# CLARK BAY CONSERVATION AREA
## LAND MANAGEMENT PLAN

VOLUSIA COUNTY, FLORIDA

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

NOVEMBER 14, 2023


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

# EXECUTIVE SUMMARY

**MANAGEMENT AREA SIZE:** 5,134 acres

**DATE OF ACQUISITION**: Acquisition of parcels within Clark Bay Conservation Area began in July 2002.

**DATE OF PLAN**: November 14, 2023
**MAJOR BASINS:** Lower St. Johns River and Northern Coastal
**PLANNING BASINS:** Crescent Lake and Halifax River

**LOCATION**: Clark Bay Conservation Area (CBCA or Property) is located northeast of the city of DeLand in Volusia County.

**FUNDING SOURCE**: The acquisition funding sources for CBCA include Florida Forever, ad valorum, Florida Department of Transportation (FDOT) mitigation and donation, and Volusia Forever.

**MANAGEMENT PARTNERS:** The St. Johns River Water Management District (District) is lead manager of Clark Bay Conservation Area.

**VISION STATEMENT:** The management focus for CBCA is the continued protection of the water resources of the Lower St. Johns River Basin. This includes protection of nearly 3,200 acres of diverse wetlands associated with the headwaters of Little Haw Creek. Activities occurring on the uplands within the Property include forest resource, wildland fire and fuels and invasive species management for the maintenance and restoration of its natural systems.

**RESOURCE PROTECTION AND MANAGEMENT:**

- **WATER RESOURCES** – Water resources are largely undisturbed, with most protection accomplished through acquisition. The Property protects nearly 3,200 acres of diverse wetlands including basin swamp, depression marsh and dome swamp.
- **FOREST MANAGEMENT AND RESTORATION** – Forest management activities will include clearcut harvests of sand pine, thinning of slash and loblolly pine plantations, monitoring for disease and insect infestation, and re-establishing longleaf and slash pine.
- **FIRE MANAGEMENT** – The application of prescribed fire will occur in accordance with the annual burn plan and the Clark Bay Fire Management Plan.
- **FLORA AND FAUNA** – CBCA provides habitat for numerous wildlife species, including the Florida black bear (*Ursus americanus floridanus*), and listed species including the gopher tortoise (*Gopherus polyphemus*) and wood stork (*Mycteria americana*). Invasive exotic plant and animal species occur on the property. The District regularly monitors for the presence of invasive plants and animals and executes appropriate control actions as needed.

- **CULTURAL AND HISTORICAL RESOURCES** – A review of the Department of State Division of Historical Resources Master Site File indicates no known or registered cultural sites within the boundaries of the Property.

## LAND USE MANAGEMENT:

- **ACCESS** – One public access point is located on the Property.
- **RECREATION** – The Property is open to the public for hiking, bicycling, equestrian activities, wildlife viewing, and hunting.
- **SECURITY** – Maintenance of fence lines, parking areas, gates, and locks is conducted by the District. District staff coordinate with the Florida Fish and Wildlife Conservation Commission (FWC) and local law enforcement for security needs.

## ADMINISTRATION:

- **REAL ESTATE ADMINISTRATION** – Over 700 acres have been identified as potential acquisitions to CBCA. In addition, the District may consider purchasing parcels near the Property that become available and that will aid in the conservation of water resources within the Crescent Lake and Deep Creek basins and the Volusia Conservation Corridor. Additionally, the District may pursue acquisition of small parcels, property exchanges, or access easements with adjacent landowners to provide additional/improved access to the Property.
- **COOPERATIVE AND SPECIAL USE AGREEMENTS, LEASES, AND EASEMENTS** – The District and Volusia County are parties to an intergovernmental management agreement designating the District as the lead manager for CBCA. Additionally, there are four special-use authorizations on CBCA. The District administers revenue-generating apiary and communication tower leases. Two deeded access easements encumber CBCA.
- **MANAGEMENT COSTS AND REVENUES** – Management costs at CBCA were $417,984 from 2011–2023 and are projected at $468,790 from 2024–2033. Revenues from apiary and communication tower leases as well as timber sales were $631,349 from 2011–2023 and are projected at $670,604 from 2024–2033.

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## VISION STATEMENT

The management focus for Clark Bay Conservation Area is the continued protection of the water resources of the Lower St. Johns River Basin. This includes protection of nearly 3,200 acres of diverse wetlands associated with the headwaters of Little Haw Creek. Activities occurring on the uplands within Clark Bay include forest resource, wildland fire and fuels and invasive species management for the maintenance and restoration of the Property's natural systems.

# OVERVIEW

This document provides the goals and strategies to guide land management activities at the Clark Bay Conservation Area (CBCA or the Property) over the next 10 years. This land management plan was developed in accordance with Section 373.1391 and Section 373.591, Florida Statutes. This is the third land management plan for the Property.

The St. Johns River Water Management District (District) owns an interest in nearly 780,000 acres of land across 18 counties, acquired for the purposes of water management, water supply, