HEART ISLAND CONSERVATION AREA LAND MANAGEMENT PLAN

VOLUSIA AND FLAGLER COUNTIES, FLORIDA



ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

MARCH 2021



EXECUTIVE SUMMARY

MANAGEMENT AREA SIZE: 13,645 acres

DATE OF ACQUISITION: Acquisition of parcels within Heart Island Conservation Area began in July 1994.

DATE OF PLAN: March 2021 **MAJOR BASIN:** Lower St. Johns River and Lake George **PLANNING BASIN:** Crescent Lake and Lake Woodruff

LOCATION: Heart Island Conservation Area (Heart Island) is located in Volusia and Flagler counties near the city of Barberville. The property is located east of US 17 and is bisected by SR 40. A small portion of the conservation area is located east of SR 11.

FUNDING SOURCE: The acquisition funding sources for Heart Island include Preservation 2000 (P2000), Florida Forever, Florida Department of Transportation (FDOT) mitigation funds, and Volusia Forever.

MANAGEMENT PARTNERS: A cooperative intergovernmental management agreement exists between the District and Volusia County, designating the District as lead manager with responsibility for natural and cultural resources and daily operational management activities within the conservation area. Volusia County will assist the District's management needs, as necessary. Volusia County has reviewed and approved this management plan.

VISION STATEMENT: The management focus for Heart Island is the continued protection of the water resources of Deep Creek, Crescent Lake and Lake Woodruff basins, and the Lake George and Lower St. Johns River watersheds. This includes protection of approximately 6.6 miles of Deep Creek, and more than 6,232 acres of diverse wetlands such as basin swamp, dome swamp, floodplain swamp, depression marsh, and wet prairie. Management activities within the uplands of Heart Island will be focused on forest management and restoration activities to maintain or improve natural communities that support a diverse assemblage of native wildlife species. The District will continue to maintain and improve quality recreational opportunities that are consistent with the ecological needs of the property.

RESOURCE PROTECTION AND MANAGEMENT:

- WATER RESOURCES Water resources are largely undisturbed; most protection was accomplished with acquisition. Heart Island protects approximately 6.6 miles of Deep Creek and more than 6,232 acres of diverse wetlands such as basin swamp, dome swamp, floodplain swamp, depression marsh, and wet prairie.
- **FOREST MANAGEMENT AND RESTORATION** Prior to acquisition, commercial timber companies owned much of the acreage within Heart Island, and the property was managed for silviculture. While tailored to meet silvicultural management goals, the primary objectives of harvesting on Heart Island 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 harvesting, mechanical and herbicide vegetation management, and prescribed burning to encourage optimal forest health during the scope of this plan. As stands of off-site species mature, they will be evaluated for stand replacement with site-appropriate species.

- **FIRE MANAGEMENT** Implementation of prescribed burns occurs in accordance with annual burn plans and individual unit prescriptions.
- FLORA AND FAUNA Heart Island provides habitat for numerous wildlife species, including listed species such as the gopher tortoise (*Gopherus Polyphemus*). 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.
- **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 Five public access points are currently located on Heart Island off US 17, SR 40, SR 11, and Lake Winona Road. With the ongoing FDOT project to widen SR 40 and US17, it is anticipated that FDOT will consolidate the existing parking areas accessed from US 17 and SR 40 into one parking area to be located at Wells road on the south side of SR 40.
- **RECREATION** Heart Island is open to the public for bicycling, picnicking, hiking, horseback riding, fishing, wildlife viewing, photography, and primitive camping at designated sites. Heart Island has more than 5 miles of blazed trails. A portion of the roads are open to motorized vehicles year-round. Public hunting opportunities are administered by the Florida Fish and Wildlife Conservation Commission (FWC).
- **SECURITY** Maintenance of fence lines, parking areas, gates, and locks is conducted as needed. The District maintains contact with FWC, local law enforcement, and a private security firm for security needs.

ADMINISTRATION:

 REAL ESTATE ADMINISTRATION – The District may consider purchasing parcels near Heart Island that become available and that will aid in the conservation of water resources within the Lake Woodruff 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. For many years, the District has been working with the FDOT to address right of way needs for the expansion of US 17 and SR 40. During the writing of this plan, 52.74 acres of the property have been identified for surplus and sale with FDOT. Additionally, through the District lands assessment process, a 1,639-acre parcel east of SR 11 has been identified for potential surplus.

- COOPERATIVE AND SPECIAL USE AGREEMENTS, LEASES, AND EASEMENTS A cooperative management agreement exists between the District and Volusia County, incorporating the Strawn parcel into the conservation area and designating the District as the lead managing entity for the conservation area. The District administers numerous leases, agreements, easements, special use authorizations (SUAs) and concessions. The District will continue to coordinate with FWC to administer the existing Wildlife Management Area (WMA).
- MANAGEMENT COSTS AND REVENUES Management costs at Heart Island were \$670,422 from 2009–2020 and are projected at \$850,820 from 2021–2031. Revenues from forest management at Heart Island were \$269,412 from 2009–2020 and are projected at \$1,718,896 from 2021–2031.

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VISION STATEMENT

The management focus for Heart Island is the continued protection of the water resources of the Deep Creek, Crescent Lake and Lake Woodruff basins, and the Lake George and Lower St. Johns River watersheds. This includes protection of approximately 6.6 miles of Deep Creek, and more than 6,232 acres of diverse wetlands such as basin swamp, dome swamp, floodplain swamp, depression marsh, and wet prairie. Management activities within the uplands of Heart Island will be focused on forest management and restoration activities to maintain or improve natural communities that support a diverse assemblage of native wildlife species. The District will continue to maintain and improve quality recreational opportunities that are consistent with the ecological needs of the property.

OVERVIEW

This document provides the goals and strategies to guide land management activities at Heart Island Conservation Area (Heart Island) over the next 10 years. This land management plan was developed in accordance with Section 373.1391, and Section 373.591, Florida Statutes. This is a revision of the August 2009 land management plan.

The St. Johns River Water Management District (District) owns 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

Heart Island covers approximately 13,645 acres in Volusia and Flagler counties within the Lake Woodruff and Crescent Lake Basins, sub-basins of the Lake George and Lower St. Johns River Basins, respectively. Heart Island is located in numerous sections of Townships 14 and 15 and Ranges 29 and 30 East. The property is located east of U.S. Highway 17 (US 17) near the town of Barberville, approximately 10 miles west of Ormond Beach (Figure 1). A portion of Heart Island is located east of State Road 11 (SR 11); however, most of the acreage lies to the west. State Road 40 (SR 40) bisects portions of the conservation area. Figure 2 provides aerial imagery from 2015 of Heart Island.



Figure 1: General Location



Figure 2: Aerial imagery.

REGIONAL SIGNIFICANCE

Heart Island is an integral component of a larger network of publicly owned lands in Volusia and Flagler counties by providing 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 and numerous public 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.

Lead Manager	Conservation Area
City of Port Orange	Port Orange City Forest
District	Clark Bay Conservation Area
District	Dunns Creek Conservation Area
District	Lake George Conservation Area
District	Murphy Creek Conservation Area
Florida Department of Environmental Protection	
(DEP)	Blue Spring State Park
DEP	De Leon Springs State Park
DEP	Bulow Creek State Park
DEP	Haw Creek Preserve State Park
DEP	Lower Wekiva River State Park
	Marjorie Harris Carr Cross Florida
DEP	Greenway
DEP	Tomoka State Park
Florida Fish and Wildlife Conservation Commission	Caravelle Ranch Wildlife Management Area
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

The acquisition of the parcels that comprise Heart Island provides for the protection of important water resources and ecological functions. This acquisition is consistent with the goals of the Lake George and Lower St. Johns River Basins projects as set forth in the District's Land Acquisition and Management Five Year Plan, the Volusia Forever Program, and the mitigation goals for the FDOT. These goals, as they apply to Heart Island, include:

- Improve water quality, maintain natural hydrological regimes, and maintain flood protection by preserving important wetland areas.
- o Restore, maintain, and protect native natural communities and diversity.
- Provide opportunities for resource-based recreation where compatible with the above listed goals.

Acquisition of Heart Island began in 1994. Heart Island currently consists of four (4) parcels totaling 13,645 acres (Figure 4). Heart Island was previously comprised of five (5) parcels totaling 14,246 acres. Since the 2009 land management plan, the Bud Henry parcel (585 acres), Land Acquisition number 2001-040, was offered for surplus by the District in May of 2015 for sale price of \$1,200,000. The acres included in the surplus are now protected through the less than fee Lake Disston conservation easement held by the District. The Bud Henry parcel was initially acquired by the District on February 18, 2003 for \$900,000 using Florida Forever funds.

The four parcels that currently comprise Heart Island are listed below, and all acreage reported is derived from GIS calculations.

Strother (11,100 acres) Land Acquisition number 1994-008-P1
 The Strother parcel totals 11,100 acres acquired by the District through a single purchase on July 1, 1994 for \$7,065,650 using P2000 funds.

Stanley (969 acres) Land Acquisition numbers 1994-049-P1 and 1994-049-P2
The original Stanley parcel totaled 1,449 acres and was acquired by the District on April 3, 1996 for \$1,802,087, using P2000 funds. The District offered for surplus approximately 478 acres of the Stanley parcel on August 30, 1999 for \$900,000. The acres included in the surplus are protected through the Hagstrom conservation easement.

- O'Neal (373 acres) Land Acquisition number 1997-032-P1 The O'Neal parcel totals 373 acres, acquired by the District on May 16, 2003 for \$300,000 using Florida Forever funds.
- David Strawn Lands, Inc (1,203 acres) Land Acquisition number 2006-006-P1
 The David Strawn Lands, Inc parcel totals 1,203 acres, and was acquired jointly by the
 District and Volusia County on December 19, 2008. The total purchase was
 \$4,985,204.64. Volusia County contributed \$3,738,903.48 with funds from the Volusia
 Forever Program and owns 75% fee simple title. The District contributed \$1,246,301.16
 and owns 25% fee simple title. The District's portion was originally paid using Florida
 Forever funds, and in 2010 FDOT mitigation funds were used to reimburse all Florida
 Forever funds used for the original closing. FDOT mitigation funds were provided to

assist in meeting mitigation requirements associated with FDOT projects in the Middle St. Johns River Basin (Mitigation Group SJ 56).



Figure 4: Acquisition.

LOCAL GOVERNMENT LAND USE DESIGNATION

Volusia County

According to the 2018 Volusia County Comprehensive Plan, the Future Land Use designation for the portion of Heart Island within Volusia County is conservation. This land provides the framework for the preservation, protection, and enhancement of the County's natural resources. The goals, objectives, and policies of Volusia County relating to natural resources is divided into four broad categories: water resources; natural communities and wildlife; air quality; and mineral resources (Volusia County Growth and Resource Management). Other land use designations for property that surrounds the Heart Island include:

- Agriculture Resource Areas of land that are suited for intensive cultivation, ranching, aquaculture, and timber farming.
- Forestry Resource Areas of land that are primarily suited for silviculture.
- Environmental Systems Corridor These areas of land are important ecological corridors consisting of environmentally sensitive and ecologically significant lands intended to provide protected, natural pathways which connect to other protected areas such as parks, conservation lands, and water bodies.

Flagler County

According to the Flagler County Comprehensive Plan 2010-2035, the future land use designation for the portion of Heart Island 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).

NATURAL RESOURCES

WATER RESOURCES

Heart Island is located within the Lake Woodruff and Crescent Lake planning basins of the Lake George and Lower St. Johns River Basins, respectively (Figure 5). The Crescent Lake planning basin covers 605 square miles and is largest planning basin within the Lower St. Johns River Basin. The Lake Woodruff planning basin covers 276 square miles. The major waterbodies of this planning basin are Lake Woodruff and Lake Dexter. The 21,574-acre Lake Woodruff National Wildlife Refuge is totally contained within this planning basin; the St. Johns River



Figure 5: Location within Planning Basins.

demarks its western border. There are three notable springs within the Lake Woodruff planning basin: De Leon Springs is a second-magnitude and Outstanding Florida spring located within the De Leon Springs State Park; Volusia Blue Spring, a first magnitude and Outstanding Florida spring located within Blue Spring State Park; and Mosquito Spring, a third magnitude spring within the Alexander Springs Wilderness of the Ocala National Forest.

Heart Island is within a priority water resource caution area (PWRCA), an area that the District has identified that the existing and anticipated water sources and conservation efforts may not be adequate to "(1) supply water for all existing legal uses and reasonably anticipated future needs, and (2) sustain water resources related to natural systems" (2008 SWIM Plan).

HYDROGEOLOGY

The hydrogeologic characteristics of Heart Island are described to understand not only the surface features and how they may control and interact with surface drainage, but also the subsurface features that control the occurrence and movement of groundwater. Strategies for protection and management of the groundwater resource can be done based on a more thorough knowledge of the hydrogeologic system of the site.

GEOMORPHOLOGY

Heart Island lies within two physiographic districts: the Central Lakes District and the Eastern Flatwoods District (Brooks, 1981). Within the Central Lakes District the Conservation Area is in two physiographic subdistricts: the Crescent City-Deland Ridge and the St. Johns offset. Similarly, the Eastern Flatwoods District contains two subdistricts in the Conservation Areas: the Palatka Anomalies and Volusia Ridge Sets.

The Central Lakes District includes areas of uplifted limestone comprising the Floridan aquifer that lie unconformably below a veneer of surficial sand. This is a sand hill karst with solution basins developed below the surficial sand. It is the region of most active collapsed sinkhole development. Because of the xeric hills and internal drainage, these areas are the principle recharge areas of the Floridan aquifer. Approximately 7,811 acres, mostly in the southwestern portion of the Conservation Area, are situated in the St. Johns offset. This is an area where the middle segment of the St. Johns River shifted its course from east to approximately 15 miles west of the Crescent City-Deland Ridge.

The offset area was formed as a topographically low area that is believed to be related to localized faults and fractures that accelerated the dissolution of the carbonate rocks, increased artesian discharge and created a linear sub-regional depression. The river is thought to have shifted to the west during a sea level high when the offset was likely an estuary (Schmidt 1997). The Eastern Flatwoods District, also called the "Coastal Lowlands," has elevations generally less than 90 feet (Brooks, 1981). This district originated as a sequence of barrier islands and lagoons during the Pliocene-Pleistocene and Recent time. The Crescent Lake Basin subdivision is a lowland underlain by lagoonal silts, clay and fine sand. This subdistrict has an extensive swamp forest and flatwoods.

Elevations within Heart Island range from 10 to 70 feet above sea level, with the highest elevations occurring in the sandhills of the Strawn parcel (Figure 6). The significant surface hydrological features of the Conservation Area include: Lake Disston, Dan George Lake, Little



Figure 6: Land surface elevation and significant hydrological features.

Haw Creek, and Deep Creek. Heart Island drains into two sub basins of the St. Johns River. Surface waters and wetlands within the Eastern Flatwoods District generally drain north to the Crescent Lake Basin and the St. Johns River via the Little and Middle Haw Creeks. Surface water and wetlands within the Central Lakes District drain to the south via Deep Creek and Lake Woodruff to the St. Johns River.

The geomorphologic features within and surrounding Heart Island were shaped by marine processes during high stands of sea level during intra-glacial times. Among the prominent features are marine terraces and their associated scarps. Within Heart Island, four marine terraces have been identified as mapped by Healy (1975). Figure 7 depicts the marine terraces (Green and others, 2013) and their elevation ranges above sea level as follows:

- Penholloway (42 to 70 feet) limited to Deland Ridge in southeastern part of Heart Island
- Talbot (25 to 42 feet) located in northeast and central portion of Heart Island
- Pamlico (10 to 25 feet) comprises the majority of Heart Island
- Silver Bluff (1 to 10 feet) occurs in the southern portion of Heart Island.



[,] Source: \CClent\F\$\BlackDriveBUlDocuments\GIS\HeartIs|_Terraces.mxd, Time:4/6/2020 10:05 26 AM

Figure 7: Marine terraces in the Heart Island Conservation Area.

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 Heart Island the main units within 200 feet of the surface include the Undifferentiated Quaternary Sediments, the Quaternary Beach Ridge and Dunes, the Tertiary/Quaternary Dunes, the Cypress-head Formation, the Hawthorn Group, the Ocala Limestone, and the Avon Park Formation. Detailed descriptions of these units are provided in the Florida Geological Survey Statemap Daytona Beach report (Green and others, 2013). Land surface elevation ranges from 0 to 75 feet NAVD88 (Figure 8). The highest elevations occur on the eastern side but most of the property is generally below 35 feet.

The sediments of Undifferentiated Quaternary Sediments, the Quaternary Beach Ridge and Dunes, the Tertiary/Quaternary Dunes, and the Cypress-head Formation that begin at land surface are the uppermost sediments and ranging from 40 feet to 50 feet thick. A cross section on the Statemap report does not indicate the presence of the Hawthorn Group for the wells they identified. The upper part of the section within Heart Island is primarily Undifferentiated Quaternary Sediments with the Cypress-head Formation on either side of the property boundaries. Below that, the lithology of the sediments include clay, phosphate pebbles, and fine-grained silts and sands. There may be Hawthorn material that has been reworked (eroded and redeposited) so it may still have very similar properties as the Hawthorn Group. Permeability is low for these sediments. These sediments lie on top of a relatively thin (< 50 feet) layer of Ocala Limestone. Below that is the Avon Park Formation.

Areas for Potential of Artesian Flow at Land Surface

Many springs have been identified on District properties but in all likelihood, there are other ones as yet undiscovered. For a spring to flow at land surface two conditions need to be met. The first is the pressure difference between the producing aquifer and land surface must be positive (Figure 9). For example, if a well is drilled into the Floridan aquifer system (FAS) and casing is installed to the top of the FAS then a water level can be measured in the well. It could be below the level of the FAS or rise up so high it would rise above land surface if the casing continued above ground creating a positive difference. This condition would have the potential for spring flow if another criterion is met. This second criterion for discharge at land surface is for there to be a pathway between the FAS and the land surface. This could be an actual open vent or a thin layer of permeable sediments for the water to flow through. It should be noted that the potentiometric surface of the FAS is dynamic and can fluctuate many feet in vertical elevation so the first condition may be met sometimes and at other times not.



Author:, Source: X1GISUsersiPalatkaid eeiHeart_Isbind1HI_UAV2020_LMiep.mxd, Time:6/24/2020 8:47:57 PM

Figure 8: Elevation of land surface in Heart Island. This also represents the top of the surficial aquifer.



Author:, Source: X:IG ISUsers/Palatka /diee/Heart_Island/HI_UAV2020_LMirep.mxd, Time:6/24/2020 1:55:15 P.M

Figure 9: Map of the area where the 1995 average potentiometric surface is higher than land surface. Water could flow from the FAS to land surface providing there is a pathway for flow. Map also shows location of monitor well clusters Site A (wells V-0769, V-0770, and V-0501) and Site B (wells V-0062 and V-0063)

The area in the south not only has a thin confining unit but also has significant potential for artesian flow. This suggests that additional effort to explore this area may identify additional springs. Thermal imagery from either standard aircraft or unmanned aerial system would be appropriate for this type of investigation.

A sinkhole spring was discovered by District staff in the north central section of the property (Figure 9). The map shown in Figure 9 represents the difference between the potentiometric surface of the FAS in 1995 (an average surface) and land surface. Positive values mean there is the potential for discharge. Values in the +2 to -2 feet range are colored to emphasize the areas where the surface is very close to land surface so may have potential for flow sometimes and at other times not.

A reconnaissance thermal imagery flight from an Unmanned Aerial System (UAS) was done over the spring where the red star in Figure 9 is located. Surveyed ground control points, to help with creating a mosaic of the hundreds of images taken over the area, were not available so a complete image of the area flown is not available. Thermal imagery displayed below shows a single thermal image of the thermal signature of the spring (top) and of a water filled ditch (bottom) to the south away from the spring.



Figure 10: Thermal imagery of a spring in the north section of the Heart Island and to the south in a water filled ditch (blue area SE-NW-shown by arrow) illustrates the difference between a site with FAS source water and one with only surface drainage on a cold day.

The thermal imagery is not calibrated to absolute temperature but is calibrated to a "black box" relative system. Higher temperature values are shown in red and lower in blue. The spring appears to have been flowing as the water temperature is warmer in the spring where it is influenced by the warmer FAS discharge. The ditch water is more indicative of the air temperature of the day which was about 5°C (41°F).

As mentioned in an earlier section, the potentiometric surface fluctuates and this spring is located in an area where the potentiometric surface and land surface are very close to each other so that small fluctuations in the potentiometric surface can mean the spring may discharge intermittently. When the thermal imagery was flown, water could be seen flowing slightly from the spring pool. It appears that the sinkhole spring likely formed sometime after 1980 and before 1994 (Figure 11). A review of archived aerial imagery from 1973 and 1980 does not show evidence of the sink (Figure 12). The sinkhole spring was seen in 1994 imagery (not shown) and is also seen in recent 2019 Google Earth imagery (shown below).



Figure 11: Heart Island sinkhole spring from 2019 Google Earth imagery.



Figure 12: Aerial imagery from 1973 and 1980 do not show evidence of the sinkhole. Arrow indicates about where the sinkhole spring should be located.

Sinkhole Recharge Potential

A desktop evaluation of sinkholes that could have the potential to be used for groundwater recharge (Davis and Mouyard, 2017) was reviewed to assess the potential of sinkholes, as identified by closed topographic depressions, on the property for use as a recharge sink. Ranking criteria were developed based on the thickness of the ICU, the elevation difference between the base of the sinkhole and the potentiometric surface of the FAS, shape, volume, and depth of a sinkhole. All of the sinkholes on the property have the lowest potential ranking for recharge (Figure 13). This is likely related to the fact that any sinks on the site have been filled during periods of changes in the path of the St. Johns River or reworking and deposition of sediments during sea level high stands.



Figure 13: Ranking of sinkholes that may have the potential for recharge.

WATER LEVELS

The District has two active groundwater monitor well sites located inside the Heart Island boundary, which are identified as V-0062 (Upper Floridan aquifer) and V-0063 (surficial aquifer) as depicted on Figure 9 (Site B). Two sites identified as V-0769 (Upper Floridan aquifer) and V-0770 (surficial aquifer) are approximately 0.5 miles east of the Heart Island boundary seen in Figure 9 (Site A).



Figure 14: Hydrographs from Upper Floridan Aquifer monitor well V-0769 (blue line) and surficial aquifer well V-0770 (red line). At this site, there is an upward gradient to the UFA from the SAS.



Figure 15: Hydrographs from Upper Floridan Aquifer monitor well V-0769 (blue line) and surficial aquifer well V-0770 (red line). At this site, there is a downward gradient to the UFA from the SAS.

Historic water levels for each site are depicted in Figures 14 and 15. Both the SAS and the UFA water levels are plotted to show the relative elevations (NAVD 1988) of the water levels in each aquifer. The water elevations are higher in the UFA than the SAS for the sites located within the

Heart Island (V-0062 and V-0063) Figure 14. These water level elevations indicate flow upward from the UFA towards the SAS. Depending upon land surface elevations, spring flow from the UFA may be expected in some areas of Heart Island based on the relative water elevations.

The monitoring wells located 0.5 miles east of the Heart Island boundary have SAS water levels in the (V-0770) higher in elevation than the UFA (V-0769) by approximately 10 feet. This is indicative of recharge to the UFA. Free flowing springs would not occur in this water elevation scenario.

The following table summarizes the water elevation information measured at the four monitoring sites from 05/06/2003 to 04/25/2019.

Well ID	Aquifer	Median	Maximum	Minimum
V-0062	Upper Floridan	22.90	26.18	16.83
V-0063	Surficial	18.92	21.77	14.28
V-0769	Upper Floridan	24.99	29.05	19.83
V-0770	Surficial	34.31	40.95	30.48

Table 2: Water Elevations in Feet NAVD 1988 from Monitor Wells in the Vicinity of Heart Island.

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 2018 Status and Trends Report is a 15-year assessment that uses data from January 1, 2003 to December 31, 2017. Water quality trends indicate whether a water quality parameter is increasing or decreasing over time. (SJRWMD, 2019 https://floridaswater.maps.arcgis.com).

Basic water chemistry data is collected at two sites connected to Heart Island's watershed: (1) 44636, CLD, located in Lake Disston, and (2) LKWOOD, located in Lake Woodruff (Figure 16). 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). Water chemistry data do not exist within the property boundary, but these two sites provide insight to water quality conditions upstream and downstream.

The following parameters are discussed in relative terms for the past 15-year period as described in the 2018 Status and Trends Report.

Lake Disston (CLD 44636)

Phosphorous is in the low-range and has increased 2.8% per year. Nitrogen is in the high-range and has increased 1.8% per year. DO is in the mid-range and stable. pH is in the low-range and stable. Color is in the high range and stable. Salinity is in the low-range and has increased 3.2% per year. Chl-a is in the low-range and decreased 8.7% per year. Specific conductivity is in low-range and has increased 4% per year.

Lake Woodruff (LKWOOD)

Phosphorous is in the low-range and stable. Nitrogen, Chla-a, specific conductivity, and pH are in the mid-range and stable. DO and color are in the mid-range and have increased by 1.1%, and 2.9% per year. Salinity is in the low-range and has increased 3.2% per year.

Water chemistry data do not exist within the conservation area itself, but these sites provide insight to water quality conditions upstream and downstream. De Leon Springs lies approximately 2.5 miles due south of Heart Island and is designated as an Outstanding Florida Spring. This data could have implications for the ecosystem health within Heart Island, De Leon Springs, and the extensive floodplain swamp. Acquisition and protection of Heart Island helps protect portions of the contributing area for the De Leon Springshed.



Figure 16: Water Chemistry Sites.

NATURAL COMMUNITIES

The 13,645 acres that comprise Heart Island consist primarily of mesic flatwoods, floodplain swamp, basin swamp, and some sandhills (Figure 17). Information relative to the natural communities within the conservation area is derived from several sources including timber stand assessments and personal observations of District staff. Additionally, the general natural community descriptions are characterized using descriptions published in the Florida Natural Areas Inventory's (FNAI) 2010 *Guide to the Natural Communities of Florida*.

Areas within the central and southern portions of the conservation area identified as basin swamp in the 2004 management plan were reclassified in the 2009 plan to the floodplain swamp community. These areas exhibit the flowing stream signature that often differentiate the two natural communities.

The initial acquisition (Strother) of the conservation area was purchased subject to a clear-cut reservation of all merchantable timber within areas of the parcel north of SR 40. In an approximate 18-month period (1994-1996), during which the Strother acquisition closed, nearly 11,000 acres were clear-cut in the immediate vicinity of the conservation area, including the ~2,600 acres of timber reservation on Heart Island. This drastic reduction in mature trees caused an observable increase in water levels throughout the conservation area and neighboring land. This was likely due, in part, to the subsequent decrease in transpiration after the clear-cut harvest operations.

Flatwoods communities are distinguished by very flat, level topography. The mesic, wet, and scrubby flatwoods communities within the conservation area vary in levels of disturbance, with the most significant impacts in the areas of the clear-cut reservations. Historic management practices for all parcels except Strawn were primarily for commercial timber production. While timbering occurred on the Strawn parcel, the property's primary uses were cattle grazing, hunting, and some citrus production. Reforestation efforts throughout the conservation area include the reintroduction of longleaf pine in many of the clear-cut and harvest areas; however, slash pine was planted in those areas where repeated failure of longleaf pine plantings occurred.



Figure 17: Natural Communities.

Mesic Flatwoods (6,661 acres, 49%)

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 Heart Island are disturbed, with the most significant alterations attributed to historic silvicultural activities combined with the alteration of the natural fire regime. The majority of these natural communities remain in pine plantation, and approximately 230 acres of historic mesic flatwoods within the conservation area are currently in improved pasture. While many of these areas retain site appropriate species, successional changes from the prolonged absence of fire are evident. Successional changes evident include an overgrown shrub layer, and in some areas, suppressed groundcover. Silvicultural bedding is an additional disturbance within some of the mesic flatwoods. Pine species present within the mesic flatwoods includes longleaf and slash 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, altered hydrology, or hardwood encroachment typically have higher soil and fuel moistures and may require more extreme conditions to facilitate a fire.

Floodplain Swamp (4,971 acres, 36%)

Floodplain swamps occur on flooded soils along stream channels and in low spots and oxbows within river floodplains. This plant community is generally characterized by the presence of buttressed and hydrophytic trees such as cypress and tupelo and a sparse understory and groundcover. The floodplain swamp communities within Heart Island are generally associated with Deep Creek and Little Haw Creek. Typical plants found in this natural community within the conservation area include bald cypress (*Taxodium distichum*), black gum (*Nyssa sylvatica* var. *sylvatica*) lizard's tail (*Saururus cernuus*), and wax myrtle (*Morella cerifera*). Floodplain swamp communities within Heart Island are largely intact and functional.

Soils that support floodplain swamp communities are variable, but may include a mixture of sand, organic, and alluvial material. The most important physical factor associated with the shaping and maintenance of the floodplain swamp is the hydroperiod. Extended periods of inundation, which may last for most of the year, are common in the floodplain swamp environment. Because this community type is maintained by hydrologic regimes, it is not fire dependent; however, fires may occur during times of drought.

Basin Swamp (637 acres, 5%)

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. Species compositions of this natural community type within the conservation area are similar to the floodplain swamp. 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 Heart Island 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.

Wet Flatwoods (338 acres, 3%)

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 (*Gordonia lasianthus*), 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 historic wet flatwoods within Heart Island 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, which is consistent with FNAI 2010 descriptions.

Dome Swamp (256 acres, 2%)

Dome swamp communities typically occur embedded within well-maintained pyric plant communities such as flatwoods. The dome swamp communities within Heart Island 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 Heart Island 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.

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).

Wet Prairie (232 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, hooded pitcher plants, 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 Heart Island are degraded, likely due to hydrologic alterations associated with past silvicultural activities, drought, and a prolonged absence of fire.

Sandhill (166 acres, 1%)

Sandhills are characterized as a forest of widely spaced pine trees with a sparse understory of deciduous oaks and a dense groundcover of grasses and herbs on rolling hills of sand. The most typical associations are dominated by longleaf pine, turkey oak (*Quercus laevis*), and wiregrass. Sandhills occur on crests and slopes of rolling hills and ridges with steep or gentle topography. Soils are deep, marine-deposited, often-yellowish sands that are well drained and largely infertile.

The sandhill plant community is a fire climax community. Fire is a dominant factor in the ecology of this community and frequent fires are necessary to reduce hardwood competition and to perpetuate pines and native grasses. Fire return intervals within sandhill communities range from one to three years. In addition to fire frequency, intensity and season are important fire characteristics that greatly influence the species structure and composition within sandhills. Optimally, sandhills are maintained through frequent, low-intensity, growing season fires. The sandhills within Heart Island are located within the Strawn parcel and are degraded; resulting primarily from prolonged fire exclusion, historic game management, and citrus and cattle grazing practices. Groundcover assemblages in this community type are remnant.

Depression Marsh (136 acres, 1%)

A depression marsh or ephemeral pond is characterized as a shallow, usually rounded depression in sand substrate with herbaceous vegetation. Depression marshes are typically found on flat landscapes throughout Florida. They develop when the overlying sand has slumped into a depression in the limestone underlayment. Soils are typically depressional phases of fine sands. Depression marshes are maintained against woody shrub invasion through the combined effects of seasonal water fluctuations and fire. These seasonal ponds are important habitat for numerous species of wildlife but are particularly important for many amphibians that require breeding sites that are free of predatory fish (Moler, 1987).

There are numerous depression marshes embedded within the mesic flatwood communities of the Conservation Area. Natural hydrologic conditions vary with most depression marshes drying in most years. Hydroperiods can range from 50 to 200 days per year. Fire is important in maintaining this community type by restricting the invasion of shrubs and trees and the formation of peat. Fire return intervals in depression marshes are determined by vegetation characteristics and the surrounding matrix community.

Scrubby Flatwoods (129 acres, 1%)

Scrubby flatwoods are characterized as an open canopy forest of widely scattered pine trees with a sparse shrubby understory and numerous areas of barren white sand. Scrubby flatwoods often occupy broad transitions or ecotones between scrub and/or sandhill and mesic flatwoods. Typical plants of this community type, documented within the conservation area, include saw palmetto, rusty lyonia (*Lyonia ferruginea*), sand live oak (*Quercus geminata*), longleaf pine, and wiregrass.

Scrubby flatwoods are a pyric plant community. Fire is a dominant factor in maintaining the ecological components of this community type. The fire return interval is between every five to fifteen years. Lower fire return intervals may occur or may be necessary when burning in conjunction with other plant communities.

The scrubby flatwoods within Heart Island were historically managed for silviculture and are now replanted in longleaf pine. These areas have intact shrub and groundcover layers with appropriate species compositions.

Swamp Lake (110 acres, <1%)

Swamp lakes are shallow open water zones within basin or floodplain swamps, with or without floating and submerged aquatic plants. These lakes are typically lentic, however, during high
water, may flow with floodwaters. An example of the swamp lake natural community within the conservation area is Dan George Lake.

Blackwater Stream (3 acres, <1%)

Blackwater streams are perennial or intermittent seasonal watercourses originating in deep sandy lowlands where extensive wetlands with organic soils function as reservoirs, collecting rainfall and discharging it slowly to the stream. Examples of this community type within Heart Island include both Little Haw and Deep creeks.

Sandhill Upland Lake (2 acres, <1%)

Sandhill upland lakes are characterized as shallow rounded solution depressions occurring in sandy upland communities. They are generally permanent water bodies, although water levels may fluctuate substantially, occasionally drying entirely. They are typically lentic water bodies without significant inflows or outflows; water is largely derived from lateral ground water seepage or artesian connections with the underlying aquifer.

Vegetation within the sandhill upland lake community is usually confined to a narrow band along the shore and consists of various species of hydrophitic grasses, herbs, or shrubs. Emergent vegetation may be found in a wider band along the sloping shoreline and may include submerged aquatic vegetation throughout the water column. Additionally, floating plants may cover much of the surface area of the water. The sandhill upland lake is an important habitat for numerous species including reptiles, amphibians, fish, and birds.

The sandhill upland lake is not a fire dependent plant community; however, fire may burn into the grassy shoreline. A single example of the sandhill upland lake is found within the conservation area and is located on the north end of the Strawn acquisition.

Altered Areas (4 acres, <1%)

Borrow Pit (4 acres)

A borrow pit is currently located in the east area of the north-central section, adjacent to the west of State Road 11. Based upon information contained within the 1994 Phase I Environmental Site Assessment completed by Professional Service Industries, Inc., the borrow pit was created in conjunction with the development of State Road 11. A fishing platform and parking area to the west of SR 11 was added to improve recreational opportunities on the property. Additionally, the site is used as a helicopter dip site and has a dry hydrant installed for fire suppression.

SOILS

According to the USDA Soil and Conservation Service, 39 different soil types are within Heart Island. The Volusia and Flagler counties Soil Survey provided information used to develop descriptions of the predominant soil series found within Heart Island. The soil descriptions are located in Addendum 2.

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.

PAST MANAGEMENT SUMMARY

This section describes management strategies outlined in the 2009 land management plan and provides the status of each item (Table 3).

Water Resources 2009 Strategy	Status	
Regularly inspect roads, ditches, bridges,	Roads, ditches, bridges, culverts,	
culverts, crossings, fire lines, and trails for	crossings, fire lines, and trails were	
erosion problems.	regularly inspected for erosion problems	
	and repair needs.	
When possible, remove beds from harvest	To date no beds have been removed from	
areas.	harvest areas.	
Flora and Fauna 2009 Strategy	Status	
Continue to conduct diversity surveys and	District staff record new species as they	
develop species lists.	are encountered in the field.	
Continue to monitor for the presence of	District staff record new species as they are	
listed species.	encountered in the field.	
Continue to coordinate with the Bureau of	District staff are in communication with all	
Water Resources, FDOT, and other project	project participants regarding the US 17	
participants regarding the US 17 road-	road widening project. Total acreage	
widening project to ensure the smallest	impact within Heart Island is 52.74 acres	
possible impact to acreage within the	for US 17 road-widening project.	
conservation area.		
Continue to coordinate with FDOT and	District staff are currently coordinating	
FWC regarding wildlife crossings on SR	with FDOT and FWC regarding wildlife	
40 and US 17.	crossings on SR 40 and US 17. Two	
	wildlife crossings are proposed to be built	
	under SR 40. One is designed to	
	accommodate crossings for small to large	
	species within a forested wetland system	
	connected to Deep Creek floodplain, and	
	the other is designed to accommodate	
	small to medium upland-dependent and	
	ecotonal species, such as gopher tortoise,	
	Florida pine snake, eastern indigo snake,	
	eastern diamondback rattlesnake, grey fox,	
	and bobcat. Two wildlife crossings are to	
	be provided on US 17 at the Deep Creek	
	Bridges and approximately one-quarter	
	mile south of the entrance to Heart Island.	

RESOURCE PROTECTION AND MANAGEMENT

Evaluate compartment 18 stands 009, 011,	District staff have evaluated compartment
013, 015, and 035 for second thinning	18 stands 009, 011, 013, 015, and 035 for
needs.	second thinning needs. Compartment 18
	stands 009, 013, 015, and 035 are
	scheduled for a second thinning in 2021.
	Stand 011 is scheduled for a second
	thinning in 2027.
Establish access through neighboring	District staff determined this action to be
landowner (Mr. Underhill) for purposes of	economically unfeasible.
establishing a haul route.	
Evaluate compartment 24 stands 023, 024,	District staff evaluated compartment 24
and 026 for a first thinning.	stands 023, 024, and 026 for a first
	thinning, and determined that access is not
	available. To date, these stands have not
	been scheduled for a first thinning.
Continue forest management database	District staff regularly update and continue
population.	with forest management database
	population.
Refine data within existing forest	The forest management database has been
management database.	refined and is updated annually.
Coordinate forest management activities	District staff are currently in the process of
and landscape contouring with FDOT and	coordinating forest management activities
FWC as necessary to facilitate the success	with FDOT and FWC to facilitate
,	whill I DOT and I WC to facilitate
of any large animal crossing structures on	construction of animal crossing structures
of any large animal crossing structures on SR 40 and US 17.	construction of animal crossing structures on SR 40 and US 17.
of any large animal crossing structures on SR 40 and US 17. Fire Management 2009 Strategy	construction of animal crossing structures on SR 40 and US 17. Status
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	reintroduce fire in areas of high fuel loads and areas with elongated fire return intervals. Dormant season wildfires burned an additional 114 acres since the last plan.
Continue to populate the fire management database.	The fire management database is populated annually.
Exotic Species 2009 Strategy	Status
Continue to monitor for exotic plant species and implement appropriate action.	District Invasive Plant Management and Land Management staff monitor for the presence of invasive exotic vegetation and implement appropriate treatments. District staff have treated 72 acres of invasive and exotic plants since 2009.
Cultural Resources 2009 Strategy	Status
Identify and report sites to the DHR.	No registered cultural sites exist within the boundary of Heart Island. If any sites are located, District staff will document and report the sites to the DHR.
LAND USE MANAGEMENT	
Access 2009 Strategy	Status
Maintain parking areas, signs, gates, trails, and roads.	District staff regularly maintain parking areas, signs, gates, trails, and roads. Five public access points are currently located on the conservation area off US 17, SR 40, SR 11, and Lake Winona Road. With the ongoing FDOT project to widen SR 40 and US 17, the FDOT will combine areas accessed from US 17 and SR 40 into one parking area to be located on the south side of SR 40 at Wells road.
Recreation 2009 Strategy	Status
system and parking area on the Strawn parcel.	of blazed trails in the Strawn parcel, along with a parking area located off Lake Winona Road.
Complete development of fishing platform and parking area improvements at the borrow pit/pond site off SR 11.	The fishing platform and parking area improvements at the pond site off SR 11 have been completed and are now open to the public.
Evaluate the potential for additional campsites.	District staff determined that no additional campsites are needed at this time.
Include any recreation improvements in the next edition of the District's <i>Recreation Guide to District Lands</i> .	The District updates recreation information as needed on the Recreation and Lands page of its website.

Environmental Education 2009 Strategy	Status
Continue to offer environmental education	District staff have hosted several
opportunities.	educational tours for local college students.
Security 2009 Strategy	Status
Maintain signage, fencing, gates, and locks.	District staff regularly maintains signage, fencing, gates, and locks.
Continue coordination with private security firm, FWC, local law enforcement, and security resident.	District staff regularly coordinates with a private security firm, FWC, the on-site security resident, and local law enforcement. In 2019, the on-site security resident vacated the premises, and has yet to be replaced. District staff will determine the need for future service.
Evaluate the need for new fencing.	New fencing was installed at the Strawn parcel.
ADMINISTRATION	
Acquisition 2009 Strategy	Status
Evaluate adjacent properties for potential acquisition.	The District's Office of Real Estate Services evaluates all potential acquisitions that may lend to improved access for management.
Pursue opportunities to acquire any inholdings.	District staff continue to evaluate opportunities to acquire inholdings; none are identified at this time.
Cooperative Agreements 2009 Strategy	Status
Continue to administer the Lake George Wildlife management Area agreement.	The interagency agreement with FWC regarding inclusion of Heart Island in the Lake George Wildlife Management Area is current.
Continue to administer the cooperative management agreement with Volusia County.	District staff continues to administer the cooperative management agreement with Volusia County.
Incorporate any new acquisitions into the existing cooperative management agreement.	No new acquisitions have been made.
Finalize cattle grazing lease agreement between the District and Mr. Strawn.	Lease agreement was commenced on 01/01/2010 and set to terminate on 02/15/2020; however, the lease was terminated on 05/31/2019 due to the District offering parcels for surplus to FDOT for widening of US 17.

Environmental Education 2009 Strategy Status

Table 3: Past management summary and 2021 status.

IMPLEMENTATION

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

RESOURCE PROTECTION AND MANAGEMENT

Water Resources

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

Strategies:

- o Maintain roads, bridges, culverts, crossings, and trails to prevent erosion.
- o Install water bars, turnouts, and low water crossings.
- Inspect canals and ditches for erosion.
- Remove silvicultural beds from timber harvest areas if restoration is feasible.
- Rehabilitate wildfire suppression lines in order to restore hydrology.
- Identify and map locations of shallow ditches/swales that are connecting and draining isolated and/or ephemeral wetlands within the flatwoods and incorporate into regional database for restoration needs or mitigation potential and opportunities.

While most wetland protection was accomplished through acquisition, portions of the wetlands and surface waters within Heart Island have a history of disturbance. Hydrologic disturbances within the conservation area include roads, tram roads, ditches, culverts, bridges, borrow pits, and silvicultural beds. There are 7 bridges, 1 borrow pit, 10 low water crossings, and 37 known culverts within the conservation area. Table 4 provides detail regarding status and maintenance needs for culverts and bridges within the conservation area.

Roads and associated ditches exist on all parcels within Heart Island, providing access for both management and recreation. The District has made improvements to, and conducted maintenance on, many of these roads and ditches helping to reduce the potential for erosion. Figure 18 depicts the location of bridges, low water crossings, and culverts. District staff will continue to inspect roads, trails, bridges, low water crossings, and culverts for erosion problems and maintenance/repair needs.

The majority of the acreage within Heart Island 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.

Structure ID	Туре	Size/Material	Condition
1613	Bridge	36'x16'/Wood	Good
1622	Bridge	Unknown/Wood	Good
1631	Bridge	12'x12'/Concrete	Excellent
1643	Bridge	Could not measure/Wood	Poor/Needs replacing
1645	Bridge	30'x12'/Concrete	Excellent
1650	Bridge	31'x15'/Concrete	Excellent
1654	Bridge	33.5'x13.5'/Concrete	Excellent
1602	Culvert	30'x16"/Metal	Poor/Needs replacing
1604	Culvert	30'x18"/Plastic	Good
1605	Culvert	Unknown	Unknown
1607	Culvert	30'x18"/Plastic	Excellent
1608	Culvert	30'x18"/Plastic	Excellent
1609	Culvert	25'x18"/Plastic	Excellent
1610	Culvert	25'x18"/Plastic	Excellent
1611	Culvert	30'x18"/Metal	Poor/Needs replacing
1612	Culvert	30'x16"/Metal	Poor/Needs replacing
1614	Culvert	20'x18"/Plastic	Poor
1615	Culvert	30'x18"/Metal	Excellent
1616	Culvert	20'x unknown/Concrete	Fair
1623	Culvert	30'x18"/Metal	Excellent
1626	Culvert	30'x12"/Metal	Good
1627	Culvert	20'x24"/Metal	Good
1629	Culvert	30'x48"/Metal	Excellent
1630	Culvert	32'x20"/Metal	Good
1632	Culvert	30'x24"/Metal	Excellent
1633	Culvert	30'x20"/Metal	Excellent
1634	Culvert	30'x12"/Metal	Fair
1635	Culvert	30'x20"/Metal	Excellent
1636	Culvert	32'x18"/Metal	Excellent
1637	Culvert	30'x18"/Metal	Excellent
1638	Culvert	16.5'x48"/Concrete	Good
1639	Culvert	16.5'x48"/Concrete	Good
1640	Culvert	30'x24"/Metal	Fair
1641	Culvert	31'x48"/Metal	Excellent
1642	Culvert	30'x18"/Metal	Fair
1651	Culvert	30'x24"/Metal	Excellent
1653	Culvert	30'x24"/Plastic	Excellent
1656	Culvert	30'x16"/Metal	Poor/Needs replacing
1657	Culvert	20'x18"/Metal	Good
1658	Culvert	25'x18"/Concrete	Excellent
1659	Culvert	25'x13"/Concrete	Good
1660	Culvert	25'x46"/Concrete	Good
1662	Culvert	25'x46"/Concrete	Good
1601	Low Water Crossing	Rock	Fair/needs rock
1606	Low Water Crossing	Rock	Poor/needs rock
1620	Low Water Crossing	Ballast rock	Good
1621	Low Water Crossing	Slag rock	Good
1624	Low Water Crossing	Ballast rock	Good
1625	Low Water Crossing	Ballast rock	Good
1628	Low Water Crossing	Native surface	Good
1652	Low Water Crossing	Slag rock	Good
1655	Low Water Crossing	Rock	Good

Table 4: Road structures.



Figure 18: Location of Bridges, Culverts, and Low Water Crossings.

Heart Island contains many natural communities that are fire adapted and require periodic fire in the form of prescribed burning to manage for ecological diversity. Prescribed burning provides a multitude of benefits, including the protection of adjacent landowners by reducing fuels, and thereby reducing chances for wildfires. However, due to the magnitude of this task, wildfires cannot be eliminated. Since the last land management plan, wildfires have occurred on 426 acres on Heart Island. Many of these wildfires required suppression via a tractor/plow, leaving trenches behind that may alter hydrology and ecological systems. The District has rehabilitated several miles of suppression lines installed on Heart Island, and within the scope of this plan will continue with restoration efforts. Suppression lines will be brought back to a natural grade, so as not to channelize run-off or disrupt sheet flow in order to maintain current natural plant communities.

Aerial photography from the 1940s reveals numerous ditches designed to facilitate drainage across the property for the purposes of cattle grazing and timber production. These ditches drain water from the cypress domes and bayheads within the flatwood areas into roadside ditches and eventually to the large floodplain swamps, basin swamps, Deep Creek, and Little Haw Creek. During the scope of this plan, District staff plan to identify and map locations of shallow ditches/swales that are connecting and draining isolated and/or ephemeral wetlands within the flatwoods and incorporate them into a regional database for restoration needs or mitigation potential and opportunities. District staff will evaluate the site hydrology and determine restoration needs. Restoration work in these areas will be subject to any relevant permit requirements, budget availability, and/or mitigation needs.

Forest Management

Goal: Maintain, improve, and restore forest resources.

Strategies:

- Restore groundcover where appropriate.
- o Manage hardwood encroachment in sandhills and upland pine communities.
- Update forest management database.
- Thin 3,185 acres of timber.

Chapter 253.036, Florida Statutes requires the lead agency of state lands to prepare a forest resource analysis, "...which shall contain a component or section...which assesses the feasibility of managing timber resources on the parcel for resource conservation and revenue generation purposes through a stewardship ethic that embraces sustainable forest management practices if the lead management agency determines that the timber resource management is not in conflict with the primary management objectives of the parcel." The management objectives of this property will require pine harvesting.

Heart Island has a long history of silviculture management. Prior to public acquisition, with the exception of the Strawn parcel, the majority of the acreage within the conservation area was managed for commercial forestry and most of the mesic flatwoods were planted at high densities in slash pine. The \sim 2,600 acre timber reservation on the Strother parcel was clearcut within eighteen (18) months of District acquisition. The shrub layer across this portion of the

conservation area was historically dominated by ericaceous plants, with sparse saw palmetto and herbaceous components and as such, had a longer fire return interval than those mesic flatwoods with heavier saw palmetto and herbaceous coverage. Groundcover and shrub layer conditions vary widely across the conservation area.

The areas clearcut by the previous landowner provided District staff the opportunity to accomplish a species transition from slash pine to longleaf pine. Afterwards, slash pine was replanted in areas where excessive inundation caused the longleaf plantings to fail. The District will aim to convert to longleaf pine but will plant the most appropriate species according to site characteristics.

Prior to public acquisition, the Strawn parcel was utilized for cattle grazing, hunting, and some citrus and timber production. Portions of the sandhill communities within the Strawn parcel were heavily encroached by hardwoods (water, laurel, sand, live, and turkey oaks) and were void of overstory pine as a result of previous management activities. Many of these areas were utilized for hunting and were managed to optimize acorn production. Since the writing of the last management plan, management activities within the Strawn parcel have included longleaf pine reforestation and oak management. Between 2009 and 2010, 248 acres of containerized longleaf pine were planted within the Strawn parcel at a rate of 605 stems per acre. In 2012, an aerial application of herbicide was applied on approximately 89 acres of sandhill by a contractor to control various oak species, allowing for a more successful pine planting and potential regeneration of desirable groundcover. A follow up treatment on oak species occurred in 2017, with approximately 39 acres of sandhill treated with herbicide by District staff. Additionally, approximately 131 acres of sandhill were maintained with rotary mulch mowing for natural community enhancement in 2019.

No overstory pine harvesting is planned within the Strawn parcel during the scope of this plan, however oak management will likely continue in areas where groundcover is not abundant enough to carry fire. Oak management will focus on the removal of offsite sand live, laurel, and water oaks and the reduction in coverage of turkey oak where deemed necessary. While a few sandhill areas within this parcel have ample and diverse groundcover, in most areas, the groundcover is sparse with only the most resilient and disturbance-adapted species remaining. The feasibility of restoration or enhancement of groundcover in these areas will be evaluated.

Heart Island is partitioned into forest management compartments and each compartment is further divided into stands. Figure 19 illustrates the compartments and stands within the property and Figure 20 illustrates the dominant pine species within each stand.



Figure 19: Forestry compartments.



Figure 20: Pine coverage by species.

On properties like Heart Island, 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.

The primary objectives of harvesting on Heart Island are restorative in nature and are 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 writing of the last plan, forestry accomplishments include thinnings of approximately 596 acres of pine. The District will continue to employ several methods of harvest intended to increase diversity and alter tree density to allow for a healthier, more natural looking forest. Figure 21 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 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 harrowing and disking to remove silvicultural bedding, roller chopping and mowing, herbicide applications, and prescribed fire. These techniques may be used singularly or in combination as site conditions warrant. First thinning operations typically occur during 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. In addition, the District uses regeneration methods such as shelterwood cuts, seed tree cuts, and clearcuts.

Through periodic thinnings, the District will remove the poorest trees to reduce crown density and in time, allow for larger trees with full, vigorous crowns. There are eleven planned thinnings of pine within Heart Island from 2020–2030 (Figure 22). Harvesting may also provide some protection against wildfires and pine beetle outbreaks. Site preparation techniques employed prior to replanting in harvested areas throughout Heart Island may include mechanical treatment of vegetation, chemical treatment of vegetation, and prescribed fire. These techniques may be used singularly or in combination.

The District will abide by Florida Silviculture Best Management Practices, Florida Forestry Wildlife Best Management Practices for State Imperiled Species and target the achievement of appropriate overstory species in proper stand densities as described in the District Forest Management Plan. In addition to planned forest management activities, the District will 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.



Figure 21: Forest management accomplishments between 2009 and 2020.



Figure 22: Forest management planned for 2020-2030.

Fire Management

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

Strategies:

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

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 Heart Island 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 Heart Island 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. Since 2009, District staff implemented prescribed fire on 6,830 acres within the property. Additionally, many fire management units have received multiple iterations of fire as illustrated in Figure 23.

Historically, the majority of fires occurring on what is now Heart Island would have been ignited by lightning during the growing season. In more recent history, previous landowners shifted the fire regime to include primarily dormant season burning, lack of prescribed burning, or suppression of wildfire, which served to protect the growth of fast-growing slash pine investment on the property. The District makes an effort to reintroduce prescribed fire to the property during dormant season, and expand to the growing season, where possible. Since the last plan 5,625 acres were burned in the dormant season, while 1,012 acres were burned during the growing season. The District will continue to implement growing season fires where possible, understanding that constraints in some areas such as young pine, high fuel loading, and proximity to smoke sensitive areas may require the use of dormant season burning.

Limiting factors narrowing the window of opportunity for the application of prescribed fire on portions of the conservation area is the close proximity to critical smoke sensitive areas including US 17, SR 40, CR 11, and developed areas such as the town of Barberville. Smoke management is a primary 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 Heart Island are depicted in Figure 24.



Figure 23:Fire history map.



Figure 24: Smoke management.

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. Since the last management plan, 252 acres were roller chopped for fuel management, and 610 acres received fuel management via rotary brush cutting.

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 adapted 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 an ecological surrogate, 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 Florida Native Areas Inventory (FNAI) (Guide to the Natural Communities of Florida, 2010). 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.

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 areas habitats in 2020 was 50% Condition Class 1; 12% Condition Class 2; 37% Condition Class 3, and 0.5% Condition Class 4. There has been an overall increase in the percentage of habitat in Condition Class 1, decreases in Condition Classes 2 and 3, and no significant change in Condition Class 4 from 2009 to 2020 (Figure 25).



All implementation of prescribed fire within the conservation area will be conducted in accordance with the District's Fire Management Plan, the Heart Island Fire Management Plan (Addendum 2), and the annual burn plan for the property.

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.
- Continue to coordinate with the Bureau of Water Resources, FDOT, and other project participants regarding the US 17 and SR 40 road-widening projects to ensure the smallest possible impact to acreage within the conservation area.
- Continue to coordinate with FDOT and FWC regarding wildlife crossings on SR 40 and US 17.

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

Strategies:

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

Heart Island has a diverse assemblage of natural communities providing significant habitat for a variety of floral and faunal species. The 2003 management plan for this property lacked plant and animal lists. In June of 2009, District staff conducted an informal flora and fauna survey across the conservation area and have continued to add to the list (Addendum 3).

Flora

The District has developed a plant list from observations within Heart Island. The District may seek the assistance of local Native Plant Society and other volunteers to further develop the knowledge of plant species within Heart Island. State listed plant species are described below.

Garberia

Garberia (*Garberia heterophylla*), is documented within Heart Island, and is listed as a threatened species by the State of Florida. This low shrub attains a height of 4 to 8 feet and has showy late season flowers that appear in terminal corymbs of lavender pink heads. This species occurs in acidic, sand, and loam soils associated with sandhill and scrubby flatwood communities.

Hooded Pitcher Plant

Hooded pitcher plant (*Sarracenia minor*), is documented within Heart Island, 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.

Giant Airplant

Giant airplant (*Tillandsia utriculata*), is documented within Heart Island, and is listed as an endangered species by the State of Florida. This plant is the largest Tillandsia species in the United States, growing singly to 2 m tall with large, light green to gray green leaves with a wide base. This species occurs in dry and mesic and mesic hammocks, cypress swamps, and pinelands.

Fauna

Florida Black Bear

The Florida black bear (*Ursus americanus floridanus*) is documented within Heart Island. In addition to habitat loss and fragmentation and a host of diseases and parasites, threats to the Florida black bear include human caused mortality and incompatible habitat management. Heart Island lies within a critical movement corridor for the Ocala subpopulation of the Florida black bear, linking the Ocala National Forest east through Volusia and Flagler counties. The conservation area is a significant acquisition in providing connectivity to other conservation lands and provides an optimal range of desirable habitat and seasonal food sources for bears, as well as cover for denning and protection from humans. To the extent that issues relate to District-managed lands, District staff will coordinate as necessary with the FWC, FDOT, and any other relevant parties regarding the management of bear habitat and the facilitation of movement across the landscape. The District currently holds a seat on the FWC Statewide Bear Technical

Assistance Group, and provides stakeholder input for updates of the Florida Black Bear Management Plan (2019 Florida Black Bear Management Plan).

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 Heart Island. 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 sandhill and pine flatwood communities of Heart Island will focus on restoring species composition and natural fire return intervals, which will benefit the gopher tortoise.

Wood Stork

Heart Island lies within the core foraging area for a nesting colony of the federally threatened wood stork (*Mycteria americana*). The rookery is documented approximately 2 miles due north of the conservation area on Lake Disston (Wood Storks, 2019), and the entire property lies within the foraging area radius 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

Several invasive plants are known to occur within the conservation area including:

- Mimosa (*Albizia julibrissin*)
- Camphor-tree (*Cinnamomum camphora*)
- Wild taro (*Colocasia esculenta*)
- Air-potato (*Dioscorea bulbifera*)
- Old World Climbing Fern (Japonicum microphyllum)
- Cogongrass (Imperata cylindrica)
- Chinese tallow tree (*Sapium sebiferum*)
- Caesar-weed (*Urena lobate*)

These invasive plants are managed by the District's Invasive Plant Management Program. 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 Invasive Plant Management Program 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 or exotic 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 Exotic Pest Plant Council (FLEPPC) Category I and II invasive plants at Heart Island are currently at a

maintenance level (2019 FLEPPC List of Invasive Species). Since 2009, District staff have treated 72 acres of invasive vegetation within the property (acres treated include acres that have received multiple treatments).

Exotic wildlife species known to occur within Heart Island 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. Additionally, feral hogs are harvested from Heart Island in conjunction with public hunting opportunities associated with the Lake George Wildlife Management Area.

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 Heart Island.

Florida Department of Transportation Projects – U.S. Highway 17 & State Road 40

The FDOT (during the writing of this plan) is in the design phase of a road-widening project affecting portions of US 17 and SR 40. The District's land management interests in these projects include:

- Right-of-way assumption as it relates to property in which the District has an ownership interest.
- Impacts to management and public access of the conservation area.
- o Expansion and improvement of existing wildlife crossing structures.
- Location, type, size, and construction of new wildlife crossing structures and barrier fencing.
- Natural community management needs as they relate to the enhancement of the functionality of wildlife crossings.
- Monitoring of wildlife crossing structures.

U.S. Highway 17 (FDOT Project # 410251-1)

The approximate 6.8-mile project for US 17 spans from Ponce de Leon Boulevard north to SR 40 and includes approximately (2) two miles of highway frontage of the conservation area, including the Deep Creek bridge. This project is currently in the design phase and has an anticipated start date of July 31, 2030. This project is subject to, among others, District regulatory permit approval. This plan will not address regulatory or permit issues.

The expansion of the current two-lane highway to the proposed four-lane highway will be constructed to the east and will affect portions of the conservation area. Expansion to the west side of the existing road is not possible due to the presence of the Seaboard Coast Line railroad. Current design will include a total loss of 52.74 acres from the conservation area. This acreage is necessary to accommodate the footprint of the new highway surface, road shoulder, right of way, and stormwater treatment ponds. The District's Bureau of Land and Water Resources, Office of

Real Estate Services, and Division of Regulatory Services have worked closely with FDOT and consultants to ensure the smallest possible impact to public lands and jurisdictional wetlands. The District is working closely with FDOT and FWC on improvements to the existing Deep Creek bridge wildlife crossing and additional crossing structures as follows:

- 1. Large mammal crossing approximately .5 miles south of the Heart Island parking area in concentrated area of documented black bear roadkills.
- 2. Three culvert replacements which will provide improved drainage beneath US 17 while also functioning as a crossing structure for small mammals, reptiles, and amphibians.

The FDOT plans to install wildlife barrier fencing on either side of the crossing which will be a 6-foot high chain link with herpetofaunal fencing from the ground up to 18 inches. The culvert replacements will occur within the fenced area.

State Road 40 (FDOT Project #240836-1)

The FDOT (during the writing of this plan) is in the design phase regarding the proposed widening of SR 40 in Volusia County. A construction start date has not yet been determined. The proposed improvements consist of widening SR 40 from two to four lanes, from US 17 to Cone Road, approximately 13.8 miles, and will include approximately 5 miles of SR 40 frontage of the conservation area. The proposed project will utilize the existing two travel lanes on SR 40 for the future westbound lanes and construct an additional two lanes for eastbound traffic. The eastbound and westbound lanes will be separated by a 40-foot-wide grassed median. A 12-foot-wide paved multi-use trail will be provided on the south side of the roadway. The FDOT commits to coordinating the design of SR 40 with the District in such a manner that any proposed improvements do not adversely affect the activities, features and attributes of Heart Island (SR 40 PD&E Study Reevaluation Summary of Impact to the Heart Island Conservation Area).

The project is proposed to require approximately 18.44 acres of total property acquisition from Heart Island. Of this total impact, 9.77 acres are related to the construction of stormwater pond sites and 8.67 acres are related to the construction of the roadway typical section and associated wildlife crossings. Two wildlife crossings are proposed to be built off SR 40, and District staff continue to coordinate with FDOT and FWC regarding the placement and design of the crossings. One is designed to accommodate crossings for small to large species within a forested wetland system connected to the Deep Creek floodplain, and the other is designed to accommodate small to medium upland-dependent and ecotonal species, such as the gopher tortoise, Florida pine snake, eastern indigo snake, eastern diamondback rattlesnake, grey fox, and bobcat.

Cultural Resource Protection

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

Strategies:

o 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 any sites are not identified on public maps.

LAND USE MANAGEMENT

Access

Goal: Provide public access to District lands.

Strategies:

- o Maintain parking areas, signs, gates, trails, roads, and other recreational facilities.
- Update District database on maintenance of existing and creation of new parking areas, signs, gates, trails, and roads.
- Coordinate with FDOT and Volusia County on the closure of parking lots at Bee Road on SR 40 and at US 17, and opening of new parking lot at Wells Rd on the south side of SR 40.

Five public parking areas are available on Heart Island. Two parking areas are located on the west side of SR 11, one is located off US 17 just south of SR 40, one is located on the south side of SR 40 at Bee Road, and one is located on the west side of Lake Winona Road. Parking areas are fenced and have walkthroughs providing for non-motorized recreational access. Informative kiosks are provided at parking area trailheads.

With the ongoing FDOT projects to widen SR 40 and US 17, the FDOT will consolidate the existing parking areas accessed from US 17 and SR 40 by combining them into one parking area to be located on the south side of SR 40 at Wells Road. It is anticipated that the new parking area will include fencing, parking surface improvements, ADA improvements and signage. The parking area at Wells Road has been cleared, but is not yet open for public use.

There are currently 55 gates providing management access to and across the property. These gates are monitored regularly for maintenance and/or repair needs from normal wear and tear and vandalism. In an effort to expedite emergency responses and to assist law enforcement and fire rescue in locating individuals in the event of an emergency, 911 addresses have been issued at certain parking areas and access points to the property. Table 5 includes the 911 addresses for Heart Island.

911 Address	Description/Usage
1999 US 17	Main Access Gate
6340 Lake Winona Rd.	Main Access Gate
6777 Lake Winona Rd.	Occasional Access
6798 SR 11	Main Access Gate
945 E SR 40	Main Access Gate

Table 5: 911 Addresses for emergency access

Approximately 49 miles of interior management roads traverse the property, some of which incorporate the multiuse trail system. 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.

Twenty-nine (29) miles within the conservation area are classified as primary road, with the majority stabilized with limerock. Approximately 19.5 miles of secondary roads are located within Heart Island, 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 area, as necessary. Roads will be regularly inspected and receive maintenance and repair as necessary and may be subject to closure during these times. Additionally, activities such as prescribed fire, wildfires, timber harvesting, and other mechanical activities may result in temporary road closures.

Truck Trail 11, also known as Chessor Hammock Road, is jointly owned and is subject to easements by Plum Creek Land Company. By written agreement, the District improved the road, and in exchange for this, the District is relieved of any responsibility to maintain the road in the future, except when the District is using it for logging traffic. Figure 26 depicts the location of the parking areas, roads, access easements, and gates on the property.



Figure 26: Roads, gates access easements, and parking areas.

Recreation

Goal: Provide recreational opportunities consistent with the ecological needs of the property.

Strategies:

- Maintain parking areas, camp site, picnic area, kiosks, and trails.
- Update the District's online *Recreation and Lands* interactive site with recreation improvements.

The primary objective of the Recreation Management Program is to facilitate resource-based recreational activities on District lands. An aspect in developing the SJRWMD Recreation Program is not to compete with other local recreational opportunities, but rather complementing what they may already have in place by filling an outdoor recreation niche through dispersed recreation opportunities. Dispersed recreation activities generally require large tracts of land with some level of isolation. This type of recreation blends well with District conservation areas, providing numerous opportunities for passive recreation on most District properties, Heart Island differs in that most roads within the property are open to vehicular traffic. The District is committed to ensuring that all visitors, including those with physical challenges, have the opportunity to experience these natural areas. Heart Island is one of five District properties with a portion of roads open to year-round vehicular access. The open roads provide opportunity for ADA accessible recreation.

Recreational opportunities available within the conservation area include hiking, bicycling, fishing, wildlife viewing, equestrian activities, photography, camping, and seasonal hunting. Figure 26 depicts the extent of the major roads and the location of parking areas. Figure 27 depicts the multi-use trail system installed on the Strawn parcel.

Recreational improvements on Heart Island include:

- Camping One group campsite is located off Lake Winona Road and includes a non-potable pitcher pump, benches, picnic table, and a fire ring. Camping is restricted to tent camping only; no RVs, travel trailers, or campers are allowed. The campsite is by reservation only (through the District's camping reservation system <u>https://www.camplife.com/campground/St%20Johns%20River%20Water%20Manag</u> <u>ement%20District</u>).
- **Land Management Roads** Many miles of land management roads are available for driving, hiking, biking, and equestrian use. The District may close trails and roads or portions of trails and roads to accomplish land management activities or when conditions pose a public safety concern.
- Multi Use Trails Approximately 5 miles of blazed trails located on the Strawn parcel, for hiking, biking, and equestrian use. Trails on the Strawn parcel are not open for motorized vehicular use. The District may close trails or portions of trails to accomplish land management activities or when conditions pose a public safety concern.
- **Picnic Areas** A covered picnic area is located along the red blazed trail on the Strawn parcel.
- **Kiosks** Informational kiosks are located at public access points and provide information including maps, trail guides, and displays.

- **Fishing Platform** A wheelchair accessible public fishing platform and parking area is available at the most northern parking site off SR 11.
- Wildlife Management Area Portions of the property are incorporated into the Lake George Wildlife Management Area (Figure 28). Seasonal public hunting opportunities are available and managed under the jurisdiction of FWC.

The targeted maintenance schedule for trails and campsites includes:

- Mowing trails and road edges four times yearly.
- Trail blazing, trimming of overhanging branches, and tree removal along trails as needed.
- Monthly trailhead and campsite maintenance.

Any changes to the recreational infrastructure will be updated on the District's recreation section on the website, which can be viewed online at <u>https://www.sjrwmd.com/lands/recreation/</u>.

Security

Goal: Provide and maintain the site's security.

Strategies:

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

Security concerns within Heart Island include damage to roads caused by activities associated with motorized vehicle access, dumping, vandalism of gates, fences, conservation signage, and poaching. The boundaries of Heart Island were marked and posted soon after the original survey work was complete. While portions of the boundary were fenced prior to acquisition, some of the conservation area boundary, particularly through the forested wetlands, remains unfenced. District staff will evaluate the need for new fencing in unfenced areas and incorporate all new fencing into future budget and annual work plans.

Vehicular use of roads within Heart Island were formerly limited to and associated with hunting. In recent years vehicular access has been allowed to continue throughout the year. The District will continue to monitor road conditions, and if road damage, dumping or vandalism becomes a problem, gates will be closed, and vehicular access will again become associated with seasonal hunting only. The District utilizes a contract security firm as well as coordination with FWC and local law enforcement to administer security within the property.



Figure 27: Trail Map.



Figure 28: Wildlife Management Area

ADMINISTRATION

Real Estate Administration

Goal: Explore opportunities for adjacent property acquisition.

Strategy: Evaluate adjacent properties for potential acquisition.

The District has identified two areas adjacent to the Strawn parcel for potential acquisition that would serve to facilitate the restoration and protection of the natural resources found on Heart Island (Figure 29). The District may pursue acquisition of these parcels and other small parcels or easements that may improve access for management purposes over the next 10 years.

Through the District land's assessment process, a 1,639-acre parcel located east of SR 11 has been identified for potential surplus (Figure 29). This parcel along with the 585-acre Bud Henry parcel were identified in the *2012 District Land Assessment Implementation Plan* for sale with a conservation easement. The Bud Henry parcel sold in 2015 and is now protected through the less than fee Lake Disston conservation easement held by the District.

District staff are in communication with the FDOT regarding the surplus and sale of 52.74 acres of property located along US 17. This potential surplus will facilitate the implementation of the US 17 road widening project. The footprint of land up for surplus is displayed below in Figure 29. The sale will consist of several parcels, 34.66 of which are solely owned by the District and 18.076 acres co-owned by the District (25%) and Volusia County (75%). The proposed purchase price is \$533,450.00. Volusia County has agreed to the sale with the understanding that it will receive 75% of the funds from the Strawn parcel. FDOT will provide an additional \$109,372.71 for the relocation of a new trailhead and parking area to be accessible from SR 40.



Figure 29: Potential Acquisition and Surplus Parcels.

Cooperative Agreements, Leases, Easements, and SUA

Goal: Evaluate, pursue, and manage cooperative opportunities.

Strategies:

- o Continue to administer the cooperative management agreement with Volusia County.
- Continue to cooperate with researchers and universities as appropriate.
- o Incorporate any new acquisitions into the existing cooperative management agreement.
- Evaluate lease and Special Use Authorization opportunities for compatibility with conservation and management goals.

Chapter 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 Board of Trustees of the Internal Improvement Trust Fund, or local governments hold title. District Policy #90-16, 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 6 details the agreements, leases, and SUAs in effect during the writing of this plan.

Agreement Number	Type/Purpose	Agreement Name	Term
1994	SUA/Pollinator Research	Stetson University	May 2025
580	Intergovernmental/Mana gement Designation	Volusia Co – Strawn	April 2029
1008	Intergovernmental/WMA	FWC – WMA	2034
1111	Intergovernmental	Cooperative Fire Management – SJRWMD & Volusia County	September 2040
1403	Lease/Apiary	ITO D&J Apiary	June 2023
1459	Easement/Utility	Clay Electric ROW at Strother	Perpetual
1548	Acquisition Related	Strawn Property Mitigation Obligation	Perpetual
1560	SUA/Bat Research	FFWCC-Katie Teets	February 2024
1580	SUA/Hog Removal	Raulerson	December 2023
1962	Lease/Cattle Grazing	Heart Island-Mills	August 2030
2073	Lease/Saw Palmetto Frond Harvesting	Saw Palmetto Frond Harvesting – Grayson Puckett Ferneries	October 2025

Table 6: Cooperative Agreements, Leases, and Special Use Authorizations.

Heart Island is subject to a lease agreement between the District and FWC that establishes portions of the conservation area as part of the Lake George Wildlife Management Area. FWC is responsible for hunt management and associated law enforcement. An intergovernmental cooperative management agreement exists between the District and Volusia County designating the District as lead managing agency on all natural and cultural resource-based management issues, and on daily operational and recreational management issues for the Strawn parcel.

The Strawn parcel is subject to United States Army Corps of Engineers (USACOE) mitigation permit # SAJ-2010-01600 (IP-AWP). Approximately 300 acres of the Strawn parcel was obtained and reserved for habitat improvements to compensate partially for impacts associated with five FDOT projects in the Middle St. Johns River Basin (Mitigation Group SJ 56). The federal permits that incorporated the Strawn mitigation plan require that wetlands be preserved and enhanced. Per requirements in permit # SAJ-2010-01600, the District completed five years of monitoring and submitted the final annual report to the USACOE in 2017. In 2019, the USACOE determined the conditions of the permit had been met and released the District from further obligations to perform monitoring and reporting. The District remains responsible to ensure the Strawn parcel is managed for conservation purposes in perpetuity as defined in the USACOE Permit No: SAJ-2010-01600. Essential components of management activities on the Strawn parcel per the USACOE permit include fire management, maintaining ecological conditions in the floodplain swamp of a Unified Mitigation Assessment Method score of ≥ 8 , removal of Category I and II invasive exotic plant species, and elimination of cattle operations. The lease for cattle operations on the Strawn parcel was terminated on May 30, 2019 and will not be continued in the future to maintain compliance with the USACOE permit.

The remainder of Heart Island is not subject to mitigation requirements for the elimination of cattle grazing operations as outlined in the USACOE permit for the Strawn parcel. Cattle grazing was evaluated for the remainder of Heart Island and determined to be beneficial for the property as it provides vegetative management, general maintenance, and on-site security. Cattle grazing on Heart Island will primarily be conducted within the existing improved pasture areas.

Management Revenues and Costs

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

Strategies:

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

All revenue generated through cattle grazing, palmetto frond harvesting, apiary leases and forest management accomplishments are applied towards the District's land management 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 Last Management Plan

Revenues since the 2009 land management plan are primarily from timber thinning (Table 7).

Activity	Year	Revenue
Timber sale	2009	\$ 45,788
Timber sale	2012	\$ 14,264
Timber sale	2014	\$ 97,294
Timber sale	2017	\$ 23,251
FDOT Right-of-way Clear-cut	2019	\$ 6,726
Timber sale	2019	\$48,828
Cattle Lease	2010-2020	\$9,873
Palmetto Frond Lease	2010-2020	\$22,500
Apiary Lease	2018-2020	\$888
Total		\$ 269,412

Table 7: Management Revenues from the 2009 plan to 2020

Costs Since Last Management Plan

Since the 2009 plan, management costs have totaled \$670,422 (Table 8).

Annual Costs

Activity	Annual	Units	Annual	Total Cost
	Number of		Cost	(Since 2009)
	Units			
Invasive plant control	10	Acres	\$1,800	\$18,900
Prescribed fire	543	Acres	\$13,166	\$138,243
Wildfire Suppression	221	Acres	\$5,641	\$59,230
Security	50	Hours	\$2,100	\$22,050
Road maintenance	64	Miles	\$12,800	\$134,400
Mowing (roads, trails)	167	Acres	\$3,060	\$32,130
Service mowing	3	Acres	\$540	\$5,670
Trail and camp site maintenance	5	Miles	\$1,045	\$10,972
Staff Time	200	Hours	\$5,000	\$52,500
Tree planting/Site Prep	386	Acres	\$11,449	\$120,214
Forest inventory	129	plots	\$2,786	\$29,253
One Time Cost				
Activity	Total	Units	Cost	Total
	Number of			
	Units			
Fence maintenance	1	Miles	\$5,280	\$5,280
Shrub Control	200	Acres	\$30,000	\$30,000
Timber Marking	334	Acres	\$11,580	\$11,580
Total Cost Since 2009 Plan				\$ 670,422

Table 8: Management Costs from the 2009 plan to 2020

Projected Revenues

The projected revenues from forest management at Heart Island between 2021 and 2031 are \$1,718,896 (Table 9). All revenue generated through forest management accomplishments for this time will be applied towards the District's land management budget to offset management costs for the property.

Activity	Fiscal Year(s)	Revenue
Timber sale	2021	\$566,682
Timber sale	2022	\$170,392
Timber sale	2023	\$432,966
Timber sale	2024	\$80,208
Timber sale	2026	\$106,316
Timber sale	2028	\$37,714
Timber sale	2031	\$231,986
Cattle Lease	2021-2031	\$28,800
Palmetto Frond Lease	2021-2031	\$62,500
Apiary Lease	2021-2023	\$1,332
Total		\$1,718,896

Table 9: Projected revenues between Fiscal Years 2021 to 2031

Projected Management Costs

Projected management costs for Heart Island from 2021-2031 are \$850,820.

Activity	Number of Units (annual)	Units	Annual Cost	10 Year Total Cost
Invasive plant control	11	Acres	\$1,980	\$19,800
Prescribed fire	650	Acres	\$14,842	\$148,420
Security	50	Hours	\$2,310	\$23,100
Road maintenance	64	Miles	\$14,080	\$140,800
Mowing (roads, trails)	167	Acres	\$3,366	\$33,660
Service mowing	2	Acres	\$396	\$3,960
Fireline Disking	55	Miles	\$18,150	\$181,500
Trail and camp site maintenance	5	Miles	\$1,150	\$11,500
Fence maintenance	1	Miles	\$5,808	\$58,080
Staff Time	200	Hours	\$5,500	\$55,000
Forest inventory	1,600	Plots	\$3,500	\$35,000
Timber Marking	2,000	Acres	\$14,000	\$140,000
Total cost over 10 years				\$850,820

Table 10: Projected Management costs from 2021-2031

water Kesou	rces		
Goal	Protect water quality and quantity, restore hydrology to the extent feasible, and maintain the restored condition	Measure	Planning Period
Strategy A	Maintain roads, bridges, crossings, and trails	Roads	Annually by
	to prevent erosion.	maintained	Sept.
Strategy B	Install water bars, turnouts, and low water crossing.	Water bars, turnouts, and low water crossings installed	5-10 Years
Strategy C	Inspect canals and ditches for erosion.	Canals and ditches inspected	Annually by Sept.
Strategy D	Remove silvicultural beds from timber harvest areas if restoration is feasible.	Removed beds	5-10 Years
Strategy E	Rehabilitate wildfire suppression lines in order to restore hydrology.	Suppression lines restored	Ongoing
Strategy F	Identify and map locations of shallow ditches/swales that are connecting and draining isolated and/or ephemeral wetlands within the flatwoods and incorporate into regional database for restoration needs or mitigation potential and opportunities.	Acres of wetlands with restored hydrology	10 Years
Forest Mana	gement and Restoration		
Goal	Maintain, improve, and restore forest resources	Measure	Planning Period
Strategy A	Restore groundcover where appropriate.	Acres of restored groundcover	Ongoing
Strategy B	Manage hardwood encroachment in sandhills and upland pine communities.	Acres of managed sandhill and upland pine community	Annually by Sept.
Strategy C	Update forest management database.	Updated forest management database	Annually by Nov.
Strategy D	Thin 3,185 acres of timber.	Acres of timber thinned	10 Years

RESOURCE PROTECTION AND MANAGEMENT

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	Conduct dormant season burns in pine plantations and areas of high fuel loading and/or extended fire exclusion.	Acres burned in dormant season	Ongoing
Strategy C	Continue to populate the fire management database on an annual basis.	Updated fire management data base	Annually by Nov.
Strategy D	Use mechanical fuel reduction as a fire surrogate in areas where it is difficult to burn due to high fuel loads or proximity to highways.	Number of acres mowed or roller chopped	5-10 Years
Flora and Fa	iuna		
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
Strategy C	Continue to coordinate with the Bureau of Water Resources, FDOT, and other project participants regarding the US 17 and SR 40 road widening projects to ensure the smallest possible impact to acreage within the conservation area.	Acres impacted by widening project within the conservation area	Ongoing
Strategy D	Continue to coordinate with FDOT and FWC regarding wildlife crossings on SR 40 and US 17.	Number of wildlife crossings installed	Ongoing
Goal	Manage invasive and/or exotic plants and animals	Measure	Planning Period
Strategy A	Conduct feral hog removal activities as need is indicated.	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 Reso	ource 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	Provide public access to District lands	Measure	Planning Period
Strategy A	Maintain parking areas, signs, gates, trails, roads, and other recreational facilities.	Parking areas, signs, gates, trails, and roads maintained	Ongoing
Strategy B	Update District database on maintenance of existing and creation of new parking areas, signs, gates, trails, and roads.	Database updated	Ongoing
Strategy C	Coordinate with FDOT and Volusia County on the closure of parking lots at Bee Rd on SR 40 and at US 17 and opening of new parking lot at Wells Rd south of SR 40.	Closure of parking lots at Bee Rd. and US 17 and installation of new parking lot at Wells Rd south of SR 40.	Ongoing
Recreation			
Goal	Provide recreational opportunities consistent with the ecological needs of the property	Measure	Planning Period
Strategy A	Maintain parking areas, camp site, picnic area, kiosks, and trails.	Recreational sites maintained	Ongoing

Strategy B	Update the District's online <i>Recreation and</i> <i>Lands</i> interactive site with recreation improvements.	Up-to-date online site	Ongoing
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Security			
Goal	Provide and maintain the site's security	Measure	Planning Period
Strategy A	Maintain signage, fencing, 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 A	dministration		
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 U	se Authorization	ns (SUA)
Goal	Evaluate, pursue, and manage cooperative opportunities	Measure	Planning Period
Strategy A	Continue to administer the cooperative management agreement with Volusia County.	Agreement administered	Ongoing
Strategy B	Continue to cooperate with researchers and universities as appropriate.	Cooperative agreements and SUA's administered	Ongoing
Strategy C	Incorporate any new acquisitions into the existing cooperative management agreement.	Properties incorporated into cooperative management agreement	Ongoing
Strategy D	Evaluate lease and Special Use Authorization opportunities for compatibility with conservation and management goals.	Leases 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 11: Land Management Plan Implementation Chart

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ADDENDUM 1: HEART ISLAND CONSERVATION AREA SOILS

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

Apopka

The Apopka series consists of very deep, well drained, moderately permeable soils on ridges and side slopes in the Lower Coastal Plain. They formed in thick beds of sandy and loamy marine or eolian deposits. The understory vegetation supported by this series may consist of bluestem, dog fennel, paspalum, pineland threeawn, and other native grasses and weeds.

Astatula

The Astatula series consists of very deep, excessively drained, rapidly permeable soils that formed in eolian and marine sands. Natural vegetation may consist of blue jack, blackjack, turkey oaks, longleaf pine, sand pine, and an understory of rosemary, pineland threeawn, bluestem, paspalum, lopsided indiangrass, and panicum.

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.

Cassia

The Cassia series consists of very deep, somewhat poorly drained, moderately rapid permeable soils on low ridges and knolls that are slightly higher than the adjacent flatwoods. They formed in sandy materials in the Lower Coastal Plain. The native vegetation may include scattered slash pine, longleaf pine, and saw palmetto.

Chobee

The Chobee series consists of very deep, very poorly drained, slowly to very slowly permeable soils in depressions, flats, and occasionally on river flood plains in the lower Coastal Plain. They formed in thick beds of loamy marine sediments. Most of the soils remain in their natural state and have vegetation consisting of pickerelweed, lilies, saw grass, and scattered swamp maples in treeless areas. Some areas have a growth of ash, gum, maple, and cypress.

Daytona

The Daytona series consists of very deep, moderately well drained, moderately rapid permeable soils on knolls and ridges in the flatwoods. They formed in sandy deposits of marine or eolian sediments. The native vegetation may include sand pine with an understory of creeping bluestem, broom sedge bluestem, splitbeard bluestem, lopsided indiangrass, pineland threeawn, switchgrass, panicum, and paspalums.

Deland

The Deland series consists of very deep, well drained, moderately permeable soils on low, broad, sand hills. They formed in thick beds of marine, eolian, or fluvial sediments on the lower Coastal Plain. The natural vegetation may include sand live oak, turkey oak, along with scattered saw palmetto, and clumps of pineland threeawn, prickly pear, and broom sedge bluestem.

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.

Electra

The Electra series consists of somewhat poorly drained soils that formed in thick beds of sandy and loamy marine sediments on slight ridges in the flatwoods areas of central and southern Florida. Native vegetation may include dwarf live oak, a few longleaf and sand pine, running oak, saw palmetto, and blueberry. Understory vegetation may include creeping bluestem, chalky bluestem, lopsided indiangrass, low panicum, pineland threeawn, paspalum, and numerous forbs.

Farmton

The Farmton series consists of very deep, poorly drained soils formed in sandy and loamy marine sediments. Most areas are planted in pines or are in natural vegetation with an overstory of longleaf and slash pines and an understory of saw palmetto, wax myrtle, gallberry, fetterbush, lyonia, creeping bluestem, chalky bluestem, and pineland threeawn.

Favoretta

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

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.

Holopaw

The Holopaw series consists of deep and very deep, poorly and very poorly drained soils formed in sandy marine sediments. These soils are on low lying flats, in poorly defined drainages or depressional areas. Native vegetation is scattered slash and pond pine, cabbage and saw palmettos, scattered cypress, myrtle, sand cordgrass, and pineland threeawn.

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.

Immokalee

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

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.

Myakka

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

Orsino

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

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.

Pit

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

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.

Pomello

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

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.

Scoggin

The Scoggin series consists of very poorly drained soils formed in loamy and sandy marine sediments on the low Coastal Plain in central Peninsular Florida. They occur in swamps and low areas bordering swamps. They are covered with standing water for as much as 6 months in most years beginning in the summer rainy season. Most areas are in a sparse forest of slash pine and swamp hardwoods with a ground cover of maidencane, pineland threeawn, gallberry, and clumps of saw palmetto.

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.

Tavares

The Tavares series consists of very deep, moderately well drained, rapidly or very rapidly permeable soils on lower slopes of hills and knolls of the lower Coastal Plain. They formed in sandy marine or eolian deposits. In most places the natural vegetation consists of slash pine, longleaf pine, a few scattered blackjack oak, turkey oak, and post oak with an undercover of pineland threeawn. In some places natural vegetation consists of turkey oak, blackjack oak, and post oak with scattered slash pine and longleaf pine.

Tequesta

The Tequesta series consists of very deep, very poorly drained, moderately slowly permeable soils in depressional areas, fresh water swamps and marshes, and broad low flats adjacent to organic soils. They formed in stratified marine sandy and loamy sediments on the Lower Coastal Plain. The natural vegetation consists of needle grass, pickerelweed, maidencane, ferns, wax myrtle, and scattered cypress.

Terra Ceia

The Terra Ceia series consists of very deep, very poorly drained organic soils that formed from nonwoody fibrous hydrophytic plant remains. They occur mostly in nearly level fresh water marshes and occasionally on river flood plains and in tidal swamps or flats. Natural vegetation includes saw grass, lilies, sedges, reeds, maidencane, and other aquatic plants. Wooded areas include cypress, black gum, cabbage palm, ash, loblolly bay, red maple, sweet bay, and pond pine. American and white mangrove trees occur in tidal areas. Large undeveloped areas are used for water storage and as wildlife habitat.

Tomoka

The Tomoka series consists of deep, very poorly drained, moderately permeable soils that formed in decomposed dark reddish brown and black organic material about 27 inches thick over sand and loamy mineral material. Native vegetation is saw grass, lilies, reeds, sedges, myrtle and other aquatic plants. Cypress, red and white bay, maple and pond pine are common tree species.

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. Johnswort, 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.

Wauchula

The Wauchula series consists of very deep, very poorly or poorly drained, moderately slow or slowly permeable soils on flatwoods on the lower coastal plains. They formed in sandy and loamy marine sediments. The natural vegetation consists of longleaf pine, slash pine, saw palmetto, with an understory of inkberry, fetter, southern bayberry, and pineland threeawn. The Winder series consists of very deep, poorly drained, slowly to very slowly permeable soils on broad, low flats and depressional areas. Natural vegetation consists of cordgrass, maidencane, cabbage palmetto, saw palmetto, and pineland threeawn.



Figure 1: Soil types at Heart Island Conservation Area.

ADDENDUM 2: HEART ISLAND CONSERVATION AREA FIRE MANAGEMENT PLAN

PREPARED BY

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

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 Heart Island Conservation Area (Heart Island).

Introduction and Objectives

Heart Island covers approximately 13,645 acres in Volusia and Flagler counties along a portion of Deep and Little Haw Creeks. This conservation area includes four parcels and is located in numerous sections of Townships 14 and 15 South and Ranges 29 and 30 East.

The property is located along the east of U.S. Highway (US) 17 near the town of Barberville and approximately 10 miles west of the city of Ormond Beach. A small portion of the conservation area is located east of State Road (SR) 11; however, most of the acreage lies to the west. SR 40 bisects portions of the conservation area.

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.
- Continuation 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 Heart Island.

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 Heart Island 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
Sandhill (Pine Plantation*)	1-3 years
Depression Marsh	This community burns in conjunction with adjacent pyric natural communities
Wet Prairie	2-3 years
Basin Swamp (edges)	This is not a fire-adapted community
Dome Swamp (edges)	3-5 years along the outer edges (or as adjacent communities burn); 100-150 years interior
Floodplain Swamp	This is not a fire-adapted community
Blackwater Stream	This is not a fire-adapted community
Swamp Lake	This is not a fire-adapted community
Sandhill Upland Lake (edges)	This is not a fire-adapted community; however, edges may burn in conjunction with ecotones and adjacent communities
Scrubby Flatwoods (Pine Plantation*)	5-15 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.

Scrubby, Mesic, and wet flatwoods and sandhill are the most prevalent fire adapted natural community types found within Heart Island. Theses plant communities within all parcels except the Strawn were utilized in commercial silviculture operations. As a result, much of the historic scrubby, 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. Shrub and groundcover components elsewhere on the conservation area include a more diverse and abundant coverage of herbaceous and shrub components including wiregrass and saw palmetto and will contribute to the spread of fire.

The sandhill communities on the Strawn parcel are degraded with few areas exhibiting site appropriate and diverse groundcover. The primary carry of fire in these areas will be leaf litter and remnant wiregrass. These areas will likely require mechanical and chemical treatments to facilitate the implementation of prescribed fire.

Fire management within the remaining pyric plant communities (below) will be in conjunction with the associated flatwoods and sandhill communities. 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.

Depression 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. Depression marshes are embedded within in the uplands across the conservation area. In general, depression marsh fires are carried through the herbaceous layer. Many of these marshy areas have been disturbed by past land use and are small, but all still occupy an important niche in providing habitat for numerous species of wildlife. Fire will be applied to these marshes any time surrounding natural communities are burned.

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. Historic coverages of wet prairies were located in along floodplain and basin swamps. Silvicultural activities have altered these areas. It is anticipated that these areas will reemerge in conjunction with the reestablishment of longleaf pine in areas historically planted with slash pine. Fire will be applied to these areas anytime surrounding areas 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 sandhill upland lake located on the Strawn parcel is not a fire dependent community, however fire will be allowed to penetrate the shoreline; maintaining the herbaceous structure.

The basin swamp is not a primary target for fire management at Heart Island; however, this natural community grades into wet flatwoods, wet prairie, 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.

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. While fuel loads are not exceptionally high in most areas of the conservation area, heavy duff and needle litter has accumulated in some areas. These fuel conditions may require that some of the initial applications of fire be in the form of dormant season burning. This will allow for the reduction of fuel loads while providing for the protection of desirable vegetation. The ultimate goal of this strategy will be to move the prescribed fire application into a growing season rotation. District staff anticipate the gradual increase of growing season burns.

While thousands of acres have been treated with prescribed burns, or been impacted by wildfires, the effects of long-term fire exclusion prior to the District purchase of Heart Island have not been entirely overcome. These effects include increased fuel loads, increased dominance of shrubby plants, decreased abundance of herbaceous plants, and shift in species. The District has worked towards restoration of the natural distribution and abundance of plant and animal species through the use of prescribed fire and mechanical manipulations. It may take several iterations of fire and likely the addition of mechanical and chemical treatments to reduce shrub heights across much of the conservation area.

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 Heart Island 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 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). Since the writing of the last plan in 2009, prescribed burns totaling 6,830 acres have occurred. Several fire management units within the property have been burned multiple times since 2009.

While Heart Island 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 Heart Island. As development increases in the area, fire management will become more difficult. Increasing daily traffic on CR 11, SR 40, US 17 and other local roads will further impair the District's ability to implement prescribed burns at the appropriate fire return intervals within the conservation area.

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.



Figure 1: Fire management – smoke sensitive areas.

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.

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 Heart Island 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 *Florida Statute* 590.026 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. District staff are in the process of updating the FMUs for Heart Island. Many of the FMUs were delineated using forest stand data, and as a result, 79% of the FMUs are less than 50 acres in size, and 26% are less than 10 acres in size. Within the scope of this plan, District staff will combine several of the smaller FMUs to avoid redundancy.

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 Heart Island 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 (PPE)** 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 1	Latitude Longitude	29° 11' 46.86'' 81° 23' 25.33''	N W	Wells Rd Parking Area
Helispot 2	Latitude Longitude	29° 14' 45.76'' 81° 22' 11.94''	N W	Underhill Nursery

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 Volusia County Fire Rescue (386) 252-4900.
- **3.** Notify Volusia Sheriff's Office (386) 736-5961
- **4.** Assume responsibility of the Rescue Operation.
- 5. Notify National Transportation Safety Board (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 UN	IT LOCATIONS	
	1. Orlando Regional Medical Center – Burn Unit	407-237-6398
	2. UF Shands Hospital, Gainesville	352-265-0111
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

MEDICAL PLAN	1. Inc	ident Nai	ne	2. Date Prepared	3.	Time	Prepared	4. (F	Operati Period	onal
			5. Incic	lent Medical Aid	Statio	n				
Medical Aid Stations Location					Paramedics Yes No		10			
Volusia County	Fire, Sta	tion 18	n 18 500 Rodeo Rd, Ormond Beach, Fl				each, Fl	Х		
Volusia County	Fire Stati	ion 41	n 41 5007 Central Ave. DeLeon Springs, Fl				Х			
Volusia County	Fire Stati	ion 44		132 N Fountain	Drive	Pier	son Fl	Х		
			6	6. Transportation						
			A. <i>A</i>	Ambulance Servio	ces	1				
Name		Addres	S			Pho	ne	Para Yes	medics N	10
Volusia County Station 18	Fire,	500 Ro	deo Rd, Ormono	d Beach, Fl		911		х		
Volusia County Station 41	Fire	5007 C	entral Ave. DeL	eon Springs, Fl		911		х		
			B. I	ncident Ambulan	ces					
Name	Location Param Yes					amedics es No				
				7. Hospitals	r					
Name	Address	8	Travel Time Air	Ground	Pho	one	Helipad Yes No		Burn Yes	Center No
Florida Hospital Deland	701 W. Plymou DeLanc 32720	th Ave. l, FL	15 minutes	35 minutes	386 943 452	5- 3- 22	x			x
Florida Hospital Memorial Medical Center	301 Me Medical Parkwa Daytona Beach, 32117	morial y a FL	10 minutes	15 minutes	386 676 600	- - 0	x			x
Orlando Regional Medical Center	52 W Underw St., Orla FL 3280	vood ando, 06	30 minutes	1 hour	321 841 511	- - 1	Х		Х	

UF Shands Hospital	1600 Sw Archer Rd Gainesville, Fl 32608	45 Minutes	2 hours	352- 265- 0111	x		Х	
Halifax Medical Center	303 N. Clyde Morris Blvd. Daytona Beach, FL 32114	15	30	386- 254- 4000	Х			х
		8. Medic	al Emergency Pro	ocedures	•			
INCIDENT CO 1. 2. 3. SECOND IN C	OMMANDER or Notify Volusia Assume respon Delegate respon	BURN BOSS County Fire Re sibility of the Ir nsibility of fire of	scue (386-252-49 ncident within an control to the seco	00) or 911 Incident. ond in com	mand or the mos	t qualif	ïed.	
4.	Assume respon	sibility of the b	urn.					
5.	Assist the IC or	Burn Boss with	h resource and pe	rsonnel ne	eds for the emerg	ency.		
6.	Notify Supervis	sor and or Distri	ict Safety Officer					
EMERGENCY LANDING ZONES –								
	Helispot 1	Latitude 2 Longitude 8	29° 11' 46.86'' N 81° 23' 25.33'' W	Well	ls Rd Parking A	rea		
Helispot 2 Latitude 29° 14' 45.76'' N Longitude 81° 22' 11.94'' W								
Emergency Phone Numbers								
AIR RESCUE	UNITS							
7. Orlando Regional Medical Center Air Services 407-843-5783 or 800-895-4615								
BURN UNIT LOCATIONS407-237-63981. Orlando Regional Medical Center – Burn Unit407-237-63982. UF Shands Hospital, Gainesville352-265-0111								
DIVISION OF FORESTRY 1. Bunnell District Dispatch 386-585-6151								
District Safety	Officer David Sielaff			386-0	543-1941			
Prepared by (M Leader)	edical Unit							

ADDENDUM 3: HEART ISLAND CONSERVATION AREA SPECIES LIST

Plants

Genus species	Common Name (Conservation Status)
Acer rubrum	Southern red maple
Albizia julibrissin*	Silktree, mimosa
Ambrosia artemisiifolia	Common ragweed
Amorpha fruticosa	Bastard indigo, false indigo
Ampelopsis arborea	Pepper vine
Andropogon gerardii	Big bluestem
Andropogon glomeratus	Bushy bluestem
Andropogon virginicus var. glaucus	Chalky bluestem
Andropogon virginicus var. virginicus	Broomsedge bluestem
Aralia spinosa	Devil's-walkingstick
Aristida spiciformis	Bottlebrush threeawn
Aristida stricta var. beyrichiana	Wiregrass
Arnoglossum floridanum	Florida Indian plantain
Asclepias humistrata	Sandhill milkweed
Asemeia violacea	Showy milkwort
Asimina obovata	Flag pawpaw
Baccharis halimifolia	Groundsel tree/Sea myrtle
Bacopa caroliniana	Lemon Bacopa
Balduina angustifolia	Coastalplain honeycombhead
Befaria racemosa	Tar flower
Berlandiera subacaulis	Greeneyes
Bidens alba	Begger-ticks
Buchnera americana	Blueheart
Callicarpa americana	Beautyberry
Callisia ornata	Florida scrub roseling
Campanula floridana	Florida bellflower
Campsis radicans	Trumpet creeper
Carphephorus corymbosus	Deer tongue
Carpinus caroliniana	Ironwood
Ceanothus americanus	New Jersey tea, Redroot
Ceanothus microphyllus	Littleleaf buckrush
Cenchrus incertus	Coast sandspur
Centella asiatica	Coinwort
Centrosema virginianum	Spurred butterfly pea
Cephalanthus occidentalis	Buttonbush
Chamaecrista fasciculata	Partridge pea

Cinnamomum camphora* Cirsium horridulum Citrus sp. *Clitoria mariana* Cnidoscolus stimulosus Colocasia esculenta* *Commelina erecta Conyza canadensis* Coreopsis floridana *Coreopsis leavenworthii* Crotalaria rotundifolia Croton argyranthemus Cynodon dactylon* *Cyperus retrorsus* Dalia pinnata Desmodium triflorum* Dichanthelium sp. Diodia virginiana Dioscorea bulbifera* Diospyros virginiana *Dysphania ambrosioides* Elephantopus elatus Eleocharis vivipara Eragrostis spectabilis Eremochloa ophiuroides* Erigeron strigosus Erythrina herbacea Eubotrys racemosa *Eupatorium capillifolium* Euthamia caroliniana *Galactia elliottii* Garberia heterophylla** *Gelsemium sempervirens Gnaphalium obtusifolium Gordonia lasianthus* Habenaria floribunda *Hydrocotyle umbellata* Hypericum cistifolium Hypericum fasciculatum *Hypericum gentianoides* Hypoxis juncea

Camphor-tree Thistle Citrus Atlantic pigeonwings Tread softly Wild taro Whitemouth dayflower Canadian horseweed Florida tickseed Leavenworth's tickseed Rabbitbells Silver croton Bermudagrass Pinebarren flatsedge Summer farewell Sagotia beggarweed Witchgrass Buttonweed Air-potato, Devil's potato Persimmon Mexican tea Tall Elephantsfoot Sprouting spikerush Purple lovegrass Centipedegrass Daisy fleabane Coralbean Swamp Doghobble Dog fennel Flat-topped goldenrod Milk pea Garberia (ST) Yellow jessamine Sweet everlasting; Rabbit's tobacco Loblolly bay Mignonette orchid Manyflower marshpennywort Roundpod St. John's wort Peelbark St. John's wort Pineweeds Yellow star grass

