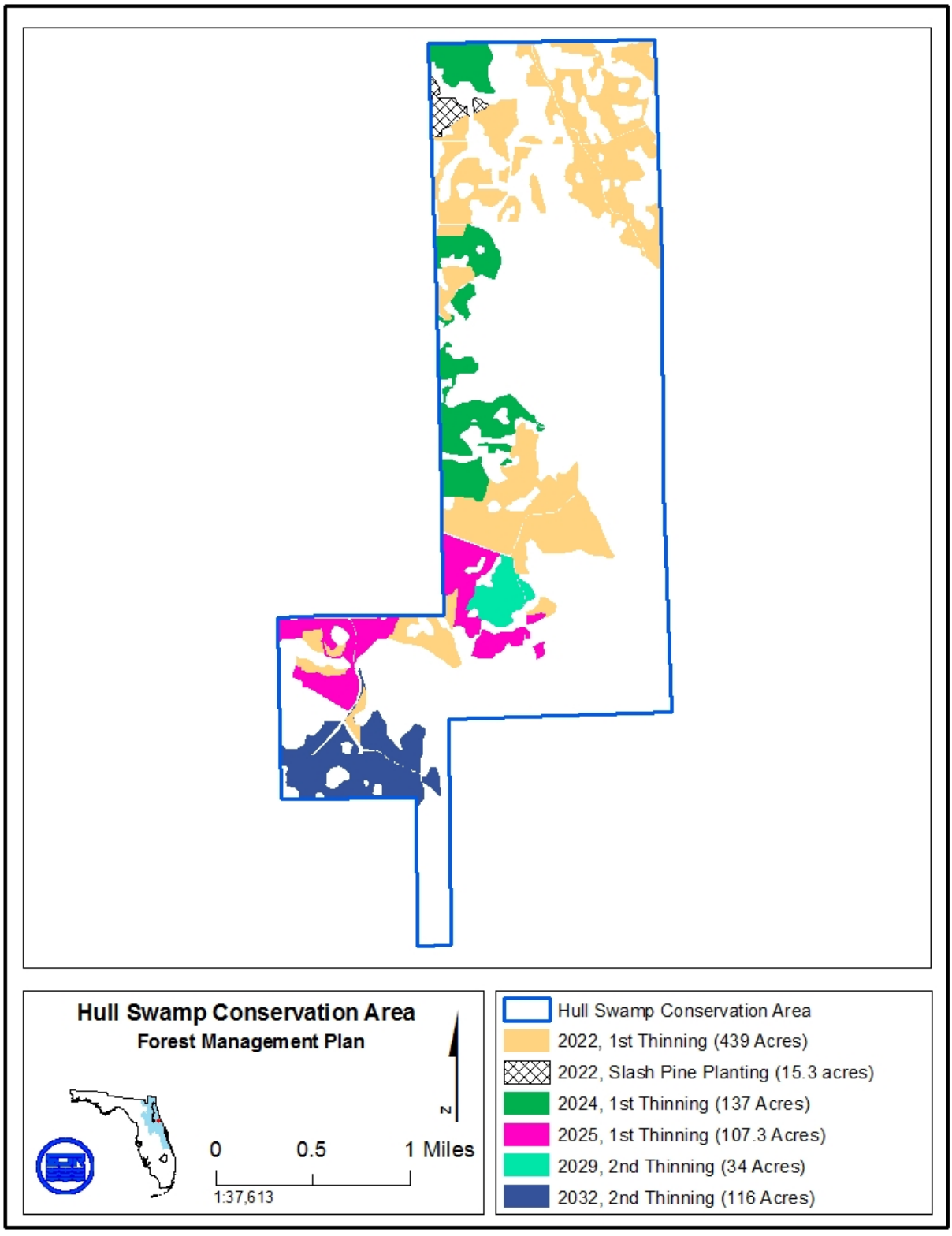

Figure 16: Forest management plan.

Fire Management

Goal: Implement a prescribed burning program in accordance with District's Fire Management Plan.

Strategies:

- Develop annual burn plans.
- Use mechanical fuel reduction as a fire surrogate in areas where it is difficult to burn due to high fuel loads.
- Continue to populate the fire management database on an annual basis.
- Conduct dormant season burns in pine plantations and areas of high fuel loading and/or extended fire exclusion.

Fire is a vital factor in managing the character and composition of vegetation in many of the natural communities in Florida. The District's primary use of fire is to mimic natural fire regimes to encourage the perpetuation of native pyric plant communities and dependent wildlife. Additionally, the application of fire aids in the reduction of fuels and minimizes the potential for catastrophic and damaging wildfires. Many of the natural communities at Hull Swamp are fire adapted, making prescribed fire an important tool for use in the restoration and maintenance of plant communities within the conservation area. Forest and fire management activities within the conservation area are critically important and integrally linked. The planning and implementation of forest and fire management activities must be coordinated to achieve restoration and management goals. Figure 17 illustrates the known fire history across the conservation area, including a large wildfire that burned across most of the property (2,153 acres) in 1998, three small wildfires (<10 acres) which occurred in 2015 and 2016, and a 108-acre site prep burn in 2021 (Figure 17).

Historically, the majority of fires occurring on what is now Hull Swamp would have been ignited by lightning during the growing season. The District intends to reintroduce growing season fire where possible, understanding that constraints in some areas such as young pine plantations, high fuel loading, and proximity to smoke sensitive areas may predicate the use of dormant season burning or mechanical fuel reduction. Limiting factors narrowing the window of opportunity for the application of prescribed fire on portions of the conservation area are the close proximity to critical smoke sensitive areas including SR 40, SR 11, I-95, US 1, and developed areas, such as the city of Ormond Beach and Bunnell. The 5.2-mile access easement is an additional barrier in that its condition can deteriorate quickly making the only way to the property impassable. Smoke management is a crucial consideration, and all burns will be conducted to minimize off-site impacts by maneuvering smoke plumes away from smoke sensitive areas and by ensuring adequate smoke dispersal. Smoke management concerns and smoke impact distances for the conservation area are depicted in Figure 18.

While prescribed fire is the preferred tool for management, restoration, enhancement, and maintenance of natural communities within the conservation area, it will be necessary at times to implement alternative methods. The District may utilize management techniques such as selective herbicide treatments, silvicultural thinning, mowing, and roller chopping in combination with fire as part of an integrated approach to restoring, creating, and maintaining desired conditions within the property.

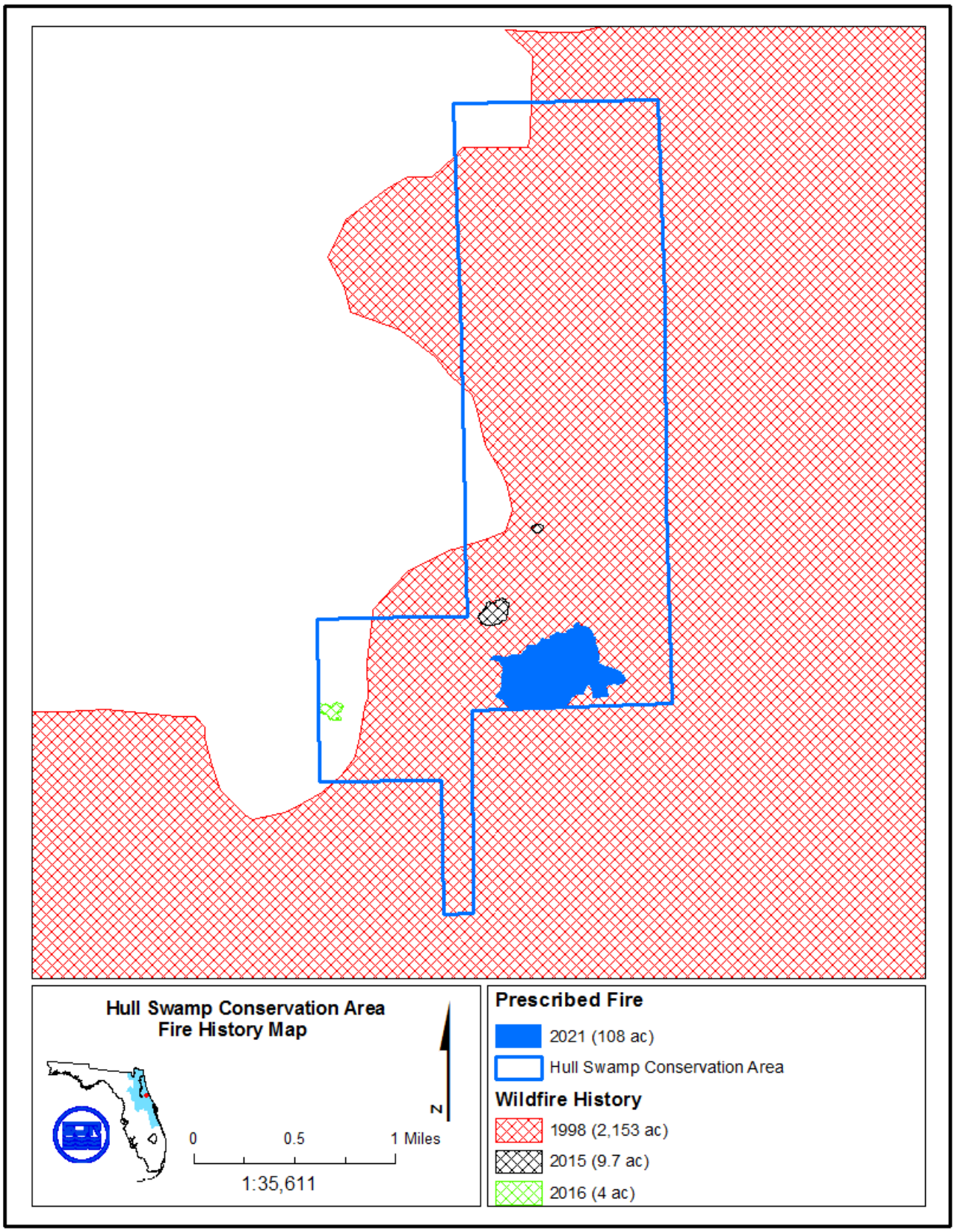

Figure 17: Fire history map.

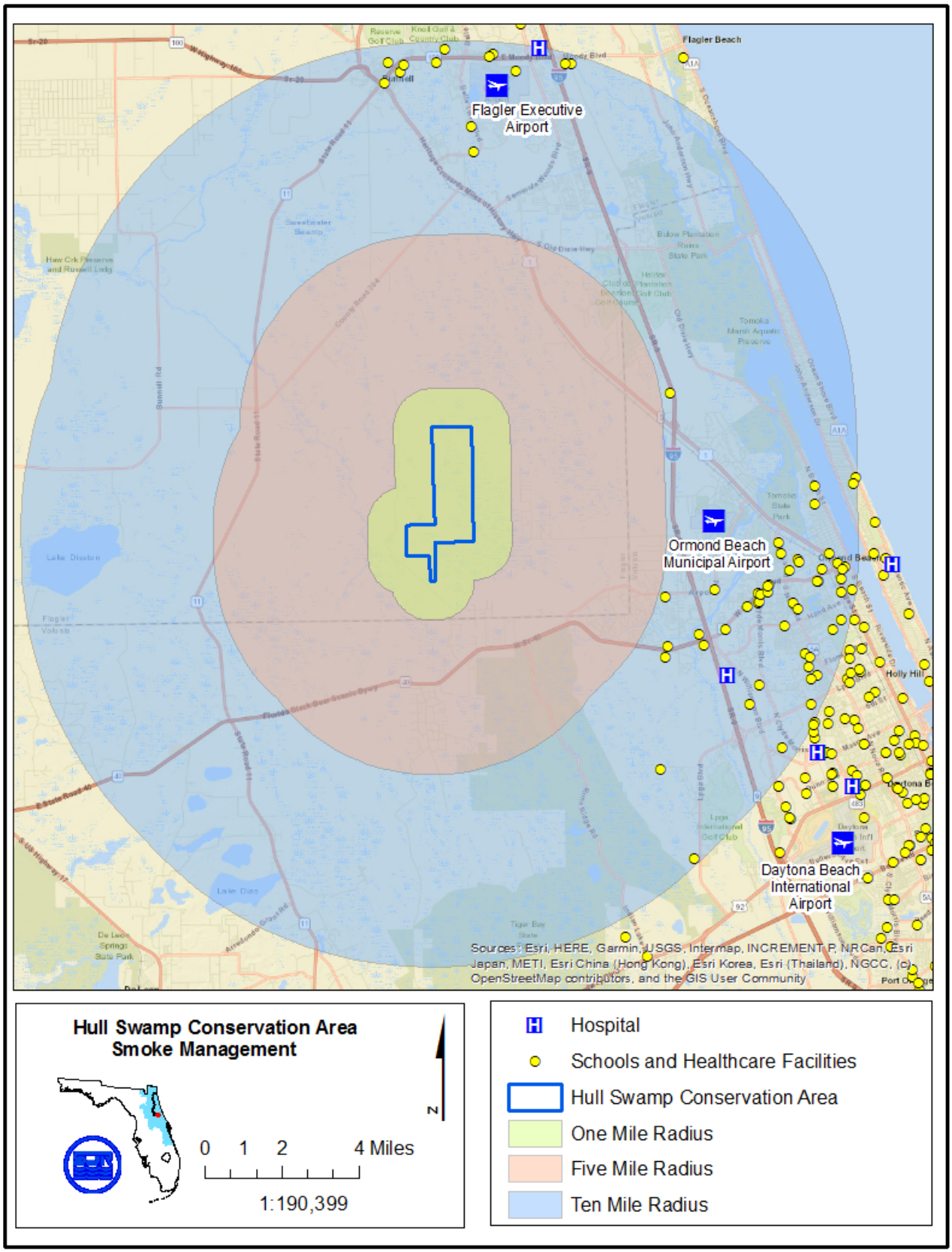

Figure 18: Smoke management.

A system of Fire Regime Condition Class measures was originally developed by the Nature Conservancy and the USDA Forest Service in 2003 as an effort to assess ecosystem health. It is based on a relative measure and describes the degree of departure from the historical natural fire regime of a given ecosystem (Hann, et al., 2003). This departure results in changes to one or more of the following ecological components: species composition, structural stages, stand age, canopy closure, or mosaic pattern. The District adopted the system in 2008 to establish a reference for ecosystem health and land management effectiveness. While fire is the preferred disturbance that maintains most natural communities in Florida, other disturbances, though not as effective, may serve to accomplish or aid in the accomplishment of management objectives. Annually, each burn zone is assigned a Condition Class score based upon the most recent disturbance and the fire frequency recommended for that plant community by FNAI. If FNAI recommends a fire return interval of 3-5 years, a plant community that has benefited from disturbance in the past 5 years is in Condition Class 1. If it has been more than 5 years but less than 15 years, or three cycles, the zone is in Condition Class 2. If it has been more than three times the fire return interval, but can still be recovered by fire, it would fall into Condition Class 3. If the plant community has gone without disturbance so long that fire alone can no longer restore the area, it is in Condition Class 4. Hull Swamp has 930 acres that are not maintained by fire or disturbance which are not included in the Condition Class report.

District staff will make annual condition class assessments and incorporate them into annual burn and work plans. The overall condition class distribution of the conservation area zones in 2021 was 37% Condition Class 1 and 63% Condition Class 3. In 2021, no zones fell within Condition Class 2 or 4. Most zones classified as Condition Class 1 received disturbance from forestry operations including prescribed fire, timber harvesting or reforestation. Since 2015, there has been an overall increase in the percentage of zones in Condition Class 1, a decrease in Condition Class 2, and no consistent trend in Condition Class 3 from 2015 to 2021 (Figure 19). There are no zones within Hull Swamp that are in Condition Class 4. All implementation of prescribed fire within the conservation area will be conducted in accordance with the District’s Fire Management Plan, the Hull Swamp Fire Management Plan (Appendix 2), and the annual burn plan for the property.

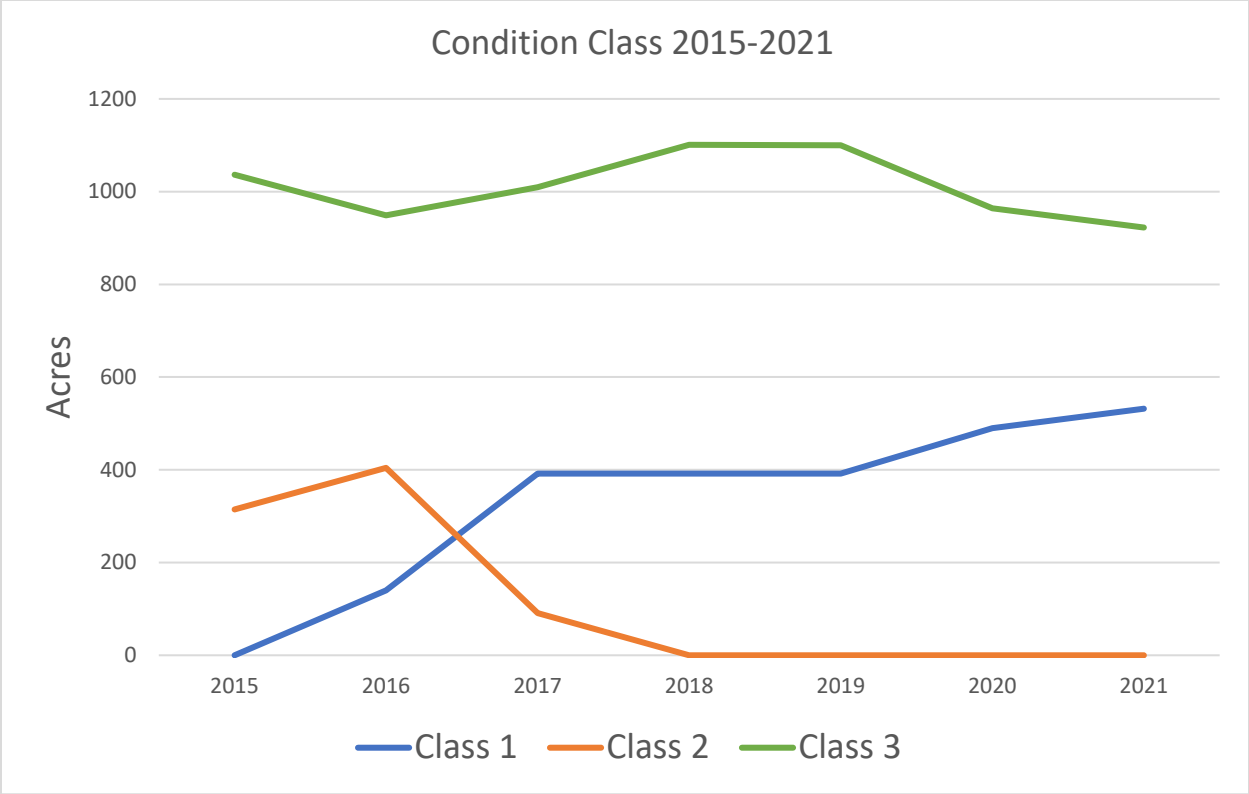

Figure 19: Condition classes.

Flora and Fauna

Goal: Maintain, improve, or restore native and listed species populations.

Strategies:

- Conduct plant and wildlife surveys and develop species lists.
- Monitor for the presence of listed species and adjust management actions appropriately.

Goal: Manage invasive and/or exotic plants and animals.

Strategies:

- Conduct feral hog removal activities as needed.
- Locate, map, and treat any new infestations of invasive and/or exotic plant species.

Hull Swamp has a diverse assemblage of natural communities providing significant habitat for a variety of floral and faunal species. In June of 2020, District staff conducted an informal flora and fauna survey across the conservation area and have continued to add to the list (Appendix 3).

Flora

The District has developed a plant list from observations within Hull Swamp. The District may seek the assistance of local Native Plant Society members and other volunteers to further develop the knowledge of plant species within Hull Swamp. Only one State listed plant species has been observed on Hull Swamp and is described below.

Hooded Pitcher Plant
Hooded pitcher plant (*Sarracenia minor*), is documented within Hull Swamp, and is listed as a threatened species by the State of Florida. This species is an erect herbaceous, insectivorous perennial plant. Leaves are 12-35 cm long, or occasionally longer. The tubular portion of the leaf gradually widens from the base to the orifice, forming hollow tubes (pitcher) and when mature will contain water and function as an insect trap. This species occurs on wet sandy-peaty to peat soils associated with bogs, pine savannas, and adjacent ditches.

Fauna

Gopher Tortoise
The gopher tortoise (*Gopherus polyphemus*), is a federal candidate species for listing as a threatened species and a state-listed threatened species which occurs within Hull Swamp. This species is typically found in dry upland habitats, such as sandhill, scrub, and pine flatwoods. Gopher tortoises excavate deep burrows and are considered a keystone species because their burrows provide refuge for more than 300 animal species. Management activities within the pine flatwood communities of Hull Swamp will focus on restoring species composition and natural fire return intervals, which will benefit the gopher tortoise.

Southern Fox Squirrel
The southern fox squirrel (*Sciurus niger niger*), previously classified as Sherman's fox squirrel, is protected as a State Species of Special Concern by the State of Florida. Southern fox squirrels inhabit open, fire-maintained longleaf pine, turkey oak, sandhills, and flatwoods, and the main threat to this species is habitat destruction.

Wood Stork
Hull Swamp lies within the core foraging area for a nesting colony of the federally threatened wood stork (*Mycteria americana*). Wood storks have been documented on the property. A rookery is documented approximately 8 miles due west of the conservation area on Lake Disston (USFWS, 2019), and the entire property lies within the foraging area radii limits established for north Florida wood stork rookeries. The District will adhere to the guidelines established in the January 1990 U.S. Fish and Wildlife Service (FWS) *Habitat Management Guidelines for the Wood Stork in the Southeast Region.*

Exotic or Invasive Species

Invasive plants known to occur within the conservation area include Cogongrass (*Imperata cylindrica*) and Caesar-weed (*Urena lobata*). Invasive species control is necessary to inhibit the continued proliferation of invasive plants and integral in the maintenance and restoration of natural plant communities. The District uses a variety of techniques including fire, mechanical, and chemical treatments. Herbicide is applied per label rates using the most appropriate method of application for the target species.

While it is unlikely that the District will entirely eradicate invasive plants within the property, maintaining or achieving maintenance control of such species is targeted within the scope of this plan. Invasive plant infestations are light across the property, and the property is regularly monitored and treated, as necessary. All known occurrences of Florida Invasive Plant Council

(FISC), formerly FLEPPC Category I and II invasive plants at Hull Swamp are currently at a maintenance level (2020 FISC List of Invasive Species). District staff have treated approximately ten acres of invasive vegetation within the property since 2013.

Exotic wildlife species known to occur within the conservation area include feral hogs (*Sus scrofa*), brown anole (*Anolis sagrei*), and nine-banded armadillos (*Dasypus novemcinctus*). The District currently utilizes feral hog removal agents through a Special Use Authorization (SUA) process to assist in the control of feral hogs. The District keeps records of hog removal from the property. On other District-managed properties, the District has coordinated via contract with the United States Department of Agriculture (USDA) to assist in the removal of feral hogs. If necessary, the District may utilize the USDA to address specific population reduction initiatives at Hull Swamp.

Cultural Resource Protection
Goal: Identify, protect, and maintain any cultural resources found on the property.

Strategies:
- Identify and report sites to the Florida Division of Historical Resources (DHR).
- Identify and report any detrimental activities to the sites to the DHR and law enforcement.

A review of the DHR data indicates no documented Florida Master Site File cultural sites within the conservation area. If any sites are located, District staff will document and report sites to the DHR. District 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 are not identified on public maps.

LAND USE MANAGEMENT

Access
Goal: Maintain access easement with Relay Timberlands/American Forest Management and evaluate opportunities to provide public access.

Strategies:
- Maintain boundary signs, gates, and roads.
- Update District database on maintenance of existing and creation of new signs, gates, trails, and roads.

Hull Swamp is surrounded by undeveloped private property and conservation easements (Figure 3). The conservation easements surrounding Hull Swamp are held by the District and Trustees. The District holds a nonexclusive access easement on a 5.2-mile logging road from Relay Timberlands/American Forest Management. The easement allows access for District staff, District contractors and their employees as well as the public. As per the easement, there are locked gates at the SR 11 and property boundary entrance, each without parking. Thus, the public's access to HSCA is greatly limited, but not prohibited. The access easement is

approximately 5.2 miles long, and the cost of road maintenance is allocated based on respective uses of the road.

There are currently five gates providing management access to and across the property. These gates are monitored regularly for maintenance and/or repair needs. Approximately 6.8 miles of interior management roads traverse the property. In order to manage road maintenance, the District utilizes a roads classification system. This system includes the following classifications:

A. Paved Road – Any road that is paved.
B. Primary Road – Any road that requires routine maintenance of any kind.
C. Secondary Road – Any road that does not require routine maintenance, only periodic or no maintenance.

