# LONGLEAF FLATWOODS RESERVE LAND MANAGEMENT PLAN

# Alachua County, Florida



ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

JUNE 2018



# **EXECUTIVE SUMMARY**

## MANAGEMENT AREA SIZE: 2,856 acres

**DATE OF ACQUISITION:** Acquisition of parcels within Longleaf Flatwoods Reserve began in August 2003.

DATE OF PLAN: June 2018 MAJOR BASIN: Ocklawaha River PLANNING BASIN: Orange Creek

**LOCATION**: Longleaf Flatwoods Reserve (Reserve) is in eastern Alachua County and is almost entirely surrounded by the St. Johns River Water Management District's (District) Lochloosa Conservation Easement.

**FUNDING SOURCE:** Alachua County Forever, Florida Department of Transportation (FDOT) mitigation, and Florida Forever funding were utilized in the acquisition of the parcels within the property.

**MANAGEMENT PARTNERS:** There is a cooperative management agreement between the District and Alachua County that designates the District as lead manager with responsibility for natural and cultural resources and daily operational management activities within the Reserve. Alachua County will assist the District's management needs as necessary. Alachua County has reviewed and approved this management plan.

**VISION STATEMENT:** The management focus for the Reserve is the continued protection of the water resources of the River Styx, Orange Creek Basin, and the Ocklawaha River watershed. This includes protection of approximately 1.5 miles of the River Styx, and more than 784 acres of diverse wetlands such as basin swamp, dome swamp, floodplain swamp, depression marsh, and basin marsh. Management activities within the uplands of the Reserve 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. The Reserve protects approximately 1.5 miles of the River Styx, and more than 784 acres of diverse wetlands such as basin swamp, dome swamp, floodplain swamp, depression marsh, and basin marsh.
- **FOREST MANAGEMENT AND RESTORATION** Prior to public acquisition, most the upland acres within the property were managed for silviculture. Planned forest management activities include pine harvest, prescribed fire, oak and other hardwood harvest, and pine planting.

Additional techniques include mechanical vegetation management, selective herbicide treatment, and to achieve restoration goals.

- **FIRE MANAGEMENT** Implementation of prescribed burns occurs in accordance with annual burn plans and individual unit prescriptions.
- **FLORA AND FAUNA** The Reserve provides habitat for numerous native plant and animal species. Invasive exotic pest plant and animal species occur on the property. The District regularly monitors for the presence of invasive plants and animals and executes appropriate control action.
- **CULTURAL AND HISTORICAL RESOURCES** A review of the Department of State, Division of Historical Resources does not indicate the presence of any registered cultural sites within the boundaries of the conservation area. If any sites are located, District staff will document and report the sites to the Division of Historical Resources.

# LAND USE MANAGEMENT:

- ACCESS The entire conservation area is open to the public with recreational opportunities for hiking, biking, camping, equestrian activities, wildlife viewing, and photography. A public access point is located off County Road 325.
- **RECREATION** Recreational opportunities at the Reserve include hiking, biking, camping, equestrian activities, wildlife viewing, and photography. The Reserve has more than 6 miles of blazed trails.
- SECURITY Maintenance of fence lines, parking areas, gates, and locks is conducted as necessary. The District will continue to maintain contact with local law enforcement and a private security firm for any potential security needs. The District will continue to evaluate the need for a security residence on the Reserve.

# **ADMINISTRATION:**

- **REAL ESTATE ADMINISTRATION** The District may consider purchasing parcels near the Reserve that become available and that will aid in the conservation of water resources within River Styx and associated basins. The District may pursue acquisition of small parcels or property exchanges with neighbors to improve and provide additional access to the conservation area.
- COOPERATIVE AND SPECIAL USE AGREEMENTS, LEASES, AND EASEMENTS A cooperative management agreement exists between the District and Alachua County. The District administers numerous leases, agreements, easements, special use authorizations (SUAs) and concessions.
- MANAGEMENT COSTS AND REVENUES Management costs at the Reserve were \$436,636 from 2009–2017 and are projected at \$660,281 from 2018–2028. Revenues from forest management at the Reserve were \$401,606 from 2009–2017 and are projected at \$542,135 from 2018–2028.

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# VISION STATEMENT

The management focus for the Longleaf Flatwoods Reserve is the continued protection of the water resources of the River Styx, Orange Creek Basin, and the Ocklawaha River watershed. This includes protection of approximately 1.5 miles of the River Styx, and more than 784 acres of diverse wetlands such as basin swamp, dome swamp, floodplain swamp, depression marsh, and basin marsh. Management activities within the uplands of the Longleaf Flatwoods Reserve 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 the Longleaf Flatwoods Reserve (Reserve) over the next 10 years. This land management plan was developed in accordance with Section 373.1391, and Section 373.591, Florida Statues. This is a revision of the February 2009 land management plan.

The St. Johns River Water Management District (District) owns or manages nearly 700,000 acres of land, acquired for the purposes of water management, water supply, and the conservation and protection of water resources.

#### LOCATION

The Reserve covers approximately 2,856 acres in Alachua County within the Orange Creek Basin, a sub-basin of the Ocklawaha River Basin and along River Styx. The Reserve includes three contiguous parcels and is in numerous sections of Township 11 north and Range 21 east. The property is located off County Road (CR) 325, approximately 6 miles southeast of the city of Gainesville (Figure 1). U.S. Highway 441 is 5 miles to the west and U.S. Highway 301 is 5 miles to the east of the property. Additionally, the property is approximately half a mile north of CR 346, 1.5 miles east of CR 234 and 1.5 miles south of CR 20A. Figure 2 provides aerial imagery from 2015 of the Reserve.



Figure 1: General location.



Figure 2: Aerial imagery.

#### **REGIONAL SIGNIFICANCE**

The Reserve provides linkage within the Lochloosa Wildlife – Florida Forever Project and Alachua County's Lochloosa Forest Levy Prairie Connector Project. The Reserve is an integral component of a larger network of publicly owned lands in eastern Alachua County (Table 1; Figure 3). These publicly owned and managed lands provide for the protection of water quality and storage, native floral and faunal species, and numerous natural resource-based recreational opportunities.

Lead Manager	Conservation Area
Alachua Conservation Trust/ City of Hawthorne	Little Orange Creek Nature Park
Alachua County	Balu Forest
District	Lochloosa Wildlife Conservation Area
District	Newnans Lake Conservation Area
District	Orange Creek Restoration Area
Florida Department of Environmental Protection	Paynes Prairie Preserve State Park
(DEP)	
DEP	San Felasco Hammock Preserve State Park
Florida Fish and Wildlife Conservation Commission	Santa Fe Swamp Conservation Area
(FWC)	
Florida Forest Service	Etoniah State Forest
Florida Forest Service	Belmore State Forest
University of Florida	Ordway-Swisher Biological Station
University of Florida	Austin Cary Memorial Forest
United States Department of Agriculture (USDA)	Ocala National Forest
Forest Service	

Table 1: Proximate conservation areas.



Figure 3: Regional significance.

#### **ACQUISITION HISTORY**

The Reserve was cooperatively purchased by the District and Alachua County. As part of a cooperative management agreement, the District serves as lead managing agency for the property. The acquisition of the Reserve is consistent with the goals of the Orange Creek and Ocklawaha River Basin Projects set forth in the District's Land Acquisition and Management Five-Year Plan, the District's Water Management Plan, and the mitigation goals for the Florida Department of Transportation. These goals are to:

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

The purchase of the Reserve also fulfills the goals of the Alachua County Forever Project: to acquire, improve, and manage environmentally significant lands to protect water resources, wildlife habitats and natural areas suitable for resource-based recreation (Alachua County 2007). Additionally, the Reserve is a significant acquisition within the Florida Forever Program's Lochloosa Wildlife Project (Florida State Department of Environmental Protection 2016).

The Reserve is comprised of three contiguous parcels totaling 2,856 acres (Figure 4). The following properties were jointly purchased by the District and Alachua County using funding sources as indicated and were incorporated into the Reserve as they were acquired.

#### Lybass (1,388 acres) Land Acquisition number 2003-24

The original Lybass property totals 1,388 acres and is comprised of two parcels acquired cooperatively by the District and Alachua County through a single purchase on August 28, 2003, a portion of which was exchanged for then Plum Creek property (see below). The total purchase price was \$2,191,500. The county contributed \$1,468,305 with funds from the Alachua County Forever Program and owns a 67% undivided interest in the parcel. The District contributed \$723,195 and owns a 33% undivided interest in the parcel. District funding was provided by the Florida Department of Transportation (FDOT) to assist in meeting mitigation requirements associated with the widening of State Road (SR) 20.

#### River Styx (1,428 acres) Land Acquisition number 2007-027

The River Styx property totals 1,428 acres acquired cooperatively by the District and Alachua County on February 12, 2008. The total purchase was \$4,855,506. Alachua County contributed \$2,427,803 with funds from the Alachua County Forever Program and owns a 50% undivided interest in the parcel. The District contributed \$2,427,803 (\$1,151,000 FDOT Mitigation Plan funds and \$1,276,703 (Florida Forever funds) and owns a 50% undivided interest in the property.

Exchange Parcel from Plum Creek (40 acres) Land Acquisition numbers 2003-024 and 1994-045P2

This land exchange between the District/ Alachua County and Plum Creek closed on August 12, 2008, and was an acre-for-acre exchange. This exchange included 40 acres of the Plum Creek owned Plum Creek Conservation Easement (LA 1994-045) for a 40-acre

parcel of the District/ Alachua County owned Longleaf Flatwoods Reserve – Lybass parcel (LA 2003-024)<sup>1</sup>. The District/ Alachua County received fee title valued as unencumbered by the conservation easement, while Plum Creek received fee title encumbered by the conservation easement, same as held by the parties prior to the exchange. This land exchange provides management and recreation access between the Lybass and River Styx parcels.

#### LOCAL GOVERNMENT LAND USE DESIGNATION

According the Alachua County Comprehensive Plan: 2011–2030, the Future Land use designation for the Lybass portion of the Reserve is Preservation (Alachua County 2011). This land use is designed to recognize and protect natural resources within publicly owned lands in Alachua County. Preservation areas include property acquired in fee or less than fee simple for preservation by federal, state, and local agencies, water management districts, local municipalities, or Alachua County for use as natural reserves or managed conservation lands for the preservation of natural resources in perpetuity. Alachua County anticipates a comprehensive plan amendment to reclassify the River Styx parcel from Rural / Agriculture to Preservation.

Both the Lybass and River Styx parcels of the Reserve are designated as Strategic Ecosystems within the comprehensive plan. The purpose of this designation is to protect, conserve, enhance, and manage the ecological integrity of strategic ecosystems within Alachua County.

<sup>&</sup>lt;sup>1</sup> Plum Creek Timberlands, L.P. was acquired by Weyerhaeuser in 2016. This parcel and the surrounding conservation easements were conveyed to Weyerhaeuser following acquisition.



Figure 4: Acquisition.

## NATURAL RESOURCES

#### WATER RESOURCES

The Reserve is within the Orange Creek Basin of the Ocklawaha River watershed. The Orange Creek Basin is over 425 square miles. Orange Creek Basin's surface water flows south into Orange Creek and into sinkholes in Paynes Prairie and Orange Lake. Within the basin are three large lakes, Newnans Lake, Lochloosa Lake and Orange Lake, which cover 25,461 acres.

The surface water flow of the Reserve's watershed was altered in the 1920s. Originally, water would flow from Newnans Lake through Prairie Creek to Paynes Prairie. Camps Canal was created to divert water from Prairie Creek and drain Paynes Prairie, which at the time was a cattle ranch owned by the Camp family. The creation of Camps Canal rerouted water to the wetlands immediately west of the Reserve where the River Styx begins. Thus, Camps Canal currently conveys water from Newnans Lake to Orange Lake.

The River Styx flows south and east across the southern reaches of the Reserve and into Orange Lake, Orange Creek, the Ocklawaha River, which connects to the St. Johns River (Figure 5). The most significant surface hydrological feature of the Reserve is River Styx. The River Styx is designated by the Florida Department of Environmental Protection (DEP) on the "Special Waters" list of the "Outstanding Florida Waters" (Fla. Stat.§62-302.700. 2006). This policy affords the highest water quality protection by the DEP.

In addition, the basin swamp in the southwest corner of the Lybass parcel receives drainage from another large basin swamp, known locally as Mosquito Bay, located east of the property. The two basin swamps are connected naturally; however, portions of the natural drainage areas have been dredged to facilitate flow through a culvert under CR 325. The basin swamp drains southwest into the River Styx roughly 2 miles from the southwest corner of the Lybass parcel.



Figure 5: Location within Orange Creek Basin.

#### GEOMORPHOLOGY

The Reserve lies within the Newnans Lake Basin Subdivision of the Northern Peninsual Slopes of the Ocala Uplift District (Brooks 1981). This area lies in a broad, sloping basin comprised of clayey sands. The northwestern portion of the Lybass parcel has the most relief where sandhill slopes descend into marsh. Elevations in this area drop 30 feet over a short distance. The remainder of the Reserve has slopes that are more gradual. The Reserve lies within the eastern portion of the USGS 1:100,000 scale quadrangle which was mapped and published as Open File Map Series 94-02 (Green and others, 2005). The geomorphology of a site can have a major impact on surface water hydrology as the various landforms can control drainage direction and distribution.

The elevation of the property ranges between a low of 54 feet in the west and a high of 104 feet NAVD88 in the northeast section. The elevation of the Reserve ranges from 54 to 104 feet above sea level (Figure 6). Streams and the artificial path (i.e. modeled flow path) where they would flow assuming sufficient water was available are also shown in Figure 6. Surface water drainage should therefore be from the northeast to southwest.



Figure 6: Land surface elevation and drainage.

The Reserve is completely within the Hawthorn Lakes province of the Lakes District (Green and others, 2005). The lakes of this region originally formed through karst processes and are being modified by erosion and infill at present. The property has some of the highest elevations of the Hawthorn Lake Region.

## **Geologic Units – Lithostratigraphy**

The eastern portion of the property where the elevation is higher is primarily comprised of Undifferentiated Tertiary/ Quaternary Sediments (yellow area Figure 7). These sediments are typically sands or sandy clays with few fossils. The boundary between the Tertiary and the Quaternary sediments is difficult to recognize since they are so similar. Elevation is a key indicator as the Pleistocene seas reached a maximum of 100 feet above MSL. The Coosawatchie Formation (Figure 7) of the Hawthorn Group is present near the surface across the entire western section as well as the southwestern portion of the eastern section of the Reserve.



Figure 7 : Near surface geology (modified from Green and others, 2005).

#### Hydrostratigrphic Units

Hydrostratigraphic units can differ from the Lithostratigraphic units discussed above in that the definition and boundaries are based on the rock or sediments ability to store and transmit water and the degree of vertical hydraulic connectivity between units. This report follows the conventions for unit nomenclature and syntax (Copeland and others 2009). The major hydrostratigraphic units at this site include the surficial aquifer system (SAS), the intermediate aquifer system or intermediate confining units (IAS/ICU), and the Floridan aquifer system (FAS). The FAS is comprised of an Upper and Lower Floridan aquifer separated by a middle confining unit. The Upper Floridan aquifer (UFA) underlies the ICU and corresponds to the top of the Ocala Limestone at this site. The UFA is approximately 240 feet thick in this area and extremely productive. The ICU sediments may be similar to the sediments of the Hawthorn Group since they collectively retard hydraulic connection between the SAS and the underlying FAS. The thickness varies from southwest to northeast and ranges from a low of 40 feet to a high of 75 feet (Figure 8). The overlying SAS is generally less than 20 feet thick and may contain clay lenses that reduce permeability. It is probably not a sustainable source of water since it is dependent on rainfall.

Hydrostratigraphic unit mapping by the District is based on grids created from hydrostratigraphic unit elevations interpreted from geophysical and lithologic logs in the District Hydrogeologic Information System database. The accuracy of the grids is increased when boreholes are closely spaced to the site of interest. A geostatistical analysis was performed to generate the grids (Davis, 2016) for use in groundwater models and hydrogeologic investigations. The grid for the top of the SAS is the same as a Digital Elevation Model of the land surface as shown in Figure 6. The thickness of the ICU can be important for protection of the FAS from contamination, controlling the rate and amount of recharge, and protection of impacts to the SAS or FAS. As can be seen from Figure 8, the areas in the extreme southwest are the thinnest and are therefore most vulnerable.



Figure 8: Thickness of the ICU and location of selected boreholes near Longleaf Flatwoods Reserve.

In contrast to the ICU, the FAS has a relatively flat elevation profile. The FAS is predominately around 0' NAVD88 elevation. Additional boreholes would probably indicate more relief on this surface, however.

The Reserve has a District Floridan aquifer groundwater monitor well A-0420 located at the northeast corner of the property (Figure 8). This well was drilled by the District to a depth of 190 feet below land surface (bls) and cased to a depth of 120 feet bls. The top of ICU was encountered at 10 feet bls. The natural gamma log in Figure 9A shows alternating high and low peaks throughout the ICU section and indicates a succession of low permeable clay and dolostone interbedded with more permeable sand and shell beds. The top of the FAS was encountered at 113 feet bls. Since the well is located near the highest elevation on the property this includes the thickest section of ICU and provides the most confinement to the FAS.

This well has been collecting water level data since December 2005 and the level has fluctuated between approximately 63 and 68 feet NAVD88 or 57 and 71 MSL (Figure 9B).





*Figure 9: Geophysical logs, water level data, and well construction from Upper Floridan aquifer monitor well A-0420.* 

Other boreholes that were used to make the grid estimations are located outside the property and detailed lithologic descriptions are available by accessing the Districts web-based Hydrogeologic Information System.

A hydrogeologic cross section is shown in Figure 10 to better visualize the subsurface characteristics. This section cuts from the southwest to the northeast and demonstrates how the ICU thickens to the northeast. This can be useful to develop well construction specifications if a water supply well was needed at a specific location. The top of the FAS is shown as relatively flat, however more drilling may reveal a more variable surface.



Figure 10: Hydrogeologic cross section A-A' from southwest to northeast through the Longleaf Flatwoods Reserve.

## Karst

Karst is a landscape formed from the dissolution of soluble rocks such as limestone, dolostone, or gypsum. It is associated with sinkholes, caves, and internal or disrupted drainage. In many places in Florida, depressions in the land surface may be an indication of paleo or recent sinkhole activity. The Reserve has multiple closed topographic depressions karst features in the southwest and a few in the northeast (Figure 11). This is not unusual considering the thickness of the ICU is a controlling factor for karst formation. It is notable that there is a cluster of depressions in the southwest area. Some of these are aligned in a northwest southeast direction and may be an indication of subsurface conduits in the FAS. These depressions can be identified as lineaments on the land surface. A field survey using DC Resistivity would be needed to verify that however.

From a water resource perspective, sinkholes can provide an opportunity for enhanced recharge to the FAS. A desktop evaluation of sinkholes that could have the most potential for FAS recharge was conducted for the areas within the District boundaries (Davis and Mouyard, 2016). This GIS analysis identified the criteria that would provide the best conditions for recharge based

on available data. A ranking scoring system for sinkholes was devised so that properties could be evaluated for potential recharge. Sinkholes were ranked from Low Final Score to High Final Score. In addition, a second approach identified the sinks that met all four primary criteria.

The map in Figure 11 indicates there are only closed topographic depression with the lowest potential for recharge on the property (yellow dots). The score ranking was lowest for several reasons. The ICU is greater than 50 feet thick. The closed topographic depressions at the Reserve have very low topographic relief (generally < 5 feet). This means the sinks would have minimal storage for use as an injection site for recharge. In addition, they are relatively small in extent which further limits the storage. The shape of the closed depressions is also considered. Generally, sinks that have a collapse origin, and therefore most likely to have penetrated the confining units, have a near circular shape. An index is calculated to determine the circularity and most of these sinks are not within the range to be a collapse sink. The other factor that is considered is the difference in elevation of the Floridan potentiometric surface and the elevation of the bottom of the depression. The greater the difference between these means a higher downward head difference. The difference at this site is too low to enhance significant recharge.



Figure 11: Location of closed topographic depressions with recharge potential ranking.

#### Floridan Aquifer Potentiometric Surface

The potentiometric surface of the FAS represents the elevation that water would rise to in a well that is cased in the FAS. This elevation fluctuates over time but knowing where it would be expected to be encountered is very useful if planning a drilling project on the property. Bi-annual potentiometric surface maps are published to help monitor trends of the regional surface as it responds to rainfall, recharge, and withdrawals.

The Reserve is located southwest of a regional potentiometric high in surface that is centered in southwest Clay County (Figure 12A). Groundwater will move in the direction from high to lower head pressure which in this case is towards the southwest. This pressure surface may be above land surface and if a well is drilled into the FAS, water could flow freely out of the well without pumping. There are areas in the southwest part of Reserve (Figure 12B) where these conditions exist. For water to flow naturally at land surface such as a spring, the ICU needs to be sufficiently thin, permeable, or breached to allow the upward movement of water. The closed topographic depressions may provide conditions that could allow FAS discharge to the surface when the potentiometric surface is high enough.



Figure 12: (A) 2014 Potentiometric surface of the Upper Floridan Aquifer and (B) Areas of potential artesian flow.

#### WATER CHEMISTRY

Basic water chemistry data is collected at 2 sites connected to the Reserve's watershed: (1) CC234, located on Camps Canal on Hwy 234, upstream of the Reserve and (2) STX346, located on Camps Canal/ River Styx on Hwy 346, downstream of the Reserve (Figure 13). 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, Dissolved Oxygen (DO), potential of Hydrogen (pH), and Chlorophyll-*a* (Chl-a). Water chemistry data do not exist within the Reserve area itself, but these 2 sites provide insight to water quality conditions upstream and downstream.

#### **Nitrogen and Phosphorus**

Eutrophication is the natural aging process of water bodies, often accelerated by anthropogenic nutrient inputs. Two of the most common and often problematic nutrients associated with eutrophication include nitrogen and phosphorus (Anderson, et al. 2002). While nitrogen and phosphorus are both necessary for aquatic vegetation growth and ecosystem health, excessive loads can result in phytoplankton blooms, fish kills, and reduced dissolved oxygen. Different aquatic ecosystems have varying degrees of natural nutrient loads based on age of the ecosystem, soil, geology, and other factors. The annual averages of nitrogen and phosphorus are shown in Figures 14 and 15.

#### **Specific Conductivity**

Specific conductivity is the measure of electrical flow, directly related to the amount of ions in water. Water bodies tend to have a consistent range of specific conductivity and therefore, can be used to detect discharges or disturbances in the system, typically indicated by an increase. Freshwater ecosystems generally have a specific conductance between 50-1500  $\mu$ S/cm (Behar, 1997), and both CC234 and STX346 fall within this range. The annual averages of these sites are shown in Figure 16.

#### **Dissolved Oxygen**

DO is a measure of the amount of oxygen molecules present in aquatic systems. Consistently high DO levels are optimal for healthy biodiversity. Many factors can influence DO levels including season, temperature, time of day, depth, and altitude (Behar, 1997). Annual averages for site CC234 and STX346 are show in Figure 17.

## pН

pH describes the acidity or basicity of an aqueous solution, and is measured on a log scale of 0-14, with 0 being the most acidic, and 14 the most basic. In most surface water systems, the normal range for pH is between 6.5 to 8.5. However, in transitioning stream to marsh systems, the pH can be between 5-8. Annual averages for sites CC234 and STX346 are show in Figure 18.



Figure 13: Water chemistry sites.



Figure 14: Total Nitrogen averages by year. Trendlines indicate an overall decrease since 2003.



Figure 15: Total Phosphorus averages by year. Trendlines indicate an overall decrease for STX346, and a slight increase for CC234.



*Figure 16: Specific Conductivity averages by year. Trendlines indicate a slight increase for STX346 and a slight decrease for CC234.* 



*Figure 17: Average Dissolved Oxygen by year. Trendlines indicate an increase at CC234, and a decrease at STX346.* 



*Figure 18: Average pH by year. Trendlines indicate little change.* 

## Chlorophyll-a

Chlorophyll-*a* is a useful index in determining the algal or phytoplankton concentration in a water body. Typically increases in Chl-a are indicative of water quality degradation, as it often associated with nutrient loading. While normal Chl-a levels vary in different aquatic systems, high Chl-a values indicate that systems are more susceptible to algal blooms. Annual averages for sites CC234 and STX346 are shown in Figure 19.

## Water Levels

Water levels fluctuate with season and year in response to rainfall. Generally, CC234 and STX346 have highest water levels at the end of the rainy season in September (61.19 and 56.51, ft NAVD 88 respectively), and lowest at the end of the dry season in May (59.61 and 55.87, respectively). Figure 20 show the mean annual water levels.



Figure 19: Average Chl-a values by year. Trendlines show a decrease at CC234, and relatively no change at STX346. Chl-a data was only available after 2011.



*Figure 20: Average water levels by year. Trendlines show a slight decrease for CC234, and relatively no change for STX346. Water level data prior to 2006 does not exist for STX346.*
#### Water Chemistry Discussion

Overall there was more TN and TP at STX346 than CC234. This could be due to several reasons including but not limited to inputs from the basin swamps to the northwest and northeast of STX346, and water backing up into the River Styx from Orange Lake. There has been an overall decrease in TN and TP for both CC234 and STX346 from 2003 to 2017. There have also been decreases in Chl-a at CC234 from 2012-2017. These are indicators of water quality improvement.

#### **NATURAL COMMUNITIES**

The 2,856 acres that comprise the Reserve consist primarily of mesic flatwoods, sandhills, and xeric hammocks in the uplands and floodplain and basin swamps at lower elevations (Figure 21). Information relative to the natural communities within the Reserve is derived from several sources including timber stand assessments and personal observations of District staff. 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*.

The longleaf pine (*Pinus palustris*) ecosystem was once one of the most extensive forest ecosystems in North America, covering an estimated 92 million acres pre-settlement (Frost 1993). Longleaf pine lumber and extracted resins were valuable to settlers and became commercial drivers of the southeast following the arrival of steam railroads and steam skidders. Currently, approximately 3% of the longleaf ecosystem remains in the southeastern U.S. (Frost 2006). The Reserve has an estimated 1,065 acres where longleaf pine is the primary or secondary dominant species.

Some areas within the Reserve identified as sandhill in the 2005 management plan were reclassified in the 2009 plan to upland pine forest. These areas were described as having idiosyncratic populations of southern red oak (*Quercus falcata*), not typical of a sandhill. The District sought the advice of an FNAI plant ecologist to best assign these areas. A unique natural community is currently being described by FNAI. As this new plant community is fully described and published and further field evaluation is accomplished, some areas may again be reclassified. Natural community reclassification may also occur as restoration and fire management activities progress.

During summer 2000, prior to public acquisition, the Lybass parcel had a significant southern pine beetle (SPB) infestation. Previous landowners conducted a salvage harvest, removing much of the pine overstory, primarily from the mesic flatwoods and sandhill communities. This resulted in unmerchantable trees and logging slash being piled on the property.

Flatwoods communities are distinguished by very flat, level topography. The mesic and wet flatwoods communities at the Reserve vary in levels of disturbance. Historic management practices on the River Styx and connector parcels were for commercial timber production. Both groundcover and shrub layers are disturbed and are missing many natural components. Historic land use of the Lybass parcel was predominately hunting with some timber management. Groundcover in many of the flatwoods communities on this parcel is intact and diverse. The most altered examples of this community type within the Lybass parcel are in the areas of the

SPB salvage cuts. Reforestation efforts began in the SPB areas in 2004 with the planting of longleaf pine.

## Mesic Flatwoods (1,394 acres, 49%)

Mesic flatwoods are characterized as an open canopy forest of widely spaced pine trees with little or no understory but a dense groundcover of herbs and shrubs.

Plants and animals of this community type, documented within the Reserve, include longleaf pine, slash pine (*Pinus elliottii*), wiregrass (*Aristida stricta var. beyrichiana*), tarflower (*Bejaria racemosa*), saw palmetto, white-tailed deer (*Odocoileus virginianus*), Bachman's sparrow (*Aimophila aestivalis*), oak toad (*Bufo quercicus*), and southern black racer (*Coluber constrictor priapus*).

Fire and seasonal hydroperiods are important physical factors associated with the shaping and maintaining of this community type. Natural fire return intervals in mesic flatwoods are every one to eight years. Mesic flatwoods are the dominant natural plant community within the Reserve and approximately 580 acres are in pine plantation. Approximately 260 acres of this plant community have been replanted in longleaf pine.



Figure 21: Natural communities.

## Wet Flatwoods (116 acres, 4%)

Wet flatwoods are characterized as an open-canopy forests of scattered pine trees or cabbage palms (*Sabal palmetto*) that lacks a midstory and has a sparse understory with dense groundcover. Occasionally the shrub and groundcover vegetation would consist largely of hydrophitic plants.

Typical plants and animals of this community type that are documented within the Reserve include slash pine, sweetbay (*Magnolia virginiana*), large gallberry (*Ilex coriacea*), hooded pitcherplant (*Sarracenia minor*), Northern bobwhite (*Colinus virginianus*), cricket frog (*Acris gryllus*), and dusky pigmy rattlesnake (*Sistrus miliarius barbouri*).

The wet flatwoods plant community is fire dependent with return intervals ranging from three to ten years. Many of the historic wet flatwoods within the Reserve exhibit signs of successional changes, likely due to the prolonged absence of fire. Approximately 33 acres of wet flatwoods within the Reserve are in pine plantation.

## Upland Pine Forest (268 acres, 9%)

Upland pine forests are characterized as rolling forests of widely spaced pines with few understory shrubs and dense groundcover of grasses and herbs. Examples of this community type are dominated by longleaf pine and wiregrass. Upland pine forests are often confused with sandhills and distinguishing factors between them are often found in soil characteristics. Upland pine forests are typically associated with soils composed of sand and variable amounts of Miocene clays.

Typical plants of this community type, documented within the Reserve include southern red oak, blue jack oak (*Quercus incana*), longleaf pine, and wiregrass.

The upland pine forest is a fire climax community. Fire is a dominant factor in maintaining the ecological components of this community type through the reduction of offsite hardwood encroachment and the perpetuation of longleaf pine and wiregrass. The fire return interval is between every three to five years. Maintaining an appropriate fire return interval is essential in achieving a balance between site appropriate oaks and pine. The upland pine forest communities within the Reserve are degraded. Many areas are deficient in species richness and abundance in both the shrub layer and groundcover. This is likely a result of fire suppression and past mechanical disturbances. Approximately 100 acres of historic upland pine forest is in planted pine.

#### Sandhill (259 acres, 9%)

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 wire grass.

Typical plants and animals of this community type, documented within the Reserve, include longleaf pine, sand post oak (*Quercus stella var. margaretta*), bracken fern (*Pteridium aquilinum var. pseudocaudatum*), Sherman's fox squirrel (*Sciurus niger shermani*), eastern towhee (*Pipilo* 

*erythrophthalmus*), red-headed woodpecker (*Melanerpes erythrocephalus*), barking treefrog (*Hyla gratiosa*), and gopher tortoise (*Gopherus polyphemus*).

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 grasses. Fire return intervals within sandhill communities range from two to five years. Many of the sandhills within the Lybass parcel are oak dominated resulting primarily from the SPB salvage harvest and prolonged fire exclusion. All the historic sandhill communities within the River Styx parcel are in pine plantation and approximately 85 acres of this natural community across the Reserve are in pine plantation. Groundcover assemblages in this community type are degraded across the Reserve.

# Xeric Hammock (46 acres, 2%)

Xeric hammocks are characterized as either a scrubby, dense, low canopy forest with little understory other than palmetto, or a multi-storied forest of tall trees with an open or closed canopy. Several gradations between these extremes are possible. Typical plants and animals of this community type documented within the Reserve include live oak (*Quercus virginiana*), laurel oak (*Q. laurifolia*), southern red oak (*Q. falcata*), sand live oak (*Q. geminata*) sparkleberry (*Vaccinium arboreum*), gray squirrel (*Sciurus carolinensis*), southern fence lizard (*Sceloporus undulatus undulatus*), eastern screech-owl (*Megascops asio*), wild turkey (*Meleagris gallopavo*), and blue jay (*Cyanocitta cristata*).

Xeric hammock is an advanced successional stage of scrub or sandhill. All examples of xeric hammocks within the Reserve occur in association with and are likely succeeded by sandhills. The variation in vegetation structure is predominantly due to the original community from which it developed. The xeric hammock plant community develops on sites that have been protected from fire for 30 or more years. Fires in this plant community are catastrophic when they occur and may cause xeric hammock to revert into another community type.

#### Basin Swamp (407 acres, 14%)

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.

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

#### **Dome Swamp** (53 acres, 2%)

Dome swamps or cypress domes are shallow, forested, usually circular depressions that generally present a domed profile because smaller trees grow in the shallower waters at the outer edge while bigger trees grow in the deeper interior waters.

Typical plant and animal species found in dome swamp communities, recorded on the Reserve include loblolly bay (*Gordonia lasianthus*), buttonbush (*Cephalanthus occidentalis*), mole salamander (*Ambystoma talpoideum*), great crested flycatcher (*Myiarchus crinitus*), and wood duck (*Aix sponsa*).

Fire is essential for the maintenance of this community type with the most frequent return intervals of three to five years occurring on the outermost edges. Extended hydroperiods of 200 to 300 days per year on the interior of most dome swamps translates to a much longer fire return interval, approximately 100 to 150 years.

#### Floodplain Swamp (205 acres, 7%)

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 bald cypress (Taxodium distichum) and swamp tupelo (*Nyssa sylvatica var. biflora*) and a sparse understory and groundcover.

This community type is maintained by hydrologic regimes and is not fire dependent. Floodplain swamp communities within the conservation area appear relatively undisturbed.

#### Depression Marsh (98 acres, 3%)

A depression marsh or ephemeral pond is characterized as a shallow, usually rounded depression in sand substrate with herbaceous vegetation. Depression marsh communities provide important foraging and breeding habitat for many species of reptiles and amphibians found within the Reserve. Natural hydrologic conditions vary with most depression marshes drying in most years. Hydroperiods cans 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.

#### **Basin Marsh** (3 acres less than 1%)

Basin marshes are herbaceous or shrubby wetlands in large irregularly shaped basins. These marshes typically develop in large solution depressions that were formerly shallow lakes.

Typical plants and animals found within the basin marsh natural community and recorded on the Reserve include bloodroot (*Lachnanthes caroliniana*), two-toed amphiuma (*Amphiuma means*), pig frog (*Rana grylio*), little blue heron (*Egretta caerulea*), and great egret (*Ardea alba*).

Hydroperiods of approximately 200 days are essential to the maintenance of this natural community as is frequent fire. The fire return interval for basin marshes is every one to 10 years with more herbaceous systems having a return of between one and three years.

#### Marsh Lake (6 acres less than 1%)

Marsh lakes are characterized as an open water zone with or without floating vegetation, surrounded by a marsh system. Water in these systems is generally derived from the uplands in the immediate area. Marsh lakes may serve as aquifer recharge by acting as reservoirs, which release groundwater when adjacent water tables drop during droughts. The marsh lake community within the Reserve is Palatka Pond.

#### Swamp Lake (1 acre less than 1%)

Swamp lakes are shallow open water zones within basin or floodplain swamps. These lakes are typically lentic, however, during high water, may flow with floodwaters. An example of the swamp lake natural community, within the Reserve, is north of Palatka Pond.

# Soils

According to the USDA Soil and Conservation Service, 21 different soil types are within the Reserve (Natural Resource Conservation Service, 1985). The Alachua County Soil Survey provided information used to develop descriptions of the predominant soil series found within the (Addendum 2).

# CULTURAL AND HISTORICAL RESOURCES

The Reserve is in an area with significant cultural history. Paleo-Indian nomadic hunters first utilized the entire Lochloosa and Orange Lake area approximately 11,000 years ago. The Cades Pond culture first permanently settled the area between 100 and 200 AD. The Cades Pond people thrived in the area for the next 800 years, until other Native American cultures began to migrate to the area and eventually absorbed the remaining populations of Cades Pond people. Spanish explorers first visited the region in 1528 and began to build missions in the area by 1600. At the time of the arrival of the Spanish, the Timucuan inhabited the area. The Timucuan remained until the early 1800s, when disease and war drove most remaining native cultures south.

The European settler population began to grow during the late 1800s in conjunction with a new railroad and growing citrus industry. The citrus industry diminished following two hard freezes causing a decline in the local population. Those who remained lived in small rural communities that included Hawthorne, Cross Creek, and Island Grove and subsisted on hunting and fishing. They generated income through the operation of naval stores. Naturalist William Bartram and author Marjorie Kinnan Rawlings made the area famous in their writings. Bartram described the natural landscape of the area in his historic accounts from his journeys through Florida in the 1700s. Many species first described by Bartram are still found at the Reserve and in the surrounding area, including gopher tortoise, sandhill crane, and tarflower. Rawlings moved to Cross Creek in 1928, and described life in the area in her 1942 non-fiction classic *Cross Creek*.

The Lybass and Goethe families held ownership of the Lybass parcel for several years. The families utilized the property for hunting and timber production, and their management resulted in the protection of the diversity and quality of natural communities on the parcel.

During the writing of this plan, a potentially historical resource was discovered. This resource is assumed to be associated with the Atlantic Coast Line Railroad. The District will report this site to the Florida Division of Historical Resources (DHR) within the implementation of the plan.

# PAST MANAGEMENT SUMMARY

This section describes management strategies outlined in the 2009 land management plan and provides the status of each item (Table 2).

Table 2: Past management summary and 2018 status.

# **RESOURCE PROTECTION AND MANAGEMENT**

Water Resources 2009 Strategy	Status
Regularly inspect roads, bridges, crossings, and trails for erosion problems.	Roads, bridges, crossings, and trails were regularly inspected for erosion problems
Install water bars, turnouts, and low water crossing	There has been no need to install these yet.
Regularly inspect canals and ditches for erosion problems.	Canals and ditches were regularly inspected for erosion problems.
When possible, remove beds from harvest areas.	To date no beds have been removed from harvest areas.
Flora and Fauna 2009 Strategy	Status
Continue to conduct wildlife surveys and develop species lists.	District staff record new species as they are encountered in the field.
Confirm the removal of the introduced whitetop pitcher-plants.	Staff confirmed removal of the introduced whitetop pitcher-plants in October 2017.
Continue to monitor for the presence of RCWs and other listed species.	Staff continue to monitor for the presence of listed species. No RCW activity has been observed within the Reserve.
Forest Management 2009 Strategy	Status
Forest Management 2009 Strategy Determine forest management approach for River Styx parcel.	Status A forest management approach was determined for River Styx in 2013.
Forest Management 2009 Strategy Determine forest management approach for River Styx parcel. Evaluate feasibility of groundcover restoration or enhancement in conjunction with forest management planning for River Styx.	StatusA forest management approach was determined for River Styx in 2013.Groundcover restoration and enhancement is determined on a case by case basis.
Forest Management 2009 StrategyDetermine forest management approach for River Styx parcel.Evaluate feasibility of groundcover restoration or enhancement in conjunction with forest management planning for River Styx.Evaluate oak management needs in Lybass sandhills and upland pine communities.	Status       A forest management approach was determined for River Styx in 2013.       Groundcover restoration and enhancement is determined on a case by case basis.       Removal of oaks is evaluated and executed annually in the Lybass sandhill and upland pine communities.
Forest Management 2009 StrategyDetermine forest management approach for River Styx parcel.Evaluate feasibility of groundcover restoration or enhancement in conjunction with forest management planning for River Styx.Evaluate oak management planning for River Styx.Evaluate oak management needs in Lybass sandhills and upland pine communities.Complete forest management database population.	Status       A forest management approach was determined for River Styx in 2013.       Groundcover restoration and enhancement is determined on a case by case basis.       Removal of oaks is evaluated and executed annually in the Lybass sandhill and upland pine communities.       The forest management database was completed in 2010.
Forest Management 2009 StrategyDetermine forest management approach for River Styx parcel.Evaluate feasibility of groundcover restoration or enhancement in conjunction with forest management planning for River Styx.Evaluate oak management needs in Lybass sandhills and upland pine communities.Complete forest management database population.Refine existing forest management database.	StatusA forest management approach was determined for River Styx in 2013.Groundcover restoration and enhancement is determined on a case by case basis.Removal of oaks is evaluated and executed annually in the Lybass sandhill and upland pine communities.The forest management database was completed in 2010.The forest management database has been refined and updated annually.

Fire Management 2009 Strategy	Status
Implement prescribed burning as described	The District coordinates the use of
in the District's Management Plan.	prescribed fire with other forest
_	management activities to achieve
	management goals.
Introduce growing season burns.	Growing season burns were introduced in
	2014.
Develop annual burn plans.	Annual burn plans have been developed.
Introduce dormant season burns in pine	Dormant season burns and burns in areas of
plantations and areas of high fuel loading	high fuel loading/ extended fire exclusion
and/or extended fire exclusion.	have been included in annual burn plans.
Continue to populate the fire management	The fire management database is populated
database.	annually.
	-
Exotic Species 2009 Strategy	Status
Continue to monitor for exotic plant	The District continues to monitor for exotic
species and implement appropriate action.	plant species; 118 acres have been treated.
Continue to assess the need for a feral hog	The District will continue to assess the
removal agent.	need for a feral hog agent.
Cultural Resources 2009 Strategy	Status
Identify and report sites to the DHR.	The District is in the process of reporting a
	site during the writing of this plan.
Identify and report any detrimental	No detrimental activities have occurred to
activities to the sites to the DHR and law	cultural resources at the Reserve.
enforcement.	

# 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.
Recreation 2009 Strategy	Status
Complete development of a multiuse trail system on the River Styx parcel.	District staff determined that the existing trail system was adequate for current recreation goals.
Establish new or alternate camp sites as necessary.	The camp site was relocated upon construction of a security residence in 2010.
Evaluate the potential for an interpretive, elevated wildlife viewing platform at Palatka Pond.	District staff do not recommend an elevated platform at Palatka Pond at this time.

The District now updates recreation
information as needed on the Recreation
and Lands page of its website.
The District will continue to evaluate this
over time. There is a need to coordinate
with multiple adjacent property owners.

Security 2009 Strategy	Status
Maintain signage, fencing, gates, and locks.	District staff maintains signage, fencing, gates, and locks
Continue coordination with private security firm, FWC, and local law enforcement.	District staff regularly coordinates with a private security firm, FWC and local law enforcement.
Evaluate the need for a security residence.	A security residence was constructed in 2010 and was converted into a field station in March 2015.

# ADMINISTRATION

Acquisition 2009 Strategy	Status
Evaluate adjacent properties for potential	District staff continue to evaluate adjacent
acquisition.	properties for acquisition.
Cooperative Agreements 2009 Strategy	Status
Incorporate any new acquisitions into the existing cooperative management	No new acquisitions have been made.
agreement.	
Continue to administer the cooperative management agreement with Alachua County.	District staff continues to administer the cooperative management agreement with Alachua County.

# IMPLEMENTATION

The following sections outline land management strategies for resource protection, land use, and administration on the Reserve for the next 10 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, crossings, and trails to prevent erosion.
- o Install water bars, turnouts, and low water crossing.
- Inspect canals and ditches for erosion.
- o Remove beds from timber harvest areas if restoration is feasible.

Though wetland protection was accomplished through acquisition, the wetlands and surface waters within the Reserve have a history of disturbance. Hydrologic disturbances within the Reserve include, Camps Canal, the abandoned Atlantic Coast Line rail bed, roads, ditches, culverts, and silvicultural beds.

Camps Canal bisects the western most portion of the Reserve and is owned by the state of Florida. Camp Ranch, Inc. constructed the canal in the 1920s to divert water flow from Prairie Creek and Paynes Prairie to the River Styx and Orange Lake for the purposes of cattle grazing.

Roads and associated ditches exist on all parcels within the Reserve, providing access for both management and recreation. A portion of the abandoned Atlantic Coast Line rail bed is located on the River Styx parcel and is currently utilized and maintained as a road. The District has made improvements to roads within the Reserve, helping to reduce the potential for erosion.

The River Styx parcel is a former commercial silviculture site and as such, some of the acreage within that parcel 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.

#### **Forest Management**

Goal: Maintain, improve, and restore forest resources.

#### Strategies:

- Restore groundcover where appropriate.
- o Manage oak encroachment in Lybass sandhills and upland pine communities.
- Update forest management database.

o Monitor succession of clearcut basin swamps.

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."

On properties like the Reserve where silvicultural management is an intrinsic component of the overall management of the upland portions of the property, timber inventory values are collected. These values are 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 staff forecast forest management needs. There are four dominant pine species in the canopy of the Reserve: longleaf pine, slash pine, pond pine and loblolly pine (Figure 22). The Reserve is partitioned into forest management compartments and each compartment is further divided into stands. Figure 23 illustrates the compartments and stands within the property.

The management objectives of this property require pine and oak harvesting. Primary objectives of harvesting on the Reserve are to improve species diversity and the overall natural community health and vigor.

Prior to public acquisition, the entire River Styx parcel was utilized in commercial forestry operations and much of the historic wet and mesic flatwoods and sandhill acreage was planted with high densities of slash pine. As a result, and over time, hundreds of acres within this portion of the Reserve will require some degree of overstory pine harvesting to achieve restoration goals.

Since the last land management plan, forestry accomplishments include thinnings of more than 436 acres of pine (Figure 24). 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. Groundcover and shrub layers are absent from most of the River Styx parcel, a result of site preparation methods and shading caused by high density pine planting. These natural community components will be considered for restoration or enhancement projects as harvest or salvage operations are implemented.



Figure 22: Pine coverage by species.



Figure 23: Forestry compartments.



Figure 24: Forest management accomplishments.

Approximately 80 acres of historic basin and floodplain swamp on the west side of the River Styx parcel near Camps Canal was clear cut of cypress and other wetland tree species by previous landowners. This area will be monitored for natural succession.

While a few sandhill areas within this parcel have ample and diverse groundcover, in most areas the groundcover is remnant with only the most resilient and disturbance adapted species remaining. The feasibility of restoration or enhancement of groundcover in these areas will be evaluated. Hardwood management will continue to focus on the removal of live, laurel, and water oaks and the reduction in coverage of turkey oak.

Through planned selective harvesting, the District aims to create a more open canopy, which will reduce the competition among trees and in time, allow for larger, more vigorous trees with fuller canopies. There are six planned thinnings of pine within the Reserve from 2018–2028 (Figure 25). Harvesting may also provide some protection against wildfires and pine beetle outbreaks. Site preparation techniques employed prior to replanting in harvested areas throughout the Reserve 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 25: Forest management plan.

# **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.

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 1,186 acres within the property. A total of 810 acres have been within the Reserve have received multiple applications of prescribed fire (Figure 26).

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 amelioration 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 the Reserve are fire adapted, making prescribed fire a valuable tool for use in the restoration and maintenance of plant communities within the Reserve.

Historically, most of fires occurring on what is now the Reserve would have been ignited by lightning during the growing season. The District intends to reintroduce growing season fires where possible, understanding that constraints in some areas such as young pine plantations and high fuel loading and smoke management concerns adjacent to CR 325 may require the use of dormant season burning.



Figure 26: Fire history map.

Smoke sensitive areas, including CR 325, limit the window of opportunity for the application of prescribed fire on portions of the Reserve (Figure 27). Smoke management is paramount and any potential burns will be conducted to minimize off-site impacts, by maneuvering smoke plumes away from smoke sensitive areas and by ensuring adequate smoke dispersal.

While prescribed fire is the preferred tool for restoration and maintenance within the Reserve, it may be necessary, under certain circumstances, to implement alternative methods. During periods of extended drought conditions or in areas where implementing prescribed fire safely is not feasible, the District may employ management methods such as selective herbicide treatments, mowing, roller chopping, and overstory manipulation.

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 FNAI. If FNAI recommends a fire return interval of three to five years, a plant community that has benefited from disturbance in the past five years is in Condition Class 1. If it has been more than five 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 in to 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 Reserve's habitats in 2017 was 67% Condition Class 1; 2% Condition Class 2; and 31% Condition Class 3. There are no habitats within the Reserve that are in Condition Class 4. There has been an overall increase in the percentage of habitat in Condition Class 1 and decrease in Condition Classes 2 and 3 from 2012 to 2017 (Figure 28).



Figure 27: Smoke management.



Figure 28: Condition classes.

All implementation of prescribed fire within the Reserve will be conducted in accordance with the District's Fire Management Plan, the Longleaf Flatwoods Reserve Fire Management Plan (Addendum 3), and the annual burn plan for the property.

# Flora and Fauna

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

# Strategies:

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

Goal: Remove invasive plants and animals.

# Strategies:

- Assess the need for a feral hog removal agent.
- o Locate, map, and treat any new infestations

The Reserve has a diverse assemblage of natural communities providing significant habitat for a variety of floral and faunal species. The 2005 management plan for this property lacked plant and animal lists. In October 2008, District staff conducted an informal flora and fauna survey across the Reserve and has continued to add to the list (Addendum 4).