Ilex cassine *Ilex glabra Ilex opaca* Imperata cylindrica* Ipomoea purpurea* Juncus effusus *Juncus marginatus* Juniperus virginiana *Lachnocaulon anceps* Lantana involucrata Lemna aequinoctialis *Lepidium virginicum* Liatris chapmannii *Liatris tenuifolia* Licania michauxii *Limnobium spongia* Liquidambar styraciflua Lobelia glandulosa Ludwigia peruviana Lygodesmia aphylla *Lygodium microphyllum** Lyonia ferruginea Lyonia lucida Magnolia grandiflora Magnolia virginiana Mikania scandens Morella cerifera Nyssa sylvatica var. biflora Nyssa sylvatica var. sylvatica Opuntia humifusa Orontium aquaticum Osmunda cinnamomea Osmunda regalis var. spectabilis Oxalis corniculata Panicum hemitomon Parthenocissus quinquefolia *Paspalum notatum** Passiflora incarnata Peltandra virginica Persea borbonia Persicaria glabra

Dahoon holly Inkberry, Gallberry American holly Cogongrass Common morning-glory Soft rush Shore rush Southern red cedar **Bog-buttons** Buttonsage/not in county Duckweed Poorman's pepper Chapman's gayfeather Blazing star Gopher apple Frog's bit Sweetgum Glades lobelia Primerose willow Rose-rush Old world climbing fern Rusty lyonia Fetterbush Southern magnolia Sweet bay Climbing hempvine Wax myrtle Swamp tupelo Blackgum Prickly-pear cactus Golden club Cinnamon fern Roval Fern Yellow wood sorrel Maidencane Virginia creeper Bahiagrass Maypop;Passion flower Green arum Redbay Denseflower Knotweed

Phyla nodiflora	Frogfruit
Phytolacca americana	Pokeberry; Pokeweed
Pinus clausa	Sand pine
Pinus elliottii	Slash pine
Pinus palustris	Longleaf pine
Pinus serotina	Pond pine
Pinus taeda	Loblolly pine
Pityopsis graminifolia	Narrowleaf silkgrass
Pleopeltis michauxiana	Resurrection fern
Pluchea baccharis	Rosy camphorweed
Pluchea odorata	Sweetscent
Podranea ricasoliana	Pink trumpet-vine
Polygala nana	Candyroot
Polygala rugelli	Yellow milkwort
Polygonum polygamum	October flower
Pontederia cordata	Pickerelweed
Prunus caroliniana	Carolina laurel cherry
Pteridium aquilinum var. pseudocaudat	<i>ur</i> Bracken fern
Pterocaulon pycnostachyum	Blackroot
Quercus geminata	Sand live oak
Quercus incana	Bluejack oak
Quercus inopina	Scrub oak
Quercus laevis	Turkey oak
Quercus laurifolia	Laurel oak
Quercus nigra	Water oak
Quercus pumila	Running oak
Quercus virginiana	Live oak
Rhus copallinum	Winged sumac
Rhynchosia cinera	Brownhair snoutbean
Rhynchospora colorata	Starrush whitetop
Rubus sp.	Blackberry
Rudbeckia hirta	Black-eyed susan
Ruellia caroliniensis	Wild-petunia
Ruellia cilosa	Ciliate wild petunia
Sabal palmetto	Cabbage palm
Sabatia brevifolia	Shortleaf rosegentian
Sagittaria latifolia	Common arrowhead
Salix caroliniana	Carolina willow
Sambucus canadensis	Elderberry
Sarracenia minor**	Hooded pitcher-plant (ST)
Saururus cernuus	Lizard's-tail

Schoenocaulon dubium Serenoa repens Sesbania vesicaria Setaria parviflora Sium suave Smilax bona-nox Smilax auriculata Smilax laurifolia Solidago fistulosa Solidago odora Sonchus oleraceus* Sophronanthe hispida Spartina bakeri Sphagneticola trilobata Stillangia sylvatica Stylosanthes biflora Symphyotrichum dumosum Taxodium distichum Tephrosia rugelii Tillandsia recurvata Tillandsia usneoides Tillandsia utriculata** *Toxicodendron radicans* Triadica sebifera *Typha latifolia* Ulmus americana Urena lobata Vaccinium arboreum Vaccinium corymbosum Vaccinium myrsinites Vitis rotundifolia Woodwardia virginica *Xyris fimbriata* Yucca aloifolia Yucca filamentosa Zanthoxylum clava-herculis Zornia bracteata

Florida feathershank Saw palmetto Bladderpod Knotroot foxtail Water parsnip Greenbrier; Catbrier Earleaf greenbrier Laurel greenbrier Hollow goldenrod Goldenrod Common sow thistle Rough hedgehyssop Sand cordgrass Creeping oxeye Queensdelight Sidebeak pencilflower Rice button aster Bald cypress Rugel's hoarypea Ballmoss Spanish moss Giant airplant (SE) Poison ivy Chinese tallow tree Common cattail American elm Caesar-weed Sparkleberry Highbush blueberry Shiny blueberry Muscadine grape Virginia chain fern Yellow-eyed grass Spanish dagger Adam's needle Hercules-club Viperina

Birds	
Specific Name	Common Name (Conservation Status)
Blackbirds	Common Fund (Comper fution Status)
Molothrus ater	Brown-headed Cowbird
<i>Ouiscalus auiscula</i>	Common Grackle
Sturnella magna	Eastern Meadowlark
Agelaius phoeniceus	Red-winged Blackbird
Condinala Crashasha and Allia	
Cuingag agamulag	Blue Cresheelt
Guiraca caerulea	Indian Dupting
Passerina cyanea	lifuigo building
Carainalis	Northern Cardinal
Piranga rubra	Summer Tanager
Catbirds, Mockingbirds, and Th	rashers
Toxostoma rufum	Brown Thrasher
Dumetella carolinensis	Gray Catbird
Mimus polyglottos	Northern Mockingbird
Cormorants and Anhingas	
Anhinga	Anhinga
Cropos	
Grus canadensis**	Sandhill Crane (G5T2, S2, ST, FN)
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Cuckoos	
Coccyzus americanus	Yellow-billed Cuckoo
Gnatcatchers	
Polioptila caerulea	Blue-gray Gnatcatcher
Grouse, Ouail, and Allies	
Colinus virginianus	Northern Bobwhite
Meleagris gallopavo	Wild Turkey
Herong This and Allies	
Rubuleus ibis	Cattle Egret
Andea Henedias	Creat Plus Haran
Ardea Herodias	
Butoriaes virescens	
Egretta caerulea**	Little Blue Heron (G5, S4, S1, FN)
Egretta thula	Snowy Egret (G5, S3, SN, FN)
Eudocimus albus**	White Ibis (G5, S4, SN, FN)
Jays, Magpies, Crows, and Rave	ens
Corvus brachyrhynchos	American Crow

Blue Jay

Cyanocitta cristata

Kinglets	
Regulus calendula	Ruby-crowned Kinglet
Kingfishers	
Ceryle alcyon	Belted Kingfisher
New World Sparrows	
Spizella passerina	Chipping Sparrow
Pipilo erythrophthaln	nus Eastern Towhee
Nightjars	
Caprimulgus caroline	ensis Chuck-will's-widow
Nuthatches	
Sitta pusilla	Brown-headed Nuthatch
Owls	
Strix varia	Barred Owl
Megascops asio	Eastern Screech-Owl
Bubo virginianus	Great Horned Owl
Pigeons and Doves	
Columbina passerina	Common Ground-Dove
Zenaida macroura	Mourning Dove
Shrikes	
Lanius ludovicianus	Loggerhead Shrike
Thrushes	
Turdus migratorius	American Robin
Sialia sialis	Eastern Bluebird
Tits, Chickadees, and Titmi	ce
Poecile carolinensis	Carolina Chickadee
Baeolophus bicolor	Tufted Titmouse
Mniotilta varia	Black-and-white Warbler
Parula americana	Northern Parula
Dendroica palmarum	Palm Warbler
Dendroica pinus	Pine Warbler
Dendroica discolor	Prairie Warbler
Dendroica coronata	Yellow-rumped Warbler
Tyrant Flycatchers: Pewees,	Kingbirds, and Allies
Tyrannus tyrannus	Eastern Kingbird
Sayornis phoebe	Eastern Phoebe
Myiarchus crinitus	Great Crested Flycatcher

Vireos	
Vireo olivaceus	Red-eyed Vireo
Vireo griseus	White-eyed Vireo
Vultures, Hawks, and Allies	
Haliaeetus	Bald Eagle (G5, S3, SN, FN)
leucocephalus**	
Buteo lineatus	Red-shouldered Hawk
Buteo jamaicensis	Red-tailed Hawk
Elanoides forficatus**	Swallow-tailed Kite (G5, S2, SN, FN)
Coragyps atratus	Black Vulture
Cathartes aura	Turkey Vulture
Waterfowl	
Aix sponsa	Wood Duck
Woodpeckers	
Picoides pubescens	Downy Woodpecker
Dryocopus pileatus	Pileated Woodpecker
Melanerpes carolinus	Red-bellied Woodpecker
Melanerpes erythrocephalus	Red-headed Woodpecker
Wrens	
Thryothorus ludovicianus	Carolina Wren

# Mammals

Mammals	
Specific Name	Common Name (Conservation Status)
Canis iatrans	Coyote
Dasypus novemcinctus	Nine-Banded Armadillo
Didelphis virginana	Opossum
Lynx rufus	Bobcat
Mephitis mephitis	Striped skunk
Odocoileus virginianus	White-Tail Deer
Procyon lotor	Racoon
Sciurus carolinensis	Eastern Grey Squirrel
Sus scrofa	Feral hog
Urocyon cinereoargenteus	Gray fox
Ursus americanus floridanus	Florida black bear (G5T4, S4, SN, FN)

# Amphibians Specific Name

Acris gryllus dorsalis Anaxyrus quercicus Anaxyrus terrestris Hyla cinerea

# Common Name (Conservation Status)

Florida cricket frog Oak toad Southern toad Green treefrog

Hyla femoralis
Hyla squirella
Pseudacris crucifer
Lithobates sphenocephala
Scaphiopus holbooki

Pinewoods Treefrog Squirrel Treefrog Southern spring peeper Southern leopard frog Eastern spadefoot

# Reptiles Specific Name

# Common Name (Conservation Status)

Agkistrodon piscivorus conanti	Florida cottonmouth	
Alligator mississippiensis**	American alligator (G5, S4, FT(S/A), SAT)	
Anolis carolinensis carolinensis	Green anole	
Anolis sagrei*	Brown anole	
Apalone ferox	Florida softshell	
Aspidoscelis sexlineata	Six-lined racerunner	
Coluber constrictor priapus	Southern black racer	
Crotalus adamanteus	Eastern diamondback rattlesnake	
Gopherus Polyphemus**	Gopher tortoise (G3, S3, C, ST)	
Kinosternon baurii	Striped mud turtle	
Sceloporus undulatus undulatus	Southern fence lizard	
Scincella lateralis	Ground skink	
Sistrurus miliarius barbouri	Dusky pygmy rattlesnake	
Terrapene Carolina bauri	Florida box turtle	
Thamnophis sauritus sackeni	Peninsula ribbon snake	

# Fish

Specific Name	Common Name
Elassoma evergladei	Everglades pygmy sunfish
Fundulus chrysotus	Golden topminnow
Gambusia holbrooki	Mosquito fish
Heterandria formosa	Least killifish
Hoplosternum littorale	Brown hoplo

# Invertebrates

Order	Specific Name	Common Name
Aranea	Peucetia viridans	Green Lynx Spider
Coleoptera	Phanaeus Sp	Dung beetle
Heteroptera	Lethocerus Sp	Giant Water Bug
Lepidoptera	Agraulis vanillae	Gulf Fritillary
Lepidoptera	Battus philenor	Pipevine Swallowtail
Lepidoptera	Battus polydamas lucayus	Polydamas Swallowtail
Lepidoptera	Danaus gilippus	Zebra Swallowtail
Heliconius charithonia	Zebra Longwing	
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Papilio cresphontes	Giant Swallowtail	
Papilio troilus	Spicebush Swallowtail	
Thorybes sp.	Skippers	
Anax junius	Common Green Darner	
Anax longipes	Comet Darner	
Enallagma sp.	Damselflies	
Epiaeschna heros	Swamp Darner	
Erythemis simplicicollis	Eastern Pondhawk	
Erythrodiplax minscula	Little Blue Dragonlet	
Gomphus sp.	Clubtail Dragonfly	
Libellula airipennis	Golden-winged Skimmer	
	Heliconius charithonia Papilio cresphontes Papilio troilus Thorybes sp. Anax junius Anax longipes Enallagma sp. Epiaeschna heros Erythemis simplicicollis Erythrodiplax minscula Gomphus sp. Libellula airipennis	

*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.

## STATE LEGAL STATUS

**FT**(**S**/**A**)Threatened due to similarity of appearance

- **LE** Endangered: species, subspecies, or isolated population so few or depleted in number or so restricted in range that it is in imminent danger of extinction.
- **LT** Threatened: species, subspecies, or isolated population facing a very high risk of extinction in the future.
- **LS** Species of Special Concern is a species, subspecies, or isolated population which is facing a moderate risk of extinction in the future.
- **PE** Proposed for listing as Endangered.
- **PT** Proposed for listing as Threatened.
- **PS** Proposed for listing as Species of Special Concern.
- **SN** Not currently listed, nor currently being considered for listing.

## FEDERAL LEGAL STATUS

- LE Endangered: species in danger of extinction throughout all or a significant portion of its range.
- **LT** Threatened: species likely to become Endangered within the foreseeable future throughout all or a significant portion of its range.
- LT,PDLSpecies currently listed threatened but has been proposed for delisting.
- LT,PE Species currently listed Threatened but has been proposed for listing as Endangered.
- **SAT** Treated as threatened due to similarity of appearance to a species which is federally listed such that enforcement personnel have difficulty in attempting to differentiate between the listed and unlisted species.
- **PE** Proposed for listing as Endangered species.
- **PT** Proposed for listing as Threatened species.
- C Candidate species for which federal listing agencies have sufficient information on biological vulnerability and threats to support proposing to list the species as Endangered or Threatened.
- **XN** Non-essential experimental population.
- **SC** Not currently listed but considered a "species of concern" to USFWS.
- **FN** Not currently listed, nor currently being considered for listing as Endangered or Threatened.