Approximately 4.4 miles within the conservation area are classified as primary road, and 2.4 miles are classified as secondary roads, with the majority consisting of native surface without stabilization material. District staff will update the roads database to reflect changes to the road network within the property, as necessary. Roads will be regularly inspected and receive maintenance and repair, as necessary. Figure 20 depicts the location of the access easement, roads, and gates on the property.

Recreation

At this time, there is no public recreation developed at Hull Swamp due to limited but not prohibited access. As previously mentioned, the conservation area is surrounded by undeveloped private property and conservation easements. The sole access to the property is the 5.2-mile-long gated nonexclusive access easement on a Relay Timberlands/American Forest Management logging road. There are no parking areas or trails.

Security

Goal: Provide and maintain the site's security.

Strategies:

- Maintain boundary signage, gates, and locks.
- Continue coordination with private security firm, FWC, and local law enforcement.

Security concerns within Hull Swamp include illegal motorized vehicle access and poaching. The District utilizes a contract security firm as well as coordination with FWC and local law enforcement to administer security within the property.

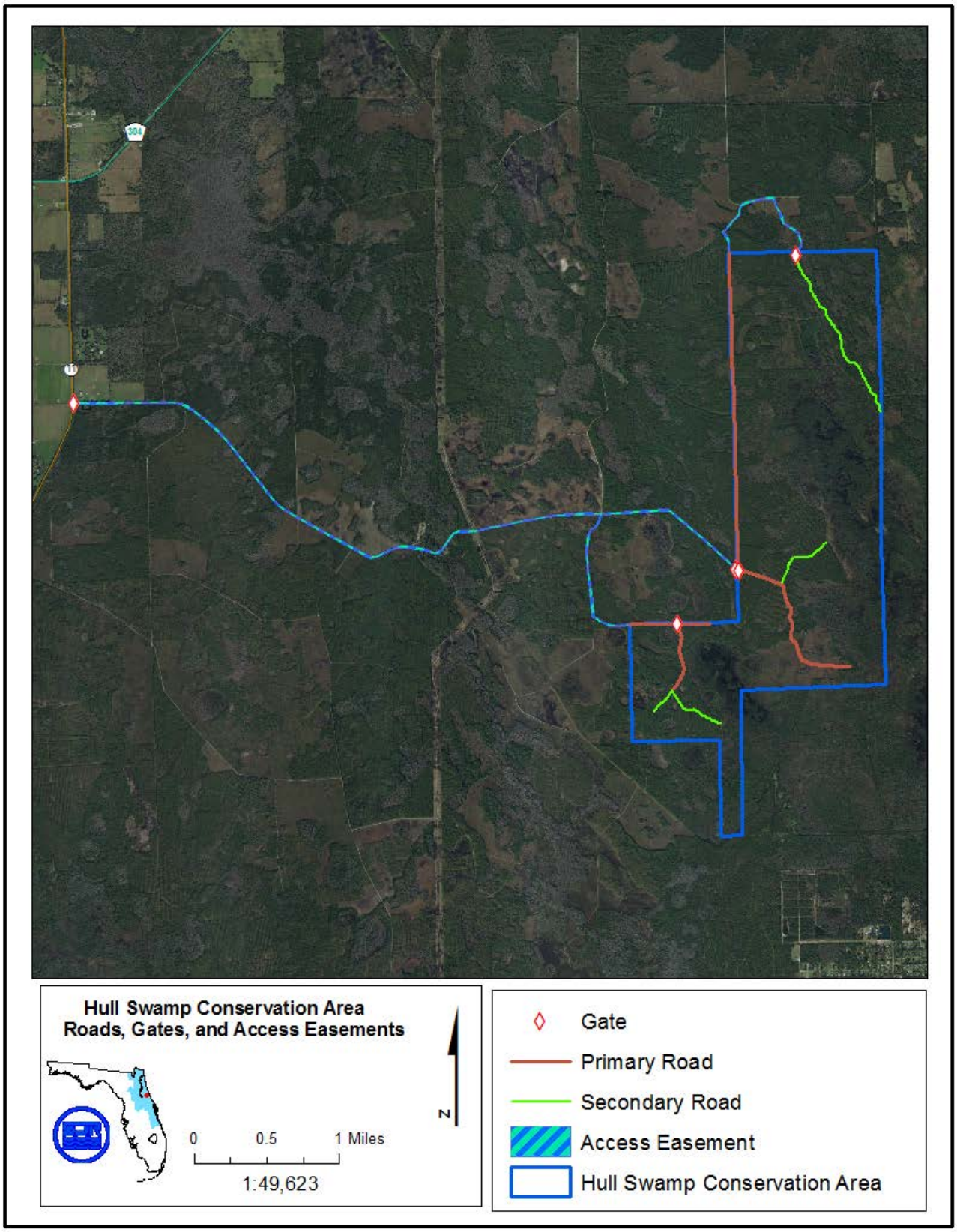

Figure 20: Roads, gates and access easements.

ADMINISTRATION

Real Estate Administration

Goal: Explore opportunities for adjacent property acquisition.

Strategy: Evaluate adjacent properties for potential acquisition.

There are no anticipated surpluses or acquisitions associated with Hull Swamp in the next ten years. The District may evaluate adjacent properties for potential acquisition that would allow for public access and/or improve ecological continuity.

Cooperative Agreements, Leases, Easements, and SUA

Goal: Evaluate, pursue, and manage cooperative opportunities.

Strategies:

- Evaluate lease and Special Use Authorization opportunities for compatibility with conservation and management goals.
- Continue to cooperate with researchers and universities as appropriate.
- Maintain contact with former landowner regarding existing lease

Section 373.1391, Florida Statutes, authorizes and encourages the District to enter into cooperative land management agreements with state agencies or local governments to provide for the coordinated and cost-effective management of lands to which the water management districts, the Trustees, or local governments hold title. District Policy #820 promotes the District entering into agreements with other agencies and private parties for cooperation and coordination of management of the District's lands. In addition, the District is authorized to enter into Cooperative Agreements, Cooperative Management Leases, Leases, Easements and Special Use Authorizations to protect the District's water management interests and to enhance the management and public value of the land. Leases can be a useful tool to accomplish land management objectives and will be evaluated and implemented where appropriate. Common examples include cattle grazing and apiaries, and the District remains open to considering other types of leases which help achieve management goals. Table 2 details the agreements, leases, and SUAs in effect during the writing of this plan.

Agreement Number	Type/Purpose	Agreement Name	Term
1403	Lease/Apiary	D&J Apiary	June 2023
1708	SUA/Access for retrieval of hunting dogs from adjacent property	Relay Hunting Club, LLC	September 2024
2132	SUA/Hog Removal	O'Neal Hog Removal	February 2026

Table 2: Cooperative Agreements, Leases, and Special Use Authorizations

Pre-Acquisition Lease and Reserved Rights

The District purchased the property subject to a lease dated April 17, 2007, for the exploration, drilling, and production of water, which expires on April 17, 2027. As of the date of this Plan, the Lessee has not utilized the property for its leased purposes.

In addition, when ownership of the property was transferred to the District, the Grantor reserved unto itself and its successors and assigns the right to use the property to develop potable and raw water for commercial use subject to and in accordance with any and all required permits , including but not limited to reasonable access to, and use of the surface and subsurface of, the property to perform geological and hydrological studies, to drill and operate wells to withdraw, recharge or inject water, and to develop points of access and transmission and distribution lines, in locations to be approved by the District and in locations likely to minimize disruption to uses of the property by the District, to remove potable and raw water from the property. If these reserved rights are exercised, the District's predecessor in interest is required to pay the District liquidated damages as set forth in the deed.

Management Revenues and Costs

Goal: Analyze and report projected and actual costs and revenues.

Strategies:

- Analyze and report revenues.
- Analyze and report land management costs.

All revenue generated through leases and forest management accomplishments are applied towards the District's land management division budget to offset management costs for the property.

Costs and revenues are projected into the future. However, prices of timber fluctuate depending on the markets.

Revenues Since Purchase of Property

Revenues since purchase of the property in 2013 are primarily from timber thinning (Table 3).

Activity	Revenue Year	Revenue
2015 Timber Sale	2016	$ 123,677
2017 Timber Sale	2017	$ 30,680
2017 Timber Sale	2020	$ 75,574
Apiary Lease	2018-2021	$ 999
Total		**$ 230,930**

Table 3: Management Revenues from 2013 to 2021

Costs Since Purchase of Property

Since purchase of the property in 2013, costs have totaled $126,485 (Table 4).

Annual Costs				
Activity	**Annual Number of Units**	**Units**	**Annual Cost**	**Total Cost (Since 2013)**
Invasive plant control	1.5	Acres	$415	$3320
Fireline Disking	15	Miles	$4,500	$36,000
Security	30	Hours	$1,350	$10,800
Road maintenance	7	Miles	$1,400	$11,200
Mowing (roads)	34	Acres	$510	$4,080
One Time Cost				
Activity	**Total Number of Units**	**Units**	**Cost**	**Total**
Tree planting/Site Prep	106	Acres	$28,051	$28,051
2014 Forest Inventory	30	Plots	$566	$566
2018 Forest Inventory	46	Plots	$1,088	$1,088
2020 Forest Inventory	19	Plots	$450	$450
Prescribed Fire	108	Acres	$4,292	$4,292
Wildfire Suppression	14	Acres	$6,333	$6,333
Total Cost Since 2013				**$106,180**

Table 4: Management Costs from 2013 to 2021

Projected Revenues

The projected revenues from forest management and apiary lease at Hull Swamp between 2022 and 2032 are $513,337.30 (Table 5). All revenue generated for this time will be applied towards the District's land management budget to offset management costs for the property.

Activity	**Year**	**Revenue**
Thinning	2022	$276,320.00
Thinning	2024	$86,280.95
Thinning	2025	$67,363.35
Thinning	2029	$18,768.00
Thinning	2032	$61,272.00
Apiary Lease	2021-2031	$3,333
Total		**$513,337.30**

Table 5: Projected revenues between 2022 to 2032

Projected Management Costs

Projected management costs for Hull Swamp from 2022-2032 are $196,052 (Table 6).

Activity	**Number of Units (annual)**	**Units**	**Annual Cost**	**10 Year Total Cost**
Invasive plant control	2	Acres	$553.2	$5,532
Prescribed fire	308	Acres	$7,084	$70,840
Fireline Disking	15	Miles	$4,950	$49,500
Security	30	Hours	$1,500	$15,000
Road maintenance	12	Miles	$2,640	$26,400
Mowing (roads)	34	Acres	$578	$5,780
One Time Cost				
Activity	**Total Number of Units**	**Units**	**Cost**	**Total**
2022 Tree planting	13	Acres	$12,000	$12,000
2028 Timber marking	34	Acres	$2,493	$2,493
2031 Timber marking	116	Acres	$8,507	$8,507
Total cost over 10 years				**$196,052**

Table 6: Projected Management costs from 2022-2032

RESOURCE PROTECTION AND MANAGEMENT

Water Resources

Goal	Protect water quality and quantity, restore hydrology to the extent feasible, and maintain the restored condition	Measure	Planning Period
Strategy A	Maintain roads and culverts to prevent erosion.	Roads and culverts maintained	Annually by Sept.
Strategy B	Install water bars, turnouts, and low water crossings.	Water bars, turnouts, and low water crossings installed	5-10 Years
Strategy D	Remove silvicultural beds from timber harvest areas if restoration is feasible.	Removed beds	5-10 Years

Forest Management and Restoration

Goal	Maintain, improve, and restore forest resources	Measure	Planning Period
Strategy A	Update forest management database.	Updated forest management database	Annually by Nov.
Strategy B	Thin 929 acres of timber.	Acres of timber thinned	10 Years

Fire Management

Goal	Implement a prescribed burning program in accordance with District's Fire Management Plan	Measure	Planning Period
Strategy A	Develop annual burn plans.	Burn plan	Annually by Nov.
Strategy B	Use mechanical fuel reduction as a fire surrogate in areas where it is difficult to burn due to high fuel loads.	Number of acres mowed or roller chopped	5-10 Years
Strategy C	Continue to populate the fire management database on an annual basis.	Updated fire management database	Annually by Nov.
Strategy D	Conduct dormant season burns in pine plantations and areas of high fuel loading and/or extended fire exclusion.	Acres burned in dormant season	Ongoing

Flora and Fauna

Goal	**Maintain, improve, or restore native and listed species populations**	**Measure**	**Planning Period**
Strategy A	Conduct plant and wildlife surveys and develop species lists.	Updates to species list	Ongoing
Strategy B	Monitor for the presence of listed species and adjust management actions appropriately.	Updates to species list and adjusted management actions	Ongoing
Goal	**Manage invasive and/or exotic plants and animals**	**Measure**	**Planning Period**
Strategy A	Conduct feral hog removal activities as needed.	Number of hogs removed	Annually by Sept.
Strategy B	Locate, map, and treat any new infestations of invasive and/or exotic plant species.	Mapping and treatment of new infestations	Ongoing