A listed plant species identified by District staff during the survey, and subsequently verified by an FNAI botanist is the whitetop pitcher-plant (*Sarracenia leucophylla*). The range of this state endangered plant within Florida is generally isolated to areas west of the Apalachicola River. The detection of this plant in Alachua County raised questions about whether the occurrence is

natural. District staff determined that this small collection of plants was introduced by local carnivorous plant enthusiasts and is not a range extension of the species. The District has confirmed the removal of these plants from the Reserve.

# Native Species

The Reserve is within a movement corridor for the Florida black bear (*Ursus americanus floridanus*) bear activity has not been documented within the property. While no listed species requiring special management are documented within the Reserve, several large longleaf pine snags show evidence of historic use by red-cockaded woodpeckers (*Picoides borealis*) (RCW), a federally threatened species. No recent RCW activity has been observed within the Reserve. Historically, there has been a wood stork (*Mycteria americana*) rookery located adjacent to the River Styx parcel.

## Exotic and Invasive Species

Several exotic pest plants occur within the Reserve including camphor tree (*Cinnamonum camphora*), showy rattlebox (*Crotalaria spectabilis*), Japanese climbing fern (*Lygodium japonicum*), and cogongrass (*Imperata cylindrica*).

The Reserve is part of the District's invasive plant management program. Exotic species control is necessary to inhibit the continued proliferation of invasive and exotic plants and is integral in the maintenance and restoration of natural plant communities. The invasive plant management program applies various herbicides per label rates using the most appropriate method of application for the target species.

The District will strive to maintain or achieve maintenance control of the targeted species during the scope of this plan. Exotic pest plant infestations are light across the property, and the property is regularly monitored and treated as necessary. Since 2009, District staff have treated more than 118 acres of exotic vegetation within the property.

Laurel wilt, a disease of red bays (*Persea borbonia*) and other trees in the laurel family has been observed in red bay populations within the Reserve. Laurel wilt is caused by a fungus that is carried and transmitted by the non-native red bay ambrosia beetle (*Xyleborus glabratus*). The beetle generally attacks healthy mature trees and the subsequent fungal infection causes the flow of water to be restricted to the leaves and branches and eventual mortality. Laurel wilt is devastating to infected populations and there are currently no established methods for controlling the disease.

Exotic wildlife species known to occur within the conservation area include feral hogs (*Sus scrofa*), and brown anole (*Anolis sagrei*). Naturalized nine-banded armadillos (*Dasypus novemcinctus*) also occur on the Reserve. Soil disturbance from feral hog activity on the property is minimal. If necessary, the District will explore the option of issuing a special use agreement (SUA) for feral hog removal to an approved agent. Additionally, the USDA may also be contracted to assist in the removal of feral hogs from the Reserve.

# **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 indicates no registered cultural sites within the Reserve. Staff are currently in the process of reporting one potential site to DHR for its evaluation. The District will conduct land management activities in a manner that will provide protection for these sites and serve to reduce the potential for adverse impacts. If District staff discovers any additional sites, staff will document and report those sites to the DHR. Additionally, detrimental activities discovered on these sites will also be reported to the DHR and appropriate law enforcement agencies. Due to District and state policy, the location of the sites is not identified on public maps.

# LAND USE MANAGEMENT

# Access

Goal: Provide public access.

# Strategies:

- Maintain parking areas, signs, gates, trails, and roads.
- Update District database on maintenance of existing and creation new of parking areas, signs, gates, trails, and roads.

One public parking area is located off CR 325 near the north end of the Lybass parcel in a previously disturbed site (Figure 29). The parking area is fenced, and has walkthroughs providing for recreational access. Informative kiosks are located at the parking area trailhead.

There are currently 3 gates providing management and emergency access from CR 325 to the property (Table 3). There are an additional six interior gates. These gates are monitored regularly for maintenance and/or repair needs from normal wear and tear and vandalism.

8980 S. CR 325 Main Access Gate	911 Address	Description/Usage
	8980 S. CR 325	Main Access Gate
9420 S. CR 325 Main Access Gate to Field Station	9420 S. CR 325	Main Access Gate to Field Station
10742 S. CR 325Main Access Gate	10742 S. CR 325	Main Access Gate

Table 3: 911 Addresses for emergency access.

Approximately 19 miles of interior management roads traverse the property, some of these incorporate the multiuse trail system. These roads are not open to the public for vehicular access. The District utilizes a roads classification system to maintain roads. This system includes the following classifications: paved roads, primary roads (these require routine maintenance), and secondary road (these require only periodic or no maintenance). All roads within the Reserve are classified as secondary roads.

District staff will update the roads database to reflect changes to the road network within the property as necessary. Roads will be regularly inspected and receive maintenance and repair as necessary and may be subject to closure during these times. Activities such as prescribed fire, wildfires, timber harvesting, and other mechanical activities may result in temporary road closures.



Figure 29: Roads, gates and parking area.

# Recreation

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

# Strategies:

- Provide special opportunity hunting programs in coordination with FWC.
- Update the District's online *Recreation and Lands* interactive site with recreation improvements.
- Evaluate the potential to connect to the Gainesville-Hawthorne trail via the rail bed on the River Styx parcel.

The primary objective of the District's recreation program is to facilitate resource-based, recreational activities. 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, which also provides solitude and challenge. Currently, recreational opportunities within the Reserve are dispersed resource-based activities.

Recreation amenities include a designated parking area with a trailhead. The trailhead includes an informational kiosk, and access to the property by trails routed using interior roads and firelines that also serve and are maintained for access and land management purposes. The trail system is predominantly used for hiking, off-road bicycling, and horseback riding.

Recreational improvements on the Reserve include (Figure 30):

- <u>Camping</u> One group campsite is available within the property. 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 website). The campsite includes a fire ring, pitcher pump, picnic tables, and an inclement weather shelter.
- <u>Trails</u> Approximately 5 miles of blazed trails are available for hiking, biking, and equestrian use. The District may close trails or portions of trails to accomplish land management activities or when conditions pose a public safety concern.
- <u>Kiosks</u> Informational kiosks are located at public access point and provide information including maps, trail guides, and displays.

The targeted maintenance schedule for trails and campsites includes:

- Mowing grassy 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 are updated on the District's recreation section on the website, which can be viewed online at www.sjrwmd.com/recreation.



Figure 30: Recreational improvements.

# Security

Goal: Provide and maintain security.

# Strategies:

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

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

## **ADMINISTRATION**

## **Real Estate Administration**

Goal: Explore opportunities for adjacent property acquisition.

Strategy: Evaluate adjacent properties for potential acquisition.

There are no anticipated surpluses or acquisitions associated with the Reserve in the next 10 years. The District may evaluate adjacent properties for potential acquisition.

## **Cooperative Agreements, Leases, Easements, and SUA**

Goal: Evaluate and pursue cooperative opportunities.

Strategies:

- o Continue to administer the cooperative management agreement with Alachua County.
- o Continue to cooperate with researchers and universities as appropriate.
- o Incorporate any new acquisitions into the existing cooperative management agreement.

In accordance with District Policy #90-16, the District promotes entering agreements with other agencies and private parties for cooperation and coordination of management of the District's lands. These cooperative agreements serve to protect the District's water management interests and to enhance the management and public value of the land. Table 4 details the agreements and SUAs in effect during the writing of this plan.

A cooperative management agreement exists between the District and Alachua 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.

Additionally, the Reserve, in cooperation with FWC and the National Turkey Federation, is used to host youth hunts, and Women in the Outdoors hunts to encourage outdoor enthusiasm. Properties used to support these programs must not be within traditional FWC Wildlife Management Areas.

Agreement Number	Type/Purpose	Agreement Name	Term
377	Intergovernmental	Longleaf Flatwoods Reserve Cooperative	September 23,
	Agreement	Management Agreement	2015 with renewal
			every 20 years
1216	SUA/ Research	Jason Ferrell University of Florida	January 4, 2018
1391	SUA/ Youth	Florida Fish and Wildlife Conservation	March 18, 2018
	Hunts	Commission	
1330	Lease/ Apiary	John Watson	March 31, 2018
1359	SUA/ Research	Jesse Borden University of Florida	May 12, 2018
954	SUA /Recreation	SUA Horse Drawn Buggy Newnans - Longleaf	October 31, 2018
1237	SUA/ Research	University of Florida David Kaplan Upland	December 21,
		Restoration Study	2018
1348	SUA/ Research	Wolfson College	April 14, 2019
1028	SUA/ Research	University of Florida IFAS Longleaf River Styx	May 1, 2019

#### Table 4: Cooperative Agreements, Leases, and Special Use Authorizations

#### Management Revenues and Costs

<u>Goal</u>: Analyze and report projected and actual costs and revenues.

Strategies:

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

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

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

#### Revenues Since Last Management Plan

Revenues since the 2009 land management plan are primarily from timber thinning (Table 5).

Table 5: Management Revenues from the 2009 plan to 2018.

Activity	Year	Tons	Revenue
Thinning	2009	6,693	\$ 97,038
Thinning	2014	8,556	\$ 169,680
Thinning	2015	5,519	\$ 109,762
Thinning	2017	1,510	\$ 21,582
Stump Clearing from firelines and roads	2012	709	\$ 3,544
Total		22,987	\$ 401,606

#### Costs Since Last Management Plan

Since the 2009 plan, management costs have totaled \$436,636 (Table 6).

Table 6: Management Costs from the 2009 plan to 2018.

Activity	Annual	Units	Annual	Total Cost
-	Number of		Cost	(Since 2009)
	Units			
Invasive plant control	48	Acres	\$ 6,615.00	\$ 52,920
Prescribed fire	254	Acres	\$ 10,133	\$ 89,960
Security	40	Hours	\$ 1,802	\$ 14,416
Road maintenance	8	Miles	\$ 2,400	\$ 19,200
Mowing (roads, trails)	38.8	Acres	\$ 5,901.28	\$ 47,210.24
Service mowing	3.2	Acres	\$ 3,072	\$ 24,572
Trail and camp site maintenance	5.5	Miles	\$ 1,293	\$ 10,340
Fence maintenance	0.9	Miles	\$ 7,200	\$ 57,600
Staff Time	437	Hours	\$12,601	\$ 100,808
Forest inventory	53	plots	\$ 1,030	\$ 8,238
One Time Cost				
Activity	Total	Units	Cost	Total
	Number of			
	Units			
Wildfire Suppression	5.3	Acres	\$ 3,159	\$ 3,159
Shrub Control	354	Acres	\$67,260	\$ 67,260
Total Cost Since 2009 Plan				\$ 436,636

#### Projected Revenues

The projected revenues from forest management at the Reserve between 2018 and 2028 are \$542,135 (Table 7). All revenue generated through forest management accomplishments for this time will be applied towards the District's land management division budget to offset management costs for the property.

# Table 7: Projected thinnings between 2018 to 2028

Activity	Year	Tons	Revenue
Thinning	2018	6,193	\$117,665
Thinning	2019	4,516	\$85,810
Thinning	2023	410	\$7,791
Thinning	2026	10,096	\$202,926
Thinning	2027	4,413	\$97,096
Thinning	2028	1,624	\$30,847
Total		27,252	\$542,135

# Projected Management Costs

Projected management costs for the Reserve from 2018-2028 are \$660,281.

Table 8: Management costs from 2018-2028.

Activity	Number of Units (annual)	Units	Annual Cost	10 Year Total Cost
Invasive plant control	48	Acres	\$6,615.00	\$66,150
Prescribed fire	689	Acres	\$24,115.00	\$241,150
Security	40	Hours	\$1,802.00	\$18,020
Road maintenance	8	Miles	\$2,400.00	\$24,000
Mowing (roads, trails)	38.8	Acres	\$5,901.28	\$59,013
Service mowing	3.2	Acres	\$3,071.52	\$30,715
Trail and camp site maintenance	5.5	Miles	\$1,292.50	\$12,925
Fence maintenance	0.9	Miles	\$7,200.00	\$72,000
Staff Time	437	Hours	\$12,601.00	\$126,010
Forest inventory	53	plots	\$1,029.79	\$10,298
Total cost over 10 years				\$660,281

# **RESOURCE PROTECTION AND MANAGEMENT**

Water Resources			
Goal	Protect water quality and quantity, restore hydrology to the extent feasible, and maintain the restored condition	Measure	Planning Period
Strategy A	Maintain roads, bridges, crossings, and trails to prevent erosion	Roads maintained	Annually by 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 beds from timber harvest areas if restoration is feasible	Removed beds	5-10 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 oak encroachment in Lybass 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	Monitor succession of clearcut basin swamps	Number of times succession is monitored	5-10 Years

# Fire Management

Goal	Implement a prescribed burning program in accordance with District's Fire Management Plan	Measure	Planning Period
Strategy A	Develop annual burn plans	Burn plan	Annually by Nov.
Strategy B	Conduct burns ecological benefits and to reduce high fuel loading	Acres burned	Ongoing
Strategy C	Continue to populate the fire management database	Updated fire management data base	Annually by Nov.
Flora and Fa	una		
Goal	Maintain, improve, or restore native and listed species populations	Measure	Planning Period
Strategy A	Conduct plant and wildlife surveys and develop species lists	Updates to species list	Ongoing
Strategy B	Monitor for the presence of listed species and adjust management actions appropriately	Updates to species list and adjusted management actions	Ongoing
Goal	Remove invasive plants and animals	Measure	Planning Period
Strategy A	Assess the need for a feral hog removal agent	Need assessment	Annually by Sept.
Strategy B	Locate, map, and treat any new infestations	Mapping and treatment of new infestations	Ongoing
Cultural Res	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

Access			
Goal	Provide public access	Measure	Planning Period
Strategy A	Maintain parking areas, signs, gates, trails, and roads	Parking areas, signs, gates, trails, and roads maintained	Ongoing
Strategy B	Update District database on maintenance of existing and creation new of parking areas, signs, gates, trails, and roads.	Database updated	Ongoing
Recreation			
Goal	Provide recreational opportunities	Measure	Planning Period
Strategy A	Provide special opportunity hunting programs in coordination with FWC	Number of special opportunity hunts	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
Strategy C	Evaluate the potential to connect to the Gainesville-Hawthorne trail via the rail bed on the River Styx parcel.	Implemented connector trail	Ongoing

# LAND USE MANAGEMENT

Security			
Goal	Provide and maintain 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
Strategy C	Evaluate the need for a security residence.	Determination of need for security residence	Annually by Sept.

# ADMINISTRATION

Real Estate Administration			
Goal	Explore opportunities for adjacent property acquisition	Measure	Planning Period
Strategy A	Evaluate adjacent properties for potential acquisition.	Properties evaluated	Annually by Sept.
Cooperative	Agreements, Leases, Easements, and Special U	se Authorization	S
Goal	Evaluate and pursue cooperative opportunities	Measure	Planning Period
Strategy A	Continue to administer the cooperative management agreement with Alachua County.	Agreement administered	Ongoing
Strategy B	Continue to cooperate with researchers and universities as appropriate.	Cooperative agreements administered	Ongoing
Strategy C	Incorporate any new acquisitions into the existing cooperative management agreement.	Properties incorporated into cooperative management agreement	Ongoing
Managemen	t Revenues and Costs		
Goal	Analyze and report projected and actual costs and revenues	Measure	Planning Period
Strategy A	Analyze and report timber revenues	Annual report	Annually by Nov.
Strategy B	Analyze and report land management costs	Annual report	Annually by Nov.
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## ADDENDUM 1: LONGLEAF FLATWOODS RESERVE SOILS

Below is a description of the soils and an accompanying map (Figure 1) at the Longleaf Flatwoods Reserve.

## Chipley

The Chipley series consists of nearly level, somewhat poorly drained, deep sandy soils that formed in thick beds of sandy marine sediment. These soils are in broad areas of the flatwoods and along the lower slopes of the sandy uplands.

## Emeralda

The Emeralda series are soils that are nearly level, poorly drained soils that formed in clayey marine sediment. These soils are in large areas of prairies and marshes.

## Kanapaha

The Kanapaha series consists of nearly level to sloping, poorly drained soils that formed in thick beds of sandy and loamy marine deposits. These soils are on nearly level to gentle slopes of uplands.

## Lochloosa

The Lochloosa series consists of nearly level to sloping, somewhat poorly drained soils that formed in thick beds of loamy marine deposits. These soils are in broad areas of gently rolling uplands and in slightly convex areas of the flatwoods.

## Mascotte

The Mascotte series consists of very deep, poorly and very poorly drained, moderately slowly permeable soils on areas of flats, depressions, and on low stream terraces of the lower Coastal Plain. They formed in sandy and loamy marine sediments.

## Millhopper

The Millhopper series consists of very deep, moderately well drained, moderately permeable soils that formed in thick beds of sandy and loamy marine sediments. They occur in central and southern Florida.

## Monteocha

The Monteocha series consists of very poorly drained, moderately permeable soils that formed in thick deposits of sandy and loamy sediments of marine origin. These soils are in wet depressions within the flatwoods of central and southern peninsular Florida.

## Newnan

The Newnan series consists of somewhat poorly drained soils that formed in thick beds of sandy and loamy marine sediments of slight ridges in the flatwoods areas of central and southern Florida.

#### Pamlico

The Pamlico series consists of very poorly drained soils that formed in decomposed organic material underlain by dominantly sandy sediment. The soils are on nearly level floodplains, bays, and depressions of the Coastal Plain.

## Pelham

The Pelham series consists of very deep, poorly drained, moderately permeable soils that formed in unconsolidated Coastal Plain sediments. These soils are on nearly level broad flats, toe slopes, depressions and drainageways.

#### Pickney

The Pickney series consists of very deep, poorly drained, rapidly permeable soils that formed in marine or fluvial sediments. These soils are in flats, depressions, stream terraces, and floodplains.

#### Plummer

The Plummer series consists of very deep, poorly or very poorly drained, marine or fluviomarine sediments in the Southern Coastal Plain, Western Coastal Plain, Atlantic Coast Flatwoods, and Tidewater Area. These soils are in flats and depressions.

#### 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.

## Pottsburg

The Pottsburg series consists of very shallow to shallow, somewhat poorly and poorly drained soils that formed in marine sediments of the Lower Coastal Plain.

#### 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 floodplains.

#### Sparr

The Sparr series consists of very deep, somewhat poorly drained, moderately slowly to slowly permeable soils on uplands of the coastal plain. They formed in thick beds of sandy and loamy marine sediments.

#### Starke

The Starke series consists of very poorly drained, moderate to moderately slowly permeable soils in depressions, poorly defined drainageways, and on floodplains. They formed in thick beds of sandy and loamy marine sediments.

## Surrency

The Surrency series consists of nearly level, poorly drained, acid soils that formed in marine deposits of sandy and loamy sediments.

#### 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.

#### Wauberg

The Wauberg series consists of poorly drained, very slowly permeable soils that formed in thick beds of loamy marine sediments within large prairie areas and low areas within the flatwoods of central and southern Florida.

#### 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.

#### Wesconnett

The Wesconnett series consists of very deep, very poorly drained sandy soils that formed in sandy deposits on marine terraces. These soils are in depressions and on floodplains.



Figure 1: Soil types at the Longleaf Flatwoods Reserve.

# ADDENDUM 2: LONGLEAF FLATWOODS RESERVE 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 Longleaf Flatwoods Reserve (Reserve).

#### **Introduction and Objectives**

The Reserve covers approximately 2,856 acres in Alachua County along a portion of the River Styx. This Reserve includes three contiguous parcels and is in numerous sections of Township 11 north and Range 21 east.

The property is located off County Road (CR) 325, approximately 6 miles southeast of the city of Gainesville and 8 miles south of the Gainesville Airport. US Highway 441 is 5 miles to the west and U.S. Highway 301 is 5 miles to the east of the property. Additionally, the property is approximately ½ mile north of CR 346, 1.5 miles east of CR 234 and 1.5 miles south of CR 20A.

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 Reserve 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
- o Promotion of diversity between natural communities, especially ecotonal areas
- o 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 the Reserve.

## **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 the Reserve 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).

Community Type	Fire Return Interval
Swamp Lake	This community is not fire adapted.
Marsh Lake	This community is not fire adapted.
Basin Swamp (edges)	Infrequent. Edges may burn in conjunction
	with ecotones and adjacent communities.
Floodplain Swamp	This community is not fire adapted.
Dome Swamp (edges)	3–5 years on the outer edges
Basin Marsh	1–10 years
Depression Marsh (edges)	1–8 years in conjunction with associated
	flatwoods and depending on composition
	of edge species
Wet Flatwoods (Pine Plantation*)	3–10 years
Mesic Flatwoods (Pine Plantation*)	2–4 years
Sandhill (Pine Plantation*)	1–3 years
Xeric Hammock	Infrequent; catastrophic

Table 1: Natural communities and fire return intervals in Longleaf Flatwoods Reserve.

\*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, often elongated. Prescribed fire will be applied as necessary to achieve management and enhancement goals.

Mesic and wet flatwoods, sandhill, and upland pine are the most prevalent fire adapted natural community types found within the Reserve. Theses plant communities within the River Styx parcel were utilized in commercial silviculture operations. Thus, much of the historic mesic and wet flatwoods and sandhill communities on this parcel are densely planted in slash pine (*Pinus elliottii*). The midstory and groundcover species within these pine plantations are absent in most areas. As a result, primary fuel for carrying fire across most of River Styx is needle litter.

During summer 2000, prior to public acquisition, the Lybass parcel had a significant southern pine beetle (SPB) infestation. Previous landowners conducted a salvage harvest, removing much of the pine overstory, primarily from the mesic flatwoods, sandhill, and upland pine communities. The District replanted with longleaf pine in 2004 and the sandhill and upland pine areas in 2008. Prior to replanting, fuel wood operations, herbicide applications and roller chopping were conducted in the upland pine and sandhill areas for the purposes of oak management.

The mesic and wet flatwoods within the Lybass parcel have diverse and intact shrub and ground cover layers. The sandhill and upland pine communities are heavily degraded with only few areas exhibiting abundant and diverse groundcover.

Fire management within the remaining pyric plant communities (below) will be in conjunction with the associated wet or mesic flatwoods sandhill or upland pine 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 a key factor in the maintenance of the edge habitats surrounding them. The natural fire regime would burn approximately every one to eight years. Depression marshes are embedded within the upland areas at the Reserve. 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.

Fire return intervals in a basin marsh community are approximately every one to 10 years. Basin marshes are bedded within the wet flatwoods natural community and examples of this natural community are found only on the River Styx parcel. Like the depression marsh, fires may not burn through each basin marsh every burn, but frequent fires are important for the maintenance of edge habitats or ecotonal areas.

Dome swamps are scattered throughout the Reserve. Fire will be allowed to burn into the domes to maintain the characteristic open edges of the domes while preventing excessive peat accumulation.

The basin swamp is not a primary target for fire management at the Reserve; however, this natural community grades into wet 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 maintain the ecotone between the two systems by prohibiting 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.

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 the Reserve 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). As the city of Gainesville and the surrounding areas become increasingly urbanized, smoke management concerns will increase in magnitude, as there become fewer acceptable places to maneuver a smoke column from a prescribed fire.

While the Reserve has an acceptable smoke shed in which to place a smoke column from a prescribed fire, there are smoke sensitive areas that surround the Reserve and affect the smoke management of each burn unit. Smoke management is a limiting factor in the application of prescribed fire with in the Reserve, and particularly at the Lybass parcel. This parcel is bound on the east side by CR 325. Additionally, the city of Gainesville is northwest of the property. Figure 1 illustrates the smoke management area for the Reserve. As development increases in the area, fire management will become more difficult. Increasing daily traffic on CR 325 and other local roads will further complicate the District's ability to implement prescribed burns at the appropriate fire return intervals within the Reserve. Each of the parcels has an acceptable smoke shed into which to place a smoke column from a prescribed fire.

Depending on the arrangement and composition of fuels, fire spread will be through grasses and/or needle litter or the shrub layer. Areas within the Reserve having heavier shrub and midstory fuel accumulation can burn for extended periods of time causing additional smoke management issues.

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

On burn day, the ability of smoke to mix and disperse into the atmosphere should be good. 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.



*Figure 1: Fire management – smoke sensitive 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.

The pyric plant communities within the River Styx parcel are dominated by dense pine plantations. The harvesting of planted pine is integral to a successful prescribed fire program within the Reserve. The District anticipates harvesting planted pine areas within the River Styx when the oldest pine plantations reach 16 years of age. 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 have been delineated on the property. Where logical, the District used existing roads and landscape features to delineate fire management units. Occasionally, multiple fire management units with similar fire needs will be burned simultaneously and roads and natural landscape features provide a break in fuels so that staff may burn smaller areas than initially planned if needed.