Cultural Resource Protection

Goal	**Identify, protect, and maintain any cultural resources found on the property**	**Measure**	**Planning Period**
Strategy A	Identify and report sites to the Florida Department of Historical Resources (DHR).	Sites identified and reported	Ongoing
Strategy B	Identify and report any detrimental activities to the sites to the DHR and law enforcement.	Sites identified and reported	Ongoing

LAND USE MANAGEMENT

Access

Goal	**Maintain access easement with Plum Creek Timberlands and evaluate opportunities to provide public access**	**Measure**	**Planning Period**
Strategy A	Maintain boundary signs, gates, and roads.	Signs, gates, and roads maintained	Ongoing
Strategy B	Update roads, gates, and firelines in the District database as maintenance, repair, or creation of new roads or trails occurs.	Database updated	Ongoing

Security			
Goal	**Provide and maintain the site's security**	**Measure**	**Planning Period**
Strategy A	Maintain boundary signage, gates, and locks.	Signs, fences, gates, and locks maintained	Ongoing
Strategy B	Continue coordination with private security firm, FWC, and local law enforcement.	Secure property	Ongoing

ADMINISTRATION

Real Estate Administration			
Goal	**Explore opportunities for adjacent property acquisition**	**Measure**	**Planning Period**
Strategy A	Evaluate adjacent properties for potential acquisition.	Properties evaluated	Annually by Sept.
Cooperative Agreements, Leases, Easements, and Special Use Authorizations (SUA)			
Goal	**Evaluate, pursue, and manage cooperative opportunities**	**Measure**	**Planning Period**
Strategy A	Evaluate lease and Special Use Authorization opportunities for compatibility with conservation and management goals.	Leases and SUA's administered	Ongoing
Strategy B	Continue to cooperate with researchers and universities as appropriate.	Cooperative agreements and SUA's administered	Ongoing
Management Revenues and Costs			
Goal	**Analyze and report projected and actual costs and revenues**	**Measure**	**Planning Period**
Strategy A	Analyze and report revenues.	Annual report	Annually by Nov.
Strategy B	Analyze and report land management costs.	Annual report	Annually by Nov.

Table 7: Land Management Plan Implementation Chart

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APPENDIX A: HULL SWAMP CONSERVATION AREA SOILS

Below is a description of the soils and an accompanying map (Figure 1) at Hull Swamp Conservation Area.

Basinger
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 may consist of wax myrtle, St. Johns wort, maidencane, pineland threeawn, cypress, slash pine, longleaf pine, pond pine, and other water tolerant plants.

EauGallie
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.

Gator
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 flood plains. Native vegetation includes mostly cordgrass or saw grass, maidencane, willow, dogwood, or swamp vegetation including bald cypress, sweet gum, red maple, and American hornbeam.

Hicoria
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.

Hontoon
The Hontoon series consists of deep, very poorly drained, rapidly permeable organic soils formed in hydrophytic non-woody plant remains. These soils occur in fresh water swamps and marshes. Native vegetation is loblolly, bay, maple, gum, and scattered cypress trees with a ground cover of greenbriers, ferns, and other aquatic plants. In a few areas there are slash pines with a ground cover of fern.

Malabar
The Malabar series consists of very deep, poorly to very poorly drained soils in sloughs, shallow depressions, and along flood plains. They formed in sandy and loamy marine sediments. Native vegetation consists of scattered slash pine, cypress wax myrtle, cabbage palm, pineland threeawn, and maidencane. In depressions, the vegetation is dominantly St. Johns wort or maidencane.

Pineda
The Pineda series consists of deep and very deep, poorly and very poorly drained, very slowly permeable soils in depressions, low hammocks, poorly defined drainageways, broad low flats, and flood plains. They formed in thick beds of sandy and loamy marine sediments on the lower coastal plain. Natural vegetation consists of slash pine, cypress, myrtle, cabbage palm, blue maidencane, chalky bluestem, bluepoint panicum, sedges, pineland threeawn, and sand cordgrass.

Placid
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.

Pomona
The Pomona series consists of very deep, poorly and very poorly drained, moderate to moderately slowly permeable soils on broad low ridges on the Lower Coastal Plain. They formed in sandy and loamy marine sediments. The native vegetation consists of slash pine, longleaf pine with an understory of saw palmetto, wax myrtle, gallberry, creeping bluestem, chalky bluestem, indiangrass, and pineland threeawn.

Riviera
The Riviera series consists of very deep, poorly drained, very slowly permeable soils on broad, low flats and in depressions in the Lower Coastal Plain. They formed in stratified sandy and loamy marine sediments on the Lower Coastal Plain. Native vegetation may consist of slash pine, cabbage, and saw palmetto, scattered cypress, maidencane, and pineland threeawn.

Samsula
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 drainageways and flood plains. Natural vegetation is loblolly bay with scattered cypress, maple, gum, and pine trees with a ground cover of greenbriers, ferns, and other aquatic plants.

Smyrna
The Smyrna series consists of very deep, poorly to very poorly drained soils formed in thick deposits of sandy marine materials. Natural vegetation consists of longleaf and slash pines with an undergrowth of saw palmetto, running oak, gallberry, wax myrtle, and pineland three awn.

St. Johns
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.

Valkaria
The Valkaria series consists of deep, rapidly permeable soils that formed in thick beds of marine sands. These soils occur in broad, poorly defined, low gradient drainageways, depressions and low nearly level areas. Natural vegetation is palms, cabbage palmettos, St. Johns wort, wax myrtle, blue maidencane, chalky bluestem, pineland threeawn, and widely spaced pine and cypress. Maidencane is the most common plant in depressions.

Wabasso
The Wabasso series consists of deep or very deep, very poorly and poorly drained, very slowly and slowly permeable soils on flatwoods, flood plains, and depressions in Peninsula Florida. They formed in sandy and loamy marine sediments. The natural vegetation consists of longleaf pine, slash pine, cabbage palm, live oak, with an understory of saw palmetto, laurel oak, wax myrtle, chalky bluestem, and pineland threeawn.

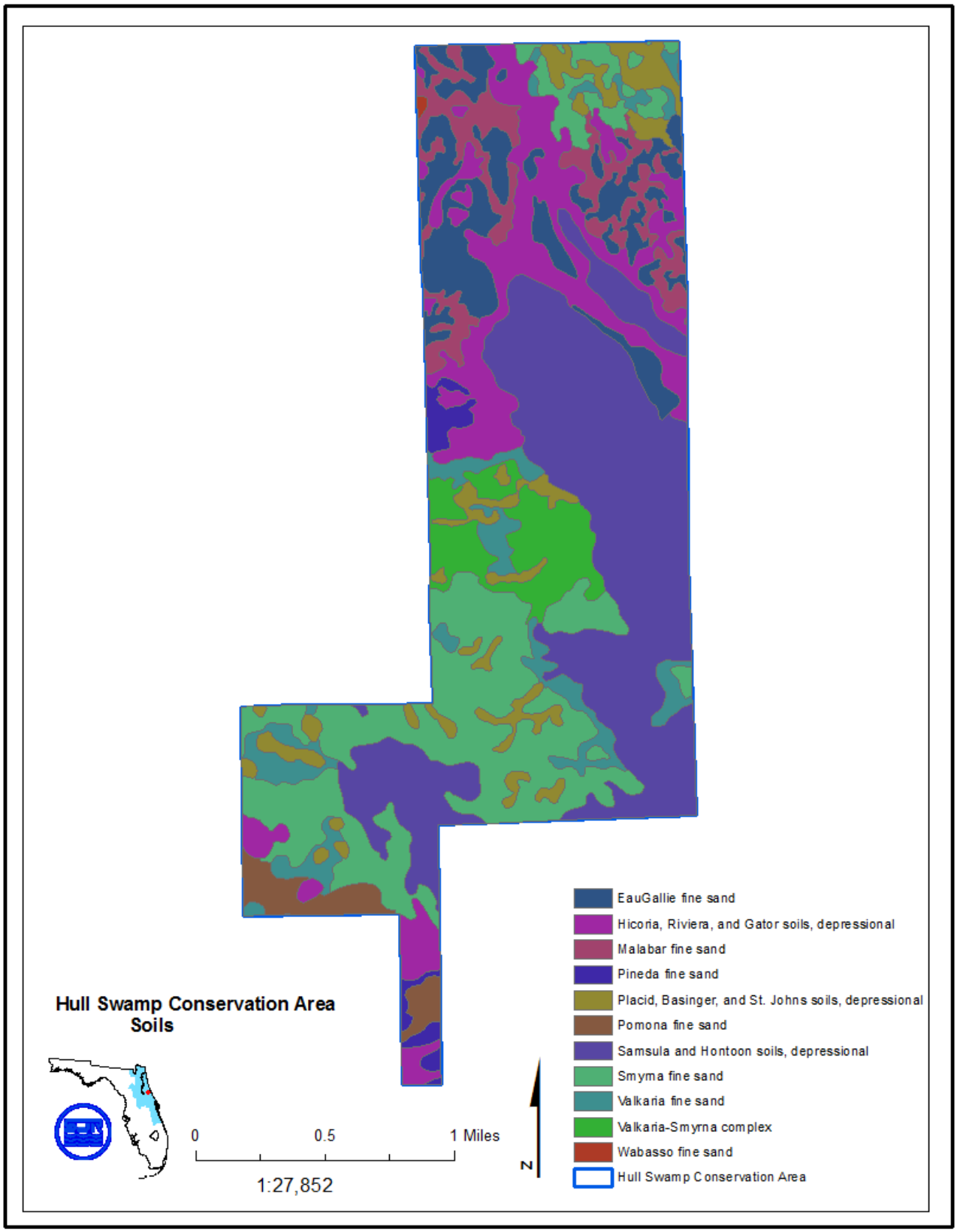

Figure 1: Soil types at Hull Swamp Conservation Area.

APPENDIX B: HULL SWAMP CONSERVATION AREA FIRE MANAGEMENT PLAN

The District Fire Management Plan provides general fire management information relative to policy, procedure, and reporting. This document provides the guidelines for the implementation of prescribed fire activities on the Hull Swamp Conservation Area (Hull Swamp).

Introduction and Objectives

Hull Swamp covers approximately 2,386 acres in Flagler County. This conservation area includes one parcel and is located in numerous sections of Townships 13 and 14 South and Range 30 East.

Hull Swamp is situated approximately 10 miles west of Ormond Beach, and 10 miles south of Bunnell, and lies within the Bunnell city limits. The property is approximately 5 miles east of SR 11 and 3 miles north of SR 40.

Historically, fires have played a vital role in the shaping and maintenance of many of the natural communities in Florida. As such, most vegetative communities and associated wildlife are fire adapted and in many instances fire dependent. Conversely, the exclusion of fire from an area allows for successional changes within the natural community. Fire exclusion leads to the excessive accumulation of fuel loads, which increases the risk for catastrophic wildfires. The goals for the implementation of fire management activities within the conservation area include:

- Reduction of fuel loads through the application of dormant season burns to decrease potential risk of damaging wildfires.
- Introduction of growing season burns to encourage the perpetuation of native fire adapted ground cover species.
- Mitigation of smoke management issues.
- Restoration and maintenance of a mosaic of natural plant communities and ecological diversity.
- Maintenance and restoration of ecotonal areas.

The achievement of these goals requires that the conservation area be partitioned into manageable burn units prior to the application of prescribed fire within those units. The following sections summarize the considerations necessary for the safe and effective use of prescribed fire as a land management tool within Hull Swamp.

Fire Return Interval

The general frequency to which fire returns to a community type is termed its fire return interval. Some communities require frequent pyric disturbances to perpetuate themselves while others are not fire adapted and subsequently do not require fire to maintain their characteristics. The following discussion of native plant communities occurring on Hull Swamp and optimal fire return intervals was characterized in part using information from the 2010 Florida Natural Areas Inventory's *Guide to the Natural Communities of Florida* (Table 1).

Natural Community Type	FNAI Fire Return Interval
Mesic Flatwoods (Pine Plantation*)	2-4 years
Wet Flatwoods (Pine Plantation*)	1-3 years in grass dominated systems; 5-7 years in shrubbier systems
Basin Marsh	5-7 years; frequency of fire varies depending on the hydrology of the marsh and its exposure to fire from surrounding areas.
Basin Swamp	This is not a fire-adapted community
Dome Swamp	3-5 years along the outer edges (or as adjacent communities burn); 100-150 years interior
Baygall	Infrequent; may burn with adjacent pyric plant communities
Wet Prairie	2-3 years

*Fire return intervals in planted pine stands vary depending on species and age.

The above referenced fire return intervals relate to high quality natural communities. The fire return interval within degraded systems is variable. Prescribed fire will be applied as necessary to achieve restoration and management goals.

Mesic and wet flatwoods are the most prevalent fire adapted natural community types found within Hull Swamp. Prior to public acquisition, most of these areas were utilized in commercial silviculture operations. As a result, much of the historic mesic and wet flatwoods are planted in slash pine (*Pinus elliottii*). Additionally, the mid-story and groundcover species within these pine plantations are altered and, in some areas, absent. The primary fuel for carrying fire across dense pine areas is needle litter.

Fire management within the remaining pyric plant communities (below) will be in conjunction with the associated mesic or wet flatwoods. These plant communities will burn as site conditions permit during the implementation of controlled burns in adjacent plant communities. Additionally, these areas will not be excluded from fire activities unless warranted by safety or smoke management issues.

Basin marsh is a fire-adapted community. Though fire may not carry entirely through each marsh during every burn, it is an important factor in the maintenance and serves to restrict encroachment of woody plant species. Natural fire regime coincides with that of the adjacent habitat. Approximately 12 acres of basin marshes are adjacent to the uplands within the conservation area. In general, basin marsh fires are carried through the herbaceous layer. Many of these marshy areas have been disturbed by past land use, but all still occupy an important niche in providing habitat for numerous species of wildlife. Fire may be applied to these marshes any time surrounding natural communities are burned.

Dome swamps are scattered throughout the conservation area. As site conditions and safety permits, fire will be allowed to burn into the domes in order to maintain the characteristic open edges of the domes while preventing excessive peat accumulation.

The basin swamp is not a primary target for fire management at Hull Swamp; however, this natural community grades into wet and mesic flatwoods communities, which are fire dependent. Basin swamps are considered fire influenced, because while they do support fire at some frequency, fire has the potential to have rather extreme effects. Under normal hydrologic conditions, fire will burn the edges of this community type without penetrating to the center. This is the desired effect of fire within the basin swamp, as it will prohibit the expansion of hardwoods and shrubs into the adjacent flatwoods.

The most important physical factors in the shaping of the wet prairie natural community are fire and hydrology. Fire is essential for the maintenance of this community type with the most frequent return intervals of 2 to 3 years. Silvicultural activities at Hull Swamp have altered these areas. Fire will be applied to these areas anytime surrounding areas are burned.

Baygalls are not generally targeted specifically for fire management, pockets of bay trees will begin to move into adjacent mesic and wet flatwoods natural communities over time. District staff utilize prescribed fire to reduce bay encroachment in adjacent natural communities.

Except for basin marsh, the above-listed communities make excellent natural firebreaks during normal or wet conditions. Whenever possible, the ecotonal areas between these communities and adjacent fire adapted communities will be included in burns.

Seasonality and Type of Fire

Historically, most fires in Florida occurred in what is commonly referred to as the "growing season." The growing season usually spans from mid-March through July. Fires during the growing season generally have significant ecological benefits as most fire adapted flora is perpetuated by fire. Mimicking lightning ignited natural fires by implementing prescribed fire during the growing season provides benefits to natural systems by controlling shrub layers and encouraging diversity in groundcover species.

Dormant season burns, conducted from late November through mid-March, help to reduce fuel loads in overgrown areas or in areas of newly planted pines. Cooler conditions associated with dormant season burning are a consideration in areas of high fuel loads and where only minimal pine mortality is acceptable. Additionally, dormant season burning may result in fewer safety and smoke management issues due to higher fuel moisture and more consistent winds. District staff will continue to work to maintain fire return frequencies that are consistent with those identified by FNAI for the various communities within the property.

In many cases, fire management units with similar fire management needs may be burned simultaneously, either with crews igniting the areas by hand from the ground, or with the aid of aircraft. Because Hull Swamp is large with an ample smoke shed, the property is a candidate for implementing prescribed fire with the aid of a helicopter. Aerial ignition allows District staff to ignite fire management units quickly, which results in faster burnout and reduces smoke management concerns. Additionally, convection produced by igniting an area can help move the smoke up and away more quickly. Aerial ignition also allows staff to introduce fire into areas that may be inaccessible from the ground, ensuring that prescribed fire is introduced into even the most remote areas within the fire management units. Aerial ignition allows staff to burn more

acres in a shorter period, which in time will aid District staff in maintaining optimal fire return frequencies. An aerial burn safety plan (Exhibit 1) will accompany the individual burn prescriptions and be onsite and on the ground the day of any aerial burn.

Wildfire Policy
In the event of a wildfire, if conditions permit, suppression strategies will utilize existing fuel breaks to contain the wildfire. These fuel breaks may include previously burned areas, existing roads, trails, and firelines, and wetlands and other water bodies. This is only possible, with the agreement of local fire rescue, Florida Forest Service, District staff, and when all the following conditions are met:

1) Fuels within the area have been managed
2) No extreme weather conditions are present or expected
3) There are no other wildfires that may require action
4) There are sufficient resources available to manage the fire to containment
5) The fire and the resulting smoke will not impact neighbors or smoke sensitive areas

If any of these conditions are not met, direct suppression action will be taken.

As soon as possible following a fire in which firelines are plowed, a plan for fireline rehabilitation shall be developed and implemented.

Persons discovering arson or wildfires on the conservation area should report them to the Florida Department of Agriculture and Consumer Services, Florida Forest Service, the St. Johns River Water Management District, or by dialing 911.

Post Burn Reports
Burn reports must be completed after each prescribed burn or wildfire. These reports include detailed information regarding the acreage, fuel models, staff and equipment hours, cooperator hours, contractor hours, weather (forecasted and observed) and fire behavior. The timely completion of these reports is necessary for the compilation of information relative to the entire District burn program. Additionally, these reports provide a documented account of site-specific conditions which are helpful in the planning of future burns.

Smoke Management
A significant challenge to the implementation of any prescribed burn program is smoke management (Figure 1). Fuel loads across the property are moderate to high. Accumulated fuels have the potential to produce a tremendous amount of smoke as areas are burned. As the surrounding areas become increasingly urbanized, smoke management concerns will increase in magnitude, as there become fewer acceptable places to maneuver a smoke column from a prescribed fire.

While Hull Swamp has an acceptable smoke shed in which to place a smoke column from a prescribed fire, there are smoke sensitive areas that surround the conservation area and may affect the smoke management of each burn unit. Smoke management is a limiting factor in the application of prescribed fire within the conservation area. Figure 1 illustrates the smoke management area for Hull Swamp. As development increases in the area, fire management will

become more difficult. Increasing daily traffic on SR 40, US 1, and I-95 will further impair the District's ability to implement prescribed burns at the appropriate fire return intervals within the conservation area. Currently, this property still has an acceptable smoke shed into which to place a smoke column from a prescribed fire.

Depending on the arrangement and composition of fuels, fire spread will be through grasses and/or needle litter, the shrub layer, or logging slash. Areas within the conservation area having heavier shrub and mid-story fuel accumulation or logging slash can burn for long periods of time causing additional smoke management issues.

A fire weather forecast is obtained and evaluated for suitable burning conditions and smoke management objectives. A wind direction is chosen that will transport smoke away from urbanized areas and/or pose the least possible impact on smoke sensitive areas. When possible, the smoke plume from burns should be directed back through the property when possible. Smoke can then mix and loft into the atmosphere over uninhabited or rural land adequately enough to minimize off-site impacts.

On burn day, the ability of smoke to mix and disperse into the atmosphere should be good. The Dispersion index is a value that indicates the atmospheres ability to "absorb and disperse" smoke. The higher the index value, the more the smoke dissipates. Dispersion indices should be above 30. Dispersions of greater than 75 will not be utilized unless other weather conditions mitigate expected fire behavior. Forecast mixing heights should be above 1,700 ft. Transport winds should be at least 9 mph to effectively minimize residual smoke. Lower transport wind speeds can be utilized if dispersion index and mixing heights are above average. Burns will be conducted with a carefully plotted wind direction to limit and/or eliminate negative impacts from smoke to neighbors and urbanized areas.

Mechanical and Chemical Treatments

Short and long-term weather conditions and a fire management unit's proximity to urban areas become increasingly important when implementing a prescribed fire program. Should drought conditions become severe, or if smoke management becomes an insurmountable problem, the District may use mechanical methods, such as mowing or roller-chopping, as alternatives to prescribed fire.

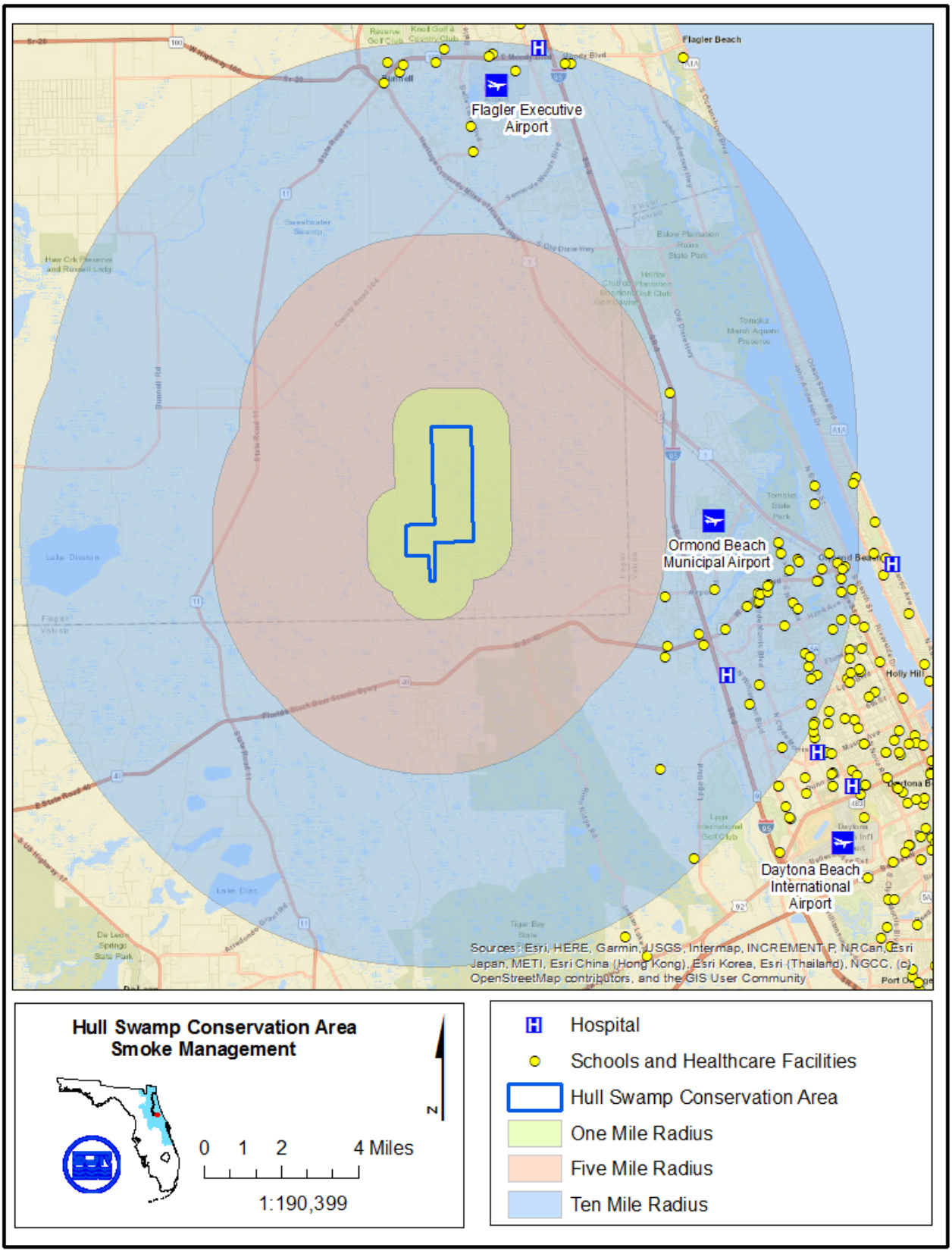

Figure 1: Fire management – smoke sensitive areas.

Many of the pyric plant communities within the conservation area are dominated by pine plantations. An integral component to the implementation of a successful prescribed fire program within Hull Swamp is the harvesting of planted pine. Harvesting of pine trees will provide safer conditions for prescribed fire staff and decrease the potential for fire related mortality to the remaining pines and other desirable vegetation.