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

#### Exhibit 1 Aerial Burn Safety Plan Longleaf Flatwoods Reserve

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. IGNITION MACHINE SAFETY** The operator will review the operation and cleaning procedures for the dispenser at the morning briefing.
- 4. **PERSONAL PROTECTIVE EQUIPMENT** The incident commander will ensure that all personnel have the required PPE.
- 5. HIGH HAZARD AREAS All high hazard areas such as power lines shall be designated on the map and attached to the burn plan.
- 6. EMERGENCY LANDING ZONES These should be confirmed with the pilot and indicated on the burn map. Helispot Latitude \_\_\_\_\_\_"N

Longitude \_\_\_\_\_"W

## **Crash Rescue Plan**

#### In the event of an accident involving the helicopter the following procedures will be followed. INCIDENT COMMANDER or BURN BOSS

- 1. Notify 911
- 2. Notify Alachua County Fire Rescue (352)955-1818
- 3. Notify Alachua Sheriff's Office (352)367-4040
- 4. Assume responsibility of the Rescue Operation.
- 5. Notify NTSB (305)957-4610 OR 404-462-1666)
- 6. Delegate responsibility of fire control to the second in command or the most qualified.

#### SECOND IN COMMAND

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

#### Level I Trauma Center

	1. Shands Gainesville –	352-265-0111
<b>FLORID</b>	A FOREST SERVICE	
	1. Waccasassa Dispatch	352-395-4951
NTSB	1. Southeast Regional Office	305-957-4610
	2. Southeast Field Office	404-462-1666

# ADDENDUM 3: LONGLEAF FLATWOODS RESERVE SPECIES LIST

Plants	
Dicotyledons	
Specific Name	Common Name (Conservation Status)
Acer rubrum	Southern Red Maple
Agalinis laxa	Foxglove
Agalinis purpurea	Purple False Foxglove
Ageratina jucunda	Hammock Snakeroot
Aralia spinosa	Devil's Walkingstick
Aristolochia serpentaria	Virginia Snakeroot
Arnoglossum floridanum	Florida Indian Plantain
Asclepias humistrata	Pinewoods Milkweed
Asclepias pedicellata	Savannah Milkweed
Asimina angustifolia	Slim Leaf Pawpaw
Asimina incana	Wooly Pawpaw
Asimina obovata	Bigflower Pawpaw
Asimina parviflora	Small-Fruited Pawpaw
Asimina pygmea	Dwarf Pawpaw
Asimina reticulata	Netted Pawpaw
Baccharis halimifolia	Groundsel Tree/Sea Myrtle
Baptisia lecontei	Pineland Wild Indigo
Berlandiera subacaulis	Florida Greeneyes
Bejaria racemosa	Tarflower
Bidens mitis	Small Fruit Begger-Ticks
Brasenia schreberi	Water Shield
Buchnera americana	American Bluehearts
Callicarpa americana	Beautyberry
Carphephorus corymbosus	Florida Paintbrush
Carphephorus paniculatus	Hairy Chaffhead
Carya glabra	Pignut Hickory
Celtis laevigata	Hackberry
Centella asiatica	Spadeleaf
Cephalanthus occidentalis	Buttonbush
Cinnamomum camphora	Camphor-Tree
Cirsium horridulum	Purple Thistle
Cnidoscolus stimulosus	Tread-Softly
Crocanthemum corymbosum	Pinebarren Frostweed
Crotalaria spectabilis*	Showy Ratilebox
Croton argyrantnemus	Silver Croton
Cuscuta gtonovii*	Love Vine, Dodder
Diospyros virginiana	Persimmon
Erecntites hieraciifolius	Fireweed
Erigeron quercifolius	Uaklear Fleadane
Erigeron vernus	Early whitetop Fleabane

Eryngium aromaticum Fragran Erngo Eryngium baldwinii Baldwin'S Eryngo Dog Fennel Eupatorium capillifolium *Eupatorium compositifolium* Yankeeweed Eupatorium mikanioides Semaphor Thoroughwort Eupatorium mohrii Mohr's Thoroughwort Euthamia caroliniana Slender Flattop Goldenrod Galactia volubilis Eastern Milkpea *Gamochaeta pensylvanica* Pennsylvania Everlasting Gaylussacia frondosa var. tomentosa Gelsemium sempervirens Gordonia lasianthus Loblolly Bay Helenium amarum Spanish Daisy Crocanthemum corymbosum Hieracium gronovii Queen-Devil *Hypericum crux-andreae* Hypericum gentianoides Pineweeds Hypericum mutilum Hypericum myrtifolium Hypericum tetrapetalum Hypoxis juncea Ilex cassine Dahoon Holly Ilex glabra Ilex opaca Kalmia hirsuta Hairy Laurel Krigia virginica Lepidium virginicum *Liatris gracilis* Liatris tenuifolia Licania michauxii Gopher Apple Liquidambar styraciflua Sweetgum Litsea aestivalis\*\* Lobelia paludosa White Lobelia Ludwigia repens Lygodesmia aphylla Rose-Rush Lyonia ferruginea Lyonia lucida Fetterbush Magnolia virginiana Marshallia graminifolia Mimosa quadrivalvis Sensitive Brier var.angustata Mitreola sessilifolia Wax Myrtle Morella cerifera Nyssa sylvatica var. biflora Swamp Tupelo Nyssa sylvatica var. sylvatica Blackgum

Blue Huckleberry Yellow Jessamine Pinebarren Frostweed St. Peter's-Wort Dwarf St. John's Wort Myrtleleaf St. John's Wort Fourpetal St. John's Wort Fringed Yellow Stargrass Inkberry, Gallberry American Holly Dwarf Dandelion Poor man's Pepper Slender Gayfeather Shortleaf Gayfeather Pondspice (G3S2, SE, FN) Creeping Primrosewillow Rusty Staggerbush Sweetbay Magnolia Grassleaf Barbara's Button Swamp Hornpod

**Opuntia** humifusa Parthenocissus quinquefolia Persea borbonia Phoebanthus grandiflorus Pinguicula lutea\*\* Piriqueta cistoides subsp. caroliniana Pityopsis graminifolia Pluchea odorata Polygala lutea Polygala nana Polygala setacea Persicaria glabra Prunus caroliniana Prunus serotina Pterocaulon pycnostachyum Ptilimnium capillaceum Quercus chapmanii Quercus falcata Quercus geminata Quercus laevis Quercus laurifolia Quercus nigra Quercus pumila Quercus stellata var. margaretta Quercus virginiana Rhexia mariana Rhus copallina Rhynchosia difformis Ruellia caroliniensis Sabatia brevifolia Salix caroliniana Sarracenia flava Sarracenia minor\*\* Saururus cernuus Sericocarpus tortifolius Solidago odora var. chapmanii Solidago fistulosa Sophronanthe hispida Stillingia sylvatica Tephrosia florida Tephrosia hispidula Toxicodendron radicans Trichostema dichotomum Ulmus americana

**Prickly-Pear Cactus** Virginia Creeper Redbay Florida False Sunflower Yellow Butterwort (ST, FN) Pitted Stripeseed Narrowleaf Silkgrass Sweetscent Orange Milkwort Candyroot Coastalplain Milkwort Dense Flower Knotweed Carolina Laurel Cherry Wild Cherry Blackroot Mock Bishopsweed Chapman's Oak Southern Red Oak Sand Live Oak Turkey Oak Laurel Oak Water Oak Running Oak Sand Post Oak Live Oak Pale Meadowbeauty Winged Sumac **Doubleform Snoutbean** Carolina Wild Petunia Shortleaf Rosegentian Carolina Willow Yellow Pitcher-Plant Hooded Pitcher-Plant (ST) Lizard's-Tail Whitetop Aster Chapman's Goldenrod Pinebarren Goldenrod Rough Hedgehyssop Queen's Delight Florida Hoarypea Sprawling Hoarypea Poison Ivy Forked Bluecurls American Elm

Vaccinium arboreum
Vaccinium myrsinites
Vaccinium stamineum
Viola sororia
Vitis rotundifolia
Wahlenbergia marginata*

#### Monocotyledons

Aletris obovata Andropogon glomeratus var. glaucopsis Andropogon ternarius Anthaenantia villosa Aristida spiciformis Aristida stricta var. beyrichiana Callisia graminea *Commelina erecta* Eragrostis spectabilis Fuirena scirpoidea Imperata cylindrica\* Juncus effusus subsp. Solutus Juncus marginatus Lachnanthes caroliniana Lachnocaulon anceps Lemna obscura **Oplismenus hirtellus** Panicum hemitomon Paspalum notatum\* Paspalum setaceum Rhynchospora colorata Sabal palmetto Schoenocaulon dubium Serenoa repens Sisyrinchium angustifolium Smilax bona-nox Sorghastrum secundum Sporobolus junceus Syngonanthus flavidulus Tillandsia usneoides Xyris fimbriata Yucca aloifolia Yucca filamentosa Zephyranthes atamasca\*\*

Sparkleberry Shiny Blueberry Deerberry Common Blue Violet Muscadine Grape Southern Rockbell

Southern Colicroot Bushy Bluestem

Splitbeard Bluestem Green Silkyscale Bottlebrush Threeawn Wiregrass

Grassleaf Roseling Whitemouth Dayflower Purple Lovegrass Southern Umbrellasedge Cogongrass Soft Rush Grassleaf Rush Bloodroot Whitehead Bogbutton Little Duckweed Woodsgrass Maidencane **Bahiagrass** Thin Paspalum Starrush Whitetop Cabbage Palm Florida Feathershank Saw Palmetto Narrowleaf Blue-Eyed Grass Greenbrier; Catbrier Lopsided Indiangrass Pineywoods Dropseed Yellow Hatpins Spanish Moss Yellow-Eyed Grass Spanish Dagger Adam's Needle Atamasco Lily (ST)

## Pterophytes

Athyrium filix-femina**	Southern Lady Fern (ST)
Lygodium japonicum*	Japanese Climbing Fern
Osmunda cinnamomea	Cinnamon Fern
Phlebodium aureum	Golden Polypody
Pleopeltis michauxiana	Resurrection Fern
Pteridium aquilinum var.	Tailed Bracken
pseudocaudatum	
Vittaria lineata	Shoestring Fern
Woodwardia virginica	Virginia Chain Fern

## **Birds**

Specific Name	Common Name (Conservation Status)
Blackbirds	
Quiscalus major	Boat-tailed Grackle
Molothrus ater	Brown-headed Cowbird
Quiscalus quiscula	Common Grackle
Agelaius phoeniceus	Red-winged Blackbird

#### Cardinals, Grosbeaks, and Allies *Guiraca caerulea* Blue Grosbeak

Guiraca caeruiea	Blue Grosbeak
Passerina cyanea	Indigo Bunting
Cardinalis	Northern Cardinal
Piranga rubra	Summer Tanager

#### Catbirds, Mockingbirds, and Thrashers

Toxostoma rufum	Brown Thrasher
Dumetella carolinensis	Gray Catbird
Mimus polyglottos	Northern Mockingbird

Cormorants and Anhingas Anhinga

Anhinga

#### Cranes

Grus canadensis\*\*

Sandhill Crane (G5T2T3, S2S3, ST, FN)

#### Cuckoos

Coccyzus americanus

Yellow-billed Cuckoo

#### Falcons and Caracaras Falco sparverius Falco columbarius\*\*

American Kestrel Merlin (G2S2, SN, FN)

#### Finches, Euphonias, and Allies Spinus tristis

American Goldfinch

Gnatcatchers	
Polioptila caerulea	Blue-gray Gnatcatcher
Grouse, Quail, and Allies	
Colinus virginianus	Northern Bobwhite
Meleagris gallopavo	Wild Turkey
Herons, Ibis, and Allies	
Bubulcus ibis	Cattle Egret
Ardea herodias	Great Blue Heron
Ardea alba	Great Egret
Egretta caerulea**	Little Blue Heron (G5S4, ST, FN)
Egretta thula	Snowy Egret (G5S3, FN)
Eudocimus albus**	White Ibis (G5S4, SN, FN)
Nyctanassa violacea	Yellow-crowned Night-heron (G5S3, FN)
Humminghirds	
Archilochus colubris	Ruby-throated Humminghird
Architochus cotubris	Ruby-unbace Hummingbild
Jays, Magpies, Crows, and Ravens	
Corvus brachyrhynchos	American Crow
Cyanocitta cristata	Blue Jay
Corvus ossifragus	Fish Crow
Kingfishers	
Megaceryle alcyon	Belted Kingfisher
Kinglets	
Regulus calendula	Ruby-crowned Kinglet
Loons and Grebes	a i
Gavia immer	Common Loon
Podilymbus podiceps	Pied-billed Grebe
Martins and Swallows	
Hirundo rustica	Barn Swallow
Progne subis	Purple Martin
Tachycineta bicolor	Tree Swallow
Now World Sporroug	
Peucaea aestivalis	Bachman's Sparrow
Spizella passoring	Chipping Sparrow
Divilo amthereshtheless	Eastern Towhee
Pipuo erythrophthalmus	Eastern 10wnee
Spizena pusilia	Field Sparrow
Ammodramus savannarum	Grassnopper Sparrow
Passerculus sandwichensis	Savannah Sparrow
Melospiza melodia	Song Sparrow
Melospiza georgiana	Swamp Sparrow

Nightj	ars	
	Caprimulgus carolinensis	Chuck-will's-widow
	Chordeiles minor	Common Nighthawk
Nutha	tches	
	Sitta pusilla	Brown-headed Nuthatch
Owls		
	Strix varia	Barred Owl
	Megascops asio	Eastern Screech-Owl
	Bubo virginianus	Great Horned Owl
Pigeoi	ns and Doves	
0	Columbina passerina	Common Ground-Dove
	Zenaida macroura	Mourning Dove
Rails.	Gallinules, and Allies	
,	Gallinula chloropus	Common Moorhen
	Porzana carolina	Sora
	Rallus limicola	Virginia Rail
Shore	birds	
	Charadrius vociferus	Killdeer
	Tringa melanoleuca	Greater Yellowlegs
	Gallinago delicata	Wilson's Snipe
Shrike	es	
	Lanius ludovicianus	Loggerhead Shrike
Storks	5	
	Mycteria Americana**	Wood Stork (G4S2, SN, FN)
Swifts	3	
	Chaetura pelagica	Chimney Swift
Thrus	hes	
	Turdus migratorius	American Robin
	Sialia sialis	Eastern Bluebird
	Catharus guttatus	Hermit Thrush
Tits, C	Chickadees, and Titmice	
	Poecile carolinensis	Carolina Chickadee
	Baeolophus bicolor	Tufted Titmouse
	Setophaga ruticilla**	American Redstart (G5, S4, SN, FN)
	Mniotilta varia	Black-and-white Warbler
	Geothlypis trichas	Common Yellowthroat
	Parula americana	Northern Parula

Oreothlypis celata	Orange-crowned Warbler
Seiurus aurocapilla	Ovenbird
Dendroica palmarum	Palm Warbler
Dendroica pinus	Pine Warbler
Dendroica discolor	Prairie Warbler
Dendroica coronata	Yellow-rumped Warbler
Dendroica dominica	Yellow-throated Warbler

#### Tyrant Flycatchers: Pewees, Kingbirds, and Allies

Empidonax virescens	Acadian Flycatcher
Tyrannus tyrannus	Eastern Kingbird
Sayornis phoebe	Eastern Phoebe
Contopus virens	Eastern Wood-Pewee
Myiarchus crinitus	Great Crested Flycatcher
myun chus crinitus	Oreat Crested Prycatell

#### Vireos

Myiarchus crinitus	Great Crested Flycatcher
Vireo solitarius	Blue-headed Vireo
Vireo olivaceus	Red-eyed Vireo
Vireo griseus	White-eyed Vireo
Vireo flavifrons	Yellow-throated Vireo

#### Vultures, Hawks, and Allies

Haliaeetus leucocephalus\*\* Accipiter cooperii Ictinia mississippiensis Circus cyaneus Pandion haliaetus\*\* Buteo lineatus Buteo jamaicensis Accipiter striatus Elanoides forficatus\*\* Coragyps atratus Cathartes aura Bald Eagle (G5S3, SN, FN) Cooper's Hawk Mississippi Kite Northern Harrier Osprey (G5S3, SN, FN) Red-shouldered Hawk Red-tailed Hawk Sharp-shinned Hawk Swallow-tailed Kite (G5S2, SN, FN) Black Vulture Turkey Vulture

#### Wagtails and Pipits Anthus rubescens

Anthus rubescens

American Pipit

#### Waterfowl

Dendrocygna autumnalis Aix sponsa Black-bellied Whistling-Duck Wood Duck

#### Woodpeckers

Picoides pubescens Picoides villosus Colaptes auratus Dryocopus pileatus Downy Woodpecker Hairy Woodpecker Northern Flicker Pileated Woodpecker

Melanerpes carolinus	Red-bellied Woodpecker
Melanerpes erythrocephalus	Red-headed Woodpecker
Sphyrapicus varius	Yellow-bellied Sapsucker

## Wrens

Thryothorus ludovicianus	Carolina Wren
Troglodytes aedon	House Wren
Cistothorus platensis	Sedge Wren

## Mammals

Specific Name	Common Name (Conservation Status)
Dasypus novemcinctus	Nine-Banded Armadillo
Geomys pinetis	Southeastern Pocket Gopher
Lynx rufus	Bobcat
Odocoileus virginianus	White-Tail Deer
Sciurus carolinensis	Eastern Grey Squirrel
Sciurus niger shermani	Sherman's Fox Squirrel (G5T3S3, SSC)
Sus scrofa	Feral hog

# Amphibians Specific Name

Amphibians	
Specific Name	Common Name (Conservation Status)
Acris gryllus dorsalis	Florida cricket frog
Ambystoma talpodium	Mole salamander
Bufo terrestris	Southern toad
Gastrophryne carolinensis	Eastern Narrow-mouthed Toad
Hyla gratiosa	Barking treefrog
Hyla femoralis	Pinewoods Treefrog
Hyla squirella	Squirrel Treefrog
Lithobates capito	Gopher frog (G3S3)
Lithobates grylio	Pig frog
Notophthalmus perstriatus	Striped Newt (G2G3S2, SC, FN)
Pseudacris ocularis	Little Grass Frog
Siren lacertina	Greater Siren

# Fish

Specific Name	Common Name
Acantharchus pomotis	Mud sunfish (G4G5S3, FN)
Gambusia holbrooki	Mosquito fish
Jordanella floridae	Flag fish
Umbra pygmaea	Eastern mudminnow (G5S3, FN)

# Reptiles

Specific Name	Common Name (Conservation Status)
Agkistrodon piscivorus conanti	Florida cottonmouth
Alligator mississippiensis**	American alligator (G5 S4 SAT FT(S/A))
Anolis carolinensis	Green anole

Anolis sagrei*	Brown anole
Aspidoscelis sexlineata	Six-lined racer
Crotalus adamenteus	Eastern diamondback rattlesnake
Deirochelys reticularia	Florida chicken turtle
Drymarchon couper	Eastern indigo snake (G3QS1, SFT, FT)
Gopherus polyphemus**	Gopher tortoise (G3S3, C, ST)
Masticophis flagellum flagellum	Eastern coachwhip
Sceloporus undulatus	Southern fence lizard
Scincella lateralis	Ground skink
Sistrurus miliarius barbouri	Dusky pygmy rattlesnake
Thamnophis sauritus sackeni	Peninsula ribbon snake
Thamnophis sirtalis sirtalis	Eastern Garter snake

# Invertebrates

Order	Specific Name	Common Name
Acrididae	Schistocerca americana	American grasshopper
Acrididae	Achurum carinatum	Long-headed toothpick Grasshopper
Acrididae	Psinidia fenestralis	Longhorn Bandwinged Grasshopper
Acrididae	Pardalophora phoenicoptera	Orange-winged Grasshopper
Acrididae	Rusty Grasshopper	Schistocerca alutacea
Acrididae	Chortophaga viridifasciata	Southern Greenstriped Grasshopper
Acrididae	Arphia granulata	Southern Yellow-winged Grasshopper
Acrididae	Spharagemon marmoratum	Marbled Grasshopper
Aranea	Latrodectus mactans	Black Widow Spider
Aranea	Mastophora timuqua	Bolas Spider
Aranea	Hogna lenta	Field Wolf Spider
Aranea	Nephila clavipes	Golden Silk Orb Weaver
Aranea	Peucetia viridans	Green Lynx Spider
Aranea	Gasteracantha cacriformis	Spinybacked Orbweaver
Carabidae	Cicindela scutellaris	Festive Tiger Beetle
Carabidae	Cicindelidia punctulata	Punctured Tiger Beetle
Coleoptera	Dytiscus sp.	Diving Beetle
Coleoptera	Cicindela punctulata	Punctured Tiger Beetle
Coleoptera	Hydrophilus sp.	Water Scavenger Beetle
Coleoptera	Grinus sp.	Whirligig Beetle
Coleoptera	Cicindelidia abdominalis	Eastern Pinebarrens Tiger Beetle
Coleoptera	Ellipsoptera hirtilabris	Moustached Tiger Beetle
Coleoptera	Xyleborus glabratus	Red bay ambrosia beetle
Diptera	Chrysops sp.	Deer fly
Diptera	Plecia nearctica	Lovebug
Hemiptera	Notonecta sp.	Backswimmer
Hemiptera	Neocicada hieroglyphica	Heiroglyphic Cicada
Heteropter	Lethocerus sp.	Giant Water Bug
Heteroptera	Gerris sp.	Water Strider

Hymenoptera Hymenoptera Hymenoptera Hymenoptera Hymenoptera Hymenoptera Ixodida Lepidoptera Lycidae Neuroptera Odonata Odonata Odonata Odonata Odonata Odonata Odonata Odonata

Dolichovespula maculata Campsomeris plumipes Pogonomyrmex badius Monobia quadridens Solenopsis invicta Campsomeris quadrimaculata Amblyomma americanum Vanessa virginiensis Hermeuptychia sosybius Leptotes cassius Hemiargus ceraunus Pontia protodice Phoebis sennae Junonia coenia Papilio glaucus Atlides halesus Strymon melinus Agraulis vanillae Erynnis horatius *Calephelis virginiensis* Pyrisitia lisa Danaus plexippus Colias eurythene Papilio palamedes *Phyciodes tharos* Phyciodes phaon **Battus** philenor Grammia placentia Utetheisa ornatrix Limenitis arthemis Satyrium favonius Copaeodes minima Papilio troilus Asterocampa clyton Heliconius charithonia Eurytides marcellus Calopteron discrepans Glenurus gratus Enallagma doubledayi Libellula axilena Pachydiplax longipennis Tramea carolina Ischnura hastata Anax junius Perithemis tenera Erythemis simplicicollis

**Baldfaced Hornet** Digger wasp Florida Harvester Ant Four-toothed Mason Wasp Red imported fire ant Scolid Wasp Lone Star Tick American Lady Carolina Satyr **Cassius Blue** Ceraunus Blue **Checkered White Cloudless Sulphur Common Buckeye** Eastern Tiger Swallowtail Giant Purple Hairstreak Gray Hairstreak **Gulf Fritillary** Horace's Duskywing Little Metalmark Little Yellow Sulfur Monarch **Orange Sulfur** Palamedes Pearl Crescent Phaon Crescent Pipevine Swallowtail Placentia Tiger Moth Rattlebox Moth **Red-spotted Purple** Southern Hairstreak Southern Skipperling Spicebush Swallowtail tawny emperor Zebra Longwing Zebra Swallowtail Banded Net-wing Beetle Antlion Atlantic Bluet Bar-winged Skimmer Blue Dasher Carolina Saddlebags Citrine Forktail Common Green Darner Eastern Amberwing Eastern Pondhawk

Odonata	Ischnura posita	Fragile Forktail
Odonata	Ischnura prognata	Furtive Forktail
Odonata	Libellula auripennis	Golden-winged Skimmer
Odonata	Celithemis eponina	Halloween Pennant
Odonata	Erythrodiplax minscula	Little Blue Dragonlet
Odonata	Libellula needhami	Needham's Skimmer
Odonata	Tricanthagyna trifida	Phantom Darner
Odonata	Ischnura ramburii	Rambur's Forktail
Odonata	Coryphaeschna ingens	Regal Darner
Odonata	Orthemis ferruginea	Roseate Skimmer
Odonata	Lestes australis	Southern Spreadwing
Odonata	Pantala flavescens	Wandering Glider
Orthoptera	Neoscapteriscus sp.	Mole Cricket
Chilopoda	Hemiscolopendra marginata	Florida blue centipede

#### \*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

- **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.