Hazards
Common hazards include heat stress, venomous snakes, trip hazards or falling trees. Individual prescriptions address the hazards to consider when burning each unit and are discussed during the pre-burn briefing.

Legal Considerations
Only burn managers certified by Florida Forest Service will approve the unit prescriptions and must be on site while the burn is being conducted. Certified burn managers adhering to the requirements of Section 590.125, Florida Statutes, are protected from liability for damage or injury caused by fire or resulting smoke, unless gross negligence is proven.

Fire Management Units
Fire management units (FMU) have been delineated on the property. Where logical, the District used existing roads and landscape features to delineate fire management units. Occasionally, multiple FMUs with similar fire needs will be burned simultaneously and roads and natural landscape features provide a break in fuels so that staff may burn smaller areas than initially planned if needed.

Ideally, District staff would thoroughly address and describe each fire management unit in terms of its fire management needs. All fire management units are categorized into one of several fuel model (FM) descriptions. The 13 standard fuel models (as described in Hal E. Anderson's *Aids to Determining Fuel Models for Estimating Fire Behavior*) were used as a basis for this categorization. The factors considered in determining each FM are: amount, composition and arrangement of available fuels within units, predicted fire behavior within each unit (under conditions acceptable to implement a prescribed burn), and resources necessary to regain management of a fire in extenuating circumstances. District staff anticipates the change of vegetative assemblages over time due to growth and/or restoration and understand that fuel characteristics, models, and resulting fire behavior will also change.

Exhibit 1
Aerial Burn Safety Plan
Hull Swamp Conservation Area

The hazards associated with this type of burning are related to working with the helicopter, the sphere dispenser, and dealing with active fire. All helicopter safety procedures and all District fireline policies and procedures will be followed.

1. **BRIEFING -** During the operational briefing the safety plan will be reviewed with all personnel on the burn.
2. **HELICOPTER SAFETY -** The pilot will give a helicopter safety briefing at the morning operational briefing.
3. **AIDS SAFETY –** The operator will review the operation and cleaning procedures for the dispenser at the morning briefing.
4. **PERSONAL PROTECTIVE EQUIPMENT –** The incident commander will ensure that all personnel have the required PPE.
5. **HIGH HAZARD AREAS –** All high hazard areas such as power lines shall be designated on the map and attached to the burn plan.
6. **EMERGENCY LANDING ZONES –** These should be confirmed with the pilot and indicated on the burn map.

Helispot	**Latitude**	**29° 18' 22.94" N**	**Relay Hunt Camp**
	Longitude	**81° 16' 04.11" W**	

Crash Rescue Plan

In the event of an accident involving the helicopter the following procedures will be followed.

INCIDENT COMMANDER or BURN BOSS

1. **Notify 911**
2. Notify Flagler County Fire Rescue (386)-313-4200.
3. Notify Flagler Sheriff's Office (386)-313-4911
4. Assume responsibility of the Rescue Operation.
5. Notify NTSB (305-957-4610 or 404-462-1666)
6. Delegate responsibility of fire control to the second in command or the most qualified.

SECOND IN COMMAND

1. Assume responsibility of the burn.
2. Assist the IC or Burn Boss with resource and personnel needs for the rescue operation.
3. If the IC is in the helicopter, second in command will assume rescue operation responsibilities and assign the most qualified to fire control.

Emergency Phone Numbers

AIR RESCUE UNITS

1. Orlando Regional Medical Center
   Air Services — **407-843-5783 or 800-895-4615**

BURN UNIT LOCATIONS

1. Orlando Regional Medical Center – Burn Unit — **407-237-6398**

FLORIDA FOREST SERVICE

1. Bunnell District Dispatch — **386-585-6151**

NTSB

1. Southeast Regional Office — **305-957-4610**
2. Southeast Field Office — **404-462-1666**

APPENDIX C: HULL SWAMP CONSERVATION AREA SPECIES LIST

Plants

Genus species	Common Name (Conservation Status)
Acer rubrum	Southern red maple
Ambrosia artemisiifolia	Common ragweed
Andropogon glomeratus	Bushy bluestem
Andropogon virginicus var. glaucus	Chalky bluestem
Andropogon virginicus var.virginicus	Broomsedge bluestem
Aristida stricta var. beryichiana	Wiregrass
Asimina incana	Woolly pawpaw
Asimina pygmea	Dwarf pawpaw
Baccharis halimifolia	Saltbush
Bacopa caroliniana	Lemon bacopa
Bejaria racemosa	Tarflower
Bidens alba	Beggarticks
Bidens mitis	Smallfruit beggarticks
Canna flaccida	Golden canna
Centella asiatica	Spadeleaf
Chamaecrista fasciculata	Partridge pea
Cirsium horridulum	Purple thistle
Cladium jamaicense	Sawgrass
Coreopsis leavenworthii	Leavenworth's tickseed
Crotalaria rotundifolia	Rabbitbells
Dicanthelium aciculare	Needleaf witchgrass
Dicanthelium sp.	Witchgrass
Diodia virginiana	Virginia buttonweed
Diospyros virginiana	Common persimmon
Dyschoriste oblongifolia	Oblongleaf twinflower
Erigeron sp.	Fleabane
Eupatorium capillifolium	Dog Fennel
Eustachys petraea	Pinewoods fingergrass
Galactia elliottii	Elliott's milkpea
Gelsemium sempervirens	Yellow jessamine
Gordonia lasianthus	Loblolly bay
Habenaria repens	Waterspider bog orchid
Heterotheca subaxillaris	Camphorweed
Hydrocotyle sp.	Dollarweed

Hypericum fasciculatum	Peelbark St. John's wort
Ilex glabra	Gallberry
Ilex cassine	Dahoon
Imperata cylindrica	Cogongrass
Juniperus virginiana	Red cedar
Lacanthes caroliniana	Redroot
Lachnocaulon sp.	Bogbutton
Lepidium virginicum	Virginia pepperweed
Limnobium spongia	Frog's-bit
Lyonia ferruginea	Rusty staggerbush
Lyonia lucida	Fetterbush
Mikania scandens	Climbing hempvine
Mimosa quadrivalvis var *angustata*	Sensitive brier
Morella cerifera	Wax myrtle
Nuphar advena	Spatterdock
Oclemena reticulata	Whitetop aster
Osmunda regalis	Royal fern
Panicum hemitomon	Maidencane
Parthenocissus quinquefolia	Virginia creeper
Paspalum notatum	Bahia grass
Paspalum urvillei	Vasey grass
Persea borbonia	Red bay
Phyla nodiflora	Turkey tangle frogfruit
Pluchea camphorata	Camphorweed
Pityopsis graminifolia	Narrowleaf silkgrass
Pinus elliottii	Slash pine
Pinus serotina	Pond pine
Pinus taeda	Loblolly pine
Polygala nana	Candyroot
Polygala rugelii	Yellow milkwort
Pontederia cordata	Pickerelweed
Proserpinaca pecinata	Combleaf mermaidweed
Pseudognaphalium obtusifolium	Rabbit tobacco
Pteridium aquilinum	Bracken fern
Quercus laurifolia	Laurel oak
Quercus virginiana	Live oak
Rhexia mariana	Pale Meadowbeauty
Rhus copallinum	Winged sumac
Rhynchospora colorata	Star rush whietop
Rhynchospora latifolia	Star rush
Rubus trivialus	Blackberry

Sabal palmetto	Cabbage palm
Sabatia grandiflora	Largefower rosegentian
Sagittaria sp.	Arrowhead
Salix caroliniana	Carolina willow
Scleria reticularis	Netted nutrush
Scirpus sp.	Bulrush
Serenoa repens	Saw palmetto
Sesbania herbacea	Danglepod
Sesbania punicea	Rattlebox
Smilax auriculata	Earleaf greenbriar
Smilax bonanox	Saw greenbrier
Spartina bakeri	Sand cordgrass
Sphagnum sp.	Sphagnum moss
Stillingia sylvatica	Queen's delight
Syngonanthes flavidulus	Hatpins
Taxodium ascendens	Pond Cypress
Taxodium distichum	Bald Cypress
Thelypteris kunthii	Widespread maiden fern
Toxicodendron radicans	Poison ivy
Typha latifolia	Broadleaf Cattail
Urena lobata	Casear Weed
Utricularia purpurea	Eastern purple bladderwort
Vaccinium corymbosum	Highbush blueberry
Vaccinium myrsinites	Shiny blueberry
Vitis rotundifolia	Muscadine
Woodwardia areolata	Netted chain fern
Xyris sp.	Yellow eyed grass

Birds

Specific Name	Common Name (Conservation Status)
Cardinals, Grosbeaks, and Allies	
Cardinalis	Northern Cardinal
Catbirds, Mockingbirds, and Thrashers	
Toxostoma rufum	Brown Thrasher
Dumetella carolinensis	Gray Catbird
Mimus polyglottos	Northern Mockingbird
Gnatcatchers	
Polioptila caerulea	Blue-gray Gnatcatcher
Grouse, Quail, and Allies	

Colinus virginianus	Northern Bobwhite
Meleagris gallopavo	Wild Turkey

Herons, Ibis, and Allies

Bubulcus ibis	Cattle Egret
*Egretta caerulea***	Little Blue Heron (G5, S4, N, ST)
*Eudocimus albus***	White Ibis (G5, S4, N, N)

Jays, Magpies, Crows, and Ravens

Corvus brachyrhynchos	American Crow
Cyanocitta cristata	Blue Jay

Pigeons and Doves

Zenaida macroura	Mourning Dove

Storks

Mycteria americana	Wood Stork (G4, S2, T, FT)

Thrushes

Turdus migratorius	American Robin

Tits, Chickadees, and Titmice

Poecile carolinensis	Carolina Chickadee
Baeolophus bicolor	Tufted Titmouse
Dendroica palmarum	Palm Warbler
Dendroica coronata	Yellow-rumped Warbler

Tyrant Flycatchers: Pewees, Kingbirds, and Allies

Myiarchus crinitus	Great Crested Flycatcher

Vultures, Hawks, and Allies

Buteo lineatus	Red-shouldered Hawk
Buteo jamaicensis	Red-tailed Hawk
*Elanoides forficatus***	Swallow-tailed Kite (G5, S2, N, N)
Coragyps atratus	Black Vulture
Cathartes aura	Turkey Vulture

Woodpeckers

Picoides pubescens	Downy Woodpecker
Dryocopus pileatus	Pileated Woodpecker
Melanerpes carolinus	Red-bellied Woodpecker

Wrens

Thryothorus ludovicianus	Carolina Wren

Amphibians

Specific Name	**Common Name (Conservation Status)**

Acris gryllus dorsalis	Florida cricket frog
Hyla femoralis	Pinewoods treefrog
Lithobates catesbeianus	American bullfrog
Rana sphenocephala	Southern leopard frog
Rana grylio	Pig frog

Mammals

Specific Name	Common Name (Conservation Status)
Dasypus novemcinctus	Nine-banded armadillo
Didelphis virginana	Opossum
Lynx rufus	Bobcat
Odocoileus virginianus	White-tailed deer
Procyon lotor	Racoon
Sciurus carolinensis	Eastern gray squirrel
Sciurus niger niger	Southern fox squirrel (G5T5, S3, N, SSC)
Sus scrofa	Feral hog
Sylvilagus floridanus	Eastern cottontail rabbit
Ursus americanus floridanus	Florida Black bear (G5T4, S4, N, N)

Reptiles

Specific Name	Common Name (Conservation Status)
Agkistrodon piscivorus conanti	Florida cottonmouth
Anolis carolinensis carolinensis	Green anole
*Anolis sagrei**	Brown anole
Coluber constrictor priapus	Southern black racer
Crotalus adamanteus	Eastern diamondback rattlesnake (G4, S3, N, N)
*Gopherus Polyphemus***	Gopher tortoise (G3, S3, C, ST)
Sistrurus miliarius	Pygmy rattlesnake
Terrapene Carolina	Florida box turtle

Fish

Specific Name	Common Name
Elassoma evergladei	Everglades pygmy sunfish
Esox americanus	Redfin pickerel
Esox niger	Chain pickerel
Gambusia holbrooki	Mosquito fish

Invertebrates

Order	Specific Name	Common Name
Coleoptera	*Phanaeus vindex*	Green Dung beetle
Diplopoda	*Anadenobolus monilicornis*	Yellow-banded millipede
Hemiptera	*Ranatra Sp*	Water Scorpion
Heteroptera	*Lethocerus Sp*	Giant Water Bug

Hymenoptera	*Camponotus floridanus*	Carpenter ant
Hymenoptera	*Dasymutilla occidentalis*	Velvet ant
Lepidoptera	*Danaus gilippus*	Zebra Swallowtail
Lepidoptera	*Thyridopteryx ephemeraeformis*	Bagworm
Lepidoptera	*Thorybes sp.*	Skippers
Odonata	*Libellula axilena*	Bar-winged skimmer

***Exotic**
**** Listed – Status descriptions below**

FNAI GLOBAL RANKING

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.
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).

FNAI STATE RANKING

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.

FEDERAL LEGAL STATUS

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.
E = Endangered: species in danger of extinction throughout all or a significant portion of its range.
T = Threatened: species likely to become Endangered within the foreseeable future throughout all or a significant portion of its range.
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.
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

Animals:

FT(S/A) = Threatened due to similarity of appearance
FEL = L**i**sted as Endangered Species at the Federal level by the USFWS
FT = Listed as Threatened Species at the Federal level by the USFWS
ST = State population listed as Threatened by the FFWCC. Defined as a species, subspecies, or isolated population which is acutely vulnerable to environmental alteration, declining in number at a rapid rate, or whose range or habitat is decreasing in area at a rapid rate and as a consequence is destined or very likely to become an endangered species within the foreseeable future.

SSC = Listed as a Species of Special Concern by the FFWCC. Defined as a population which warrants special protection, recognition, or consideration because it has an inherent significant vulnerability to habitat modification, environmental alteration, human disturbance, or substantial human exploitation which, in the foreseeable future, may result in its becoming a threatened species.
N = Not currently listed, nor currently being considered for listing.
Plants:
E = 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.
T = 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.
N = Not currently listed, nor currently being considered for listing.

APPENDIX D: DISTRICT FOREST MANAGEMENT PLAN

In 1998 the Florida Legislature charged all state land management agencies with managing the forest resources on the lands they have acquired. To date, the St. Johns River Water Management District (District) has acquired nearly 500,000 acres of land. Approximately 43% of these acres are forested.

Even prior to the legislative directive, the District has been managing its forest resources. Timber sales began in 1991 with a salvage sale at Lake George Conservation Area following a wildfire. Since that time, sales that have been completed include 14 thinning operations, 7 salvage sales and one clearcut operation to remove an off-site species. These sales were conducted based upon the immediate needs of the natural communities and recommendations from individual area management plans. To date, no overall long-term plan existed to provide guidance and coordination for the management of the District's forest resources. This plan will provide that guidance and continuity.

PURPOSE OF FOREST MANAGEMENT

The District manages forest resources for the:

1) Restoration of natural communities.
2) Maintenance of the health and vigor of natural communities.
3) Generation of revenues to counterbalance the cost of land management activities.

Restoring Natural Communities

The District acquires its land from a variety of private owners, and each owner had their own vision for the land. Many times in fulfilling their vision, private owners altered the natural communities by clearing for agricultural purposes or for planting trees. Whenever practicable, the District is charged with maintaining and/or restoring the land to its natural state and condition.

Thinning, clearcutting, and planting are all tools used to restore natural communities, but in almost all cases they are used in conjunction with fire. The combinations of overstory control and fire management are the primary restoration tools in forested communities.

In forested communities, controlling or manipulating the overstory serves as the primary tool to maintain or restore the natural community. The density of the overstory dictates the health and diversity of understory species. If the overstory becomes too dense, both the overstory and understory species begin to suffer. In cases where the overstory remains crowded too long, individual understory plants begin to disappear. Often seeds of these plants will remain dormant in the soil. Thinning individual trees from an overcrowded stand allows more light, moisture and nutrients to be available for groundcover plants. This allows dormant plants to reoccupy their former sites, thereby restoring the natural state and condition.

In some cases, private owners planted a species of tree that did not naturally occupy the site. In these cases, the District will clearcut the undesired tree species and replant with the more appropriate species.

In cases where the previous owner cleared the site, the District will prepare the site and plant the appropriate tree species. Since longleaf pine occupies approximately 5% of the area it did in 1900, and since longleaf offers a suite of wildlife benefits greater than most other pines, the District will emphasize planting of longleaf on all sites where longleaf is suited for the site.

Maintenance of the Health and Vigor of the Natural Communities

The health or quality of a forested natural community is maintained by three primary factors: 1) the availability of water, 2) the frequency of fire, and 3) the density and species composition of the overstory.

In few cases do the activities of the District affect the availability of water on District forestlands. One exception is where sites are restored through the plugging of ditches or rehydration of historically wetland systems. Weather is the primary factor influencing the availability of water.

Fire influences the health of forested communities by altering the process of succession. Fire holds natural communities in an intermediate stage of succession that is referred to as a fire climax community. If fire is removed, these natural communities follow the path of succession to become some other community. In Florida, most natural communities historically experienced fire on a frequent basis. In fact, most communities are dependent upon frequent fire for their continued existence. Because of its importance as a management tool, fire is addressed in detail in the District's Fire Management Plan.

The third factor influencing the health and/or quality of forested natural communities is the overstory density and species composition. In a truly natural system, wildfire, climatic disturbances, along with insects and diseases combined to control the composition of the overstory, which in turn controls the composition of the understory. Wildfire, insects and disease kill trees as individuals or groups, which reduces the density of the overstory and alters the species composition. These events or outbreaks would often impact large areas, especially areas where the stand density was high, weakening the overstory trees and increasing their susceptibility to pathogens. Prior to human intervention, there were huge expanses of natural land that could easily absorb large-scale alterations of the overstory so that no plant or animal species could be extirpated. Today, Florida is fast approaching a condition where natural areas are becoming islands. Plants and animals have fewer areas to populate and it is more difficult to transfer their genetic material between isolated areas of ideal habitat. Therefore, we can no longer rely entirely on large-scale disturbances to control overstory density and species composition. By managing the overstory with selective harvesting, the density and species composition can be controlled to maintain a healthy natural community while minimizing the potential for large-scale impacts.

As land managers, the District also has an obligation to protect neighboring landowners from any large-scale wildfire, insect or disease outbreaks that may originate on District land and spread to

adjacent lands. This obligation prohibits the District from employing a truly natural management system to control overstory species, density, and composition and requires the District to utilize a more interactive management program.

Generation of Revenues

The Florida legislature has directed public land managers to manage forest resources for an economic return. The District generates revenue when implementing sound overstory management practices to maintain the health of the natural community. These practices include but are not limited to thinning operations, removal of undesired species (clear-cuts), and salvage cuts to remove trees damaged from wildfires, insect infestations and/or disease outbreaks. The revenue generated from these operations can be used to fund restoration and other land management activities.

FOREST RESOURCES INVENTORY

Following legislative directive, and seeking to keep its land management efficient, the District has sought management partners. The following chart illustrates the lead manager status of District owned lands (Figure 1).

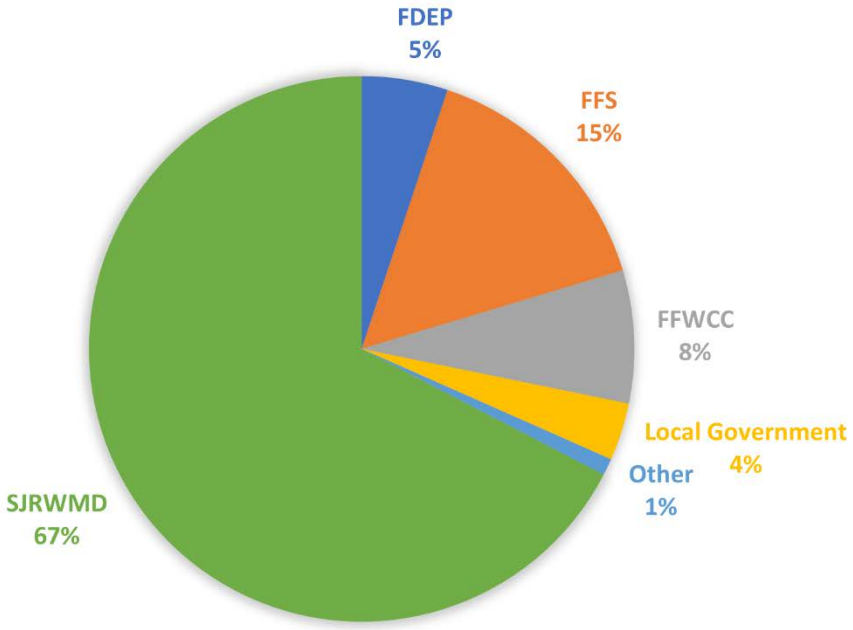

Figure 1: District Owned Land by Lead Manager. Updated January 2020

The District's Land Management Rule, agreements and philosophy call for the lead manager's rules and policies to direct the management of the affected lands, therefore this plan will be focused on the lands where the District is identified as the lead manager. The District serves as

the lead manager on 348,000 acres. These acres managed by the District are broken down as follows (Figure 2).

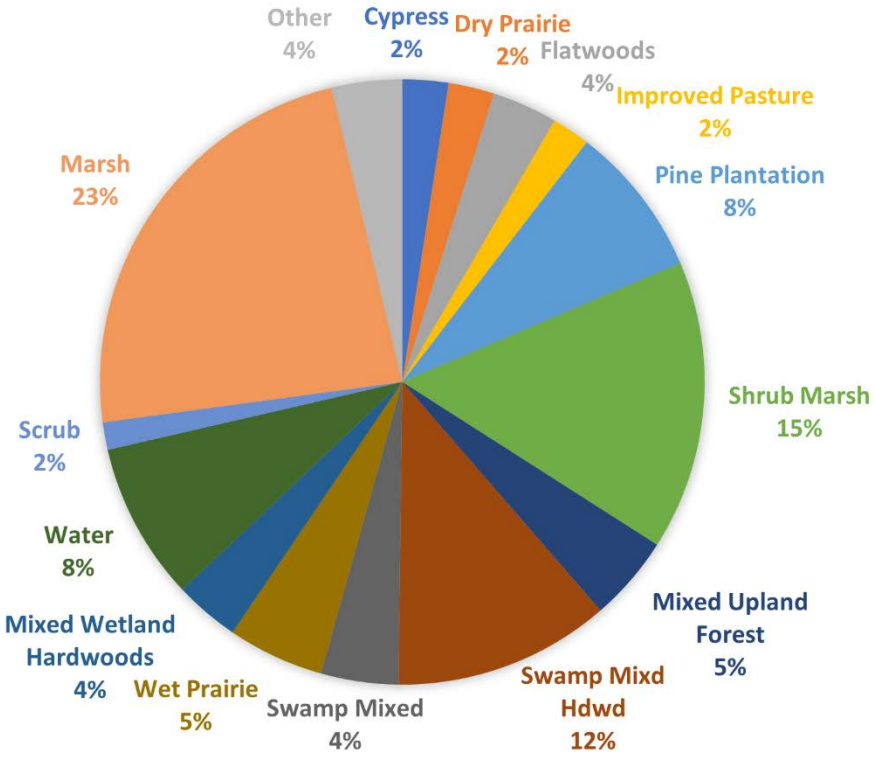

Figure 2: Percentage acres SJRWMD Managed Lands by Land Type. Updated January 2020

Twenty-seven percent of the District Managed Lands are forested, with 12% being forested uplands and 15% forested wetlands.

OBJECTIVES OF FOREST MANAGEMENT

The District's forest management objectives are to:

- Maintain the health and diversity of forested communities on District lands.
- Provide for older aged forest conditions. As public landowners we have the opportunity to provide habitat for species requiring older age classed trees.
- Provide for an array of forest stand structures and age classes. Each species of plant and animal has an age-class of forest stand that is most desirable. By providing the array of structures and age-classes, the District can provide habitat for a wide variety of species.

Techniques of Forest Management

Inventory

The District is currently developing a timber management database that will directly link timber volume information with the GIS lands database. The database will incorporate inventory data collected at acquisition and track changes overtime. Changes resulting from harvests, wildfires, insect infestations, disease outbreaks and reforestation efforts can be updated quickly and easily. Periodic updates of volume and growth information will be scheduled and incorporated into the database. The database links will aid in determining natural community needs along with geographic distribution and appropriate management techniques to implement. The database will be an intricate part in managing community health and in developing future land management workplans.

Harvesting

To accomplish its goals the District will employ a suite of harvesting systems.

Clearcutting is a silvicultural operation used to remove the entire overstory at one time. This tool will be used with limited application dependent upon the specific management needs. Those needs may include:

1. Insect or disease control. Forest pests occur naturally at low population densities and are a vital part of the forested community. When population densities reach epidemic levels control measures to remove the host and adjacent trees must be implemented to protect the remainder of the stand.
2. Salvage. If the overstory has been killed or severely damaged, removing (salvaging) the overstory will recover some financial value of the timber and will allow the District access necessary to replant the site.
3. Species conversion. If offsite species exist, clearcutting enables the District to replace the offsite species with one that is appropriate.

Thinning is a silvicultural operation where selected individual trees are removed from the stand to reduce the density of overstory trees to improve growing conditions for the remaining overstory trees and the understory plants. This method is not applied with a goal of establishing regeneration.

The seed tree system is a silvicultural operation where the entire overstory except 10-15 prime trees per acre are harvested at one time. These 10-15 trees serve as the seed source for the next generation. This technique is seldom used by the District. While the seed tree system is effective, it creates major change in the stand condition both visually to the public and biologically to the plants and animals in the stand.

Shelterwood is a silvicultural operation in which the overstory is removed in phases. When it is time to regenerate the stand, approximately 60-70 percent of the stand is removed either in one or two harvests. Again, the older trees serve as the seed source for the next generation. Once the younger trees are established the original overstory trees can be removed or they can remain on site and be subject to thinning at the same time as the younger generation. The major benefit of

this system is it results in a more gradual change from the mature trees to the next generation both visually to the public and biologically to the plants and animals.

A new modification of the shelterwood called an irregular shelterwood has recently been developed and may become the primary silvicultural system employed by the District. An irregular shelterwood begins the same as shelterwood but portions of the original overstory remain on site. When the second-generation trees are thinned, a few of the first-generation trees are also thinned. When it is time for the third generation to be established both the first- and second-generation trees are reduced to 30-40 square feet of basal area to make room for the third-generation trees. Once the third-generation trees are established the site has few first-generation trees, some second-generation trees and many third-generation trees. This provides for a variety of age classes in a single stand but is much easier to apply and should require much less staff time than uneven-aged selection management.

Uneven-aged selection is a silvicultural operation in which trees, either as individuals or in small ½ acre groups are harvested from throughout the stand every 5 -10 years. The holes left by the removal of these trees are filled with seedlings from adjacent trees thereby creating a patchwork stand composed of trees of all ages. While this system offers the greatest distribution of age within a stand, truly an uneven aged condition which some scientists feel is best for wildlife, it also requires significant staff inputs and to date appears too labor intensive to employ on a large scale.

Site Preparation

When it is necessary to establish regeneration, either naturally or artificially the District may employ one or more of the site preparation techniques described below.

Herbicide will be used when staff has determined that it is the most effective means to control the competing vegetation. Herbicides will not be used if it adversely effects the desirable understory species within the planting site. The use of herbicide is necessary when attempting to restore native trees and groundcover to areas of improved pasture. Herbicide can be applied with hand sprayers, tank sprayers, or aerially from a helicopter, depending upon the species to be treated and site conditions.

Disking/Scalping these techniques are most useful when trees are being planted in areas of improved pasture. Both techniques protect the seedlings from grass competition but offer no benefit to groundcover restoration.

Drum Chopping is effective at reducing competition from shrub species, especially saw palmetto. If properly applied grasses within the treatment area will survive chopping and will often benefit from the choppers effect on the shrubs.

Bedding is a technique where a small ridge of surface soil is formed to provide an elevated planting or seedbed. It is used primarily in wet areas to improve soil drainage and aeration for seedlings. This type of site preparation technique has not been utilized by the District because of the adverse effects it has on groundcover and sheetflow. Therefore, the District's planting costs are often higher than private industry's because without bedding several plantings are often necessary to establish seedlings on wet sites.

Regeneration

Emphasis will be placed on natural regeneration to the extent practicable. In cases where species conversion is required or where no overstory exists to provide natural seed fall, planting will be necessary.

Hand planting is primarily method used by the District, because it offers the following benefits:

1. Trees can be placed on the best microsites (i.e. highest ground in wet areas, areas with the least competition.)
2. Groundcover disturbance is minimized.
3. Seedlings can be randomly spaced or planted in clusters to provide for a more natural appearance.

Machine planting is used primarily in old field conditions where scalping is employed and rows are suitable.

OVERALL METHODOLOGY

Forested natural communities can be lumped into three different groups with regards to forest management. These include Pine Forests, Upland Hardwoods, and Wetland Hardwood/Cypress. The management of each will differ and be described separately.

Pine Forests

Pine forests include flatwoods, plantations, sandhills and sand pine scrub. With the exception of sand pine scrub pine forests will be managed through thinning. Once the stand is established and trees have reached merchantable size (5 inches at diameter breast height) at approximately 15-20 years of age depending on tree species and sites, thinning will begin. Stands will be thinned as necessary to maintain an overstory basal area range of 60 to 90 square feet per acre. This range promotes good growth of understory plants and provides good habitat for most wildlife using forested natural communities. In order to maintain this basal area range harvests will occur in each stand approximately every 10 years, depending on growth rates of the trees. Great care will be exercised during harvesting operations to minimize disturbance of the soil and groundcover. When properly performed, harvesting actually benefits groundcover regeneration by reducing shrub species and improving growing conditions.

The need for regeneration will be determined by an inventory of the health, vigor and species composition for the trees in each stand. Once the conditions of the overstory trees indicate the need, a regeneration harvest will be scheduled employing the appropriate silvicultural system described previously. Emphasis will be placed on making the most seamless transition from one generation to the next. The irregular shelterwood will be employed frequently in loblolly, slash and longleaf pine stands.

Emphasis will be placed on having a wide array of age classes between stands and an array of different aged trees within stands. Included in the desired array of ages will be trees and stands significantly older than those typically found on private lands.

To ensure the wide array of age classes is met, the District will separate pine stands into four different types based upon general age and condition. These four types include:

1. Regeneration (age 0-10) The site is occupied primarily by tree seedlings and saplings, herbs and shrubs. Competition from the trees has not yet resulted in any reduction in herb or shrub layer. This type begins at planting and continues until crown closure. Herbs, shrubs and grasses occupy 20%-80% of the ground. This type offers benefits to early successional wildlife species such as quail, rabbits, gopher tortoises, deer, turkeys and their predators.
2. Closed Canopy (age 11-20) Trees fully occupy the site and form a single, main canopy layer. There is little understory development due to the lack of light passing through the canopy. Where understory exists it is dominated frequently by palmetto and/or gallberry. This type benefits fewer wildlife species but does offer bear and deer good escape cover.
3. Understory (age 21-60) The overstory density has been reduced through thinning and the understory is beginning to reinitiate. Adequate light is again available to the forest floor. Groundcover plant species and wildlife both begin to flourish again. Wildlife benefiting from this stand type include: deer, turkey, quail, gopher tortoises.
4. Older Forest Structure (age 60+) This stand type begins to develop a layered overstory. Trees are large, with diameters >12 inches. Snags will begin to appear and should be protected. The understory is diverse and healthy. Wildlife benefiting from this stand are fox squirrels, great horned owl, southeastern kestrel, turkeys, quail, gopher tortoises, red cockaded woodpeckers, eagles and ospreys (nesting trees).

The District will strive to keep 10-15% of its pine forests in type 1, 10-15% in type 2, 30-40% in type 3 and 40% in type 4. The present condition is shown below (Figure 3):

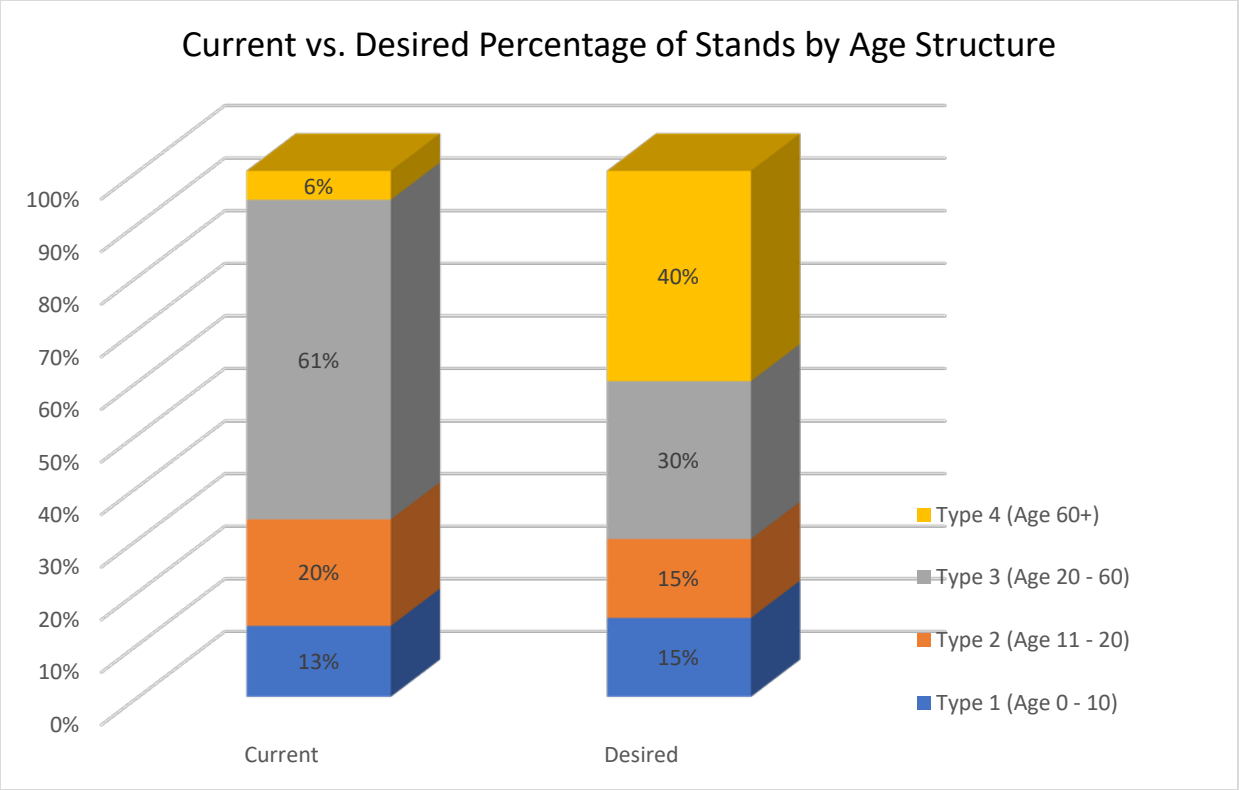

Figure 3: Current vs. Desired Percentage of Stands by Type. Updated January 2020

Sand pine management will differ from other pine types because it is adapted to an even aged environment. Sand pine characteristically grows in dense, even-aged, pure stands, which originated as a direct result of catastrophic fires or similar events. When a killing fire sweeps through a stand of cone-bearing trees, the serotinous cones (which remain tightly closed for many years unless opened by heat) open and release large quantities of seeds to naturally regenerate the area. These catastrophic fires are difficult to mimic with prescribed fire since they are difficult to control. Complete stand removal (clearcutting) is the preferred method available to mimic the natures stand replacing events. The natural cycle for stand replacing events are from 20 –60 years. Sand pine stand will therefore be clearcut and regenerated on a similar cycle.

The primary forest management activities of the District will be within these pine stands.

UPLAND HARDWOODS

Currently Upland hardwoods constitute 2% of District managed lands. Typically they are mesic and xeric hammocks with the dominant species being live oak. There is no ecological need for harvesting within these communities and no commercial value to be derived from harvesting live oak.

Limited areas of upland hardwoods have developed on former sand hills and flatwoods due to a lack of fire or other ownership priorities prior to acquisition. These areas can be returned to their original natural community by harvesting the overstory and planting the original specie appropriate to the site. Hardwood species encountered on such site include turkey oak, laurel oak, bays and sweetgum.

WETLAND HARDWOODS AND CYPRESS

As with State Forests the District has no plans to harvest timber from the swamps. However, the following may be situations where limited harvesting would offer the District benefits.

Following a catastrophic outbreak of insects, disease or wildfire harvesting the dead timber can create the growing space for the next generation. Most swamp species reproduce from both seed and sprouting. Removing the dead overstory will reduce the hazard from trees falling on people and young trees.

Twenty to 30 years following some catastrophic event the District may choose to selectively thin the hardwoods and cypress to accelerate the process of developing old-growth conditions. In a truly natural setting the development of old-growth conditions will take 75-100 years since the trees compete with one another until the weaker individuals die. Through thinning, the number of trees can be reduced and the growth concentrated on the remaining trees so that they become larger faster and old-growth habitat can be created earlier.

The sensitivity required to log wetland systems cannot be overly stressed. Any harvesting performed in wetlands must be carried out under the most stringent conditions to avoid damage to the site. Harvesting can only be done when rutting and damage to residual trees can be minimized. Harvesting must be closely monitored and shut down if conditions deteriorate.

This plan was approved by the Governing Board in February, 2000 with charts updated January 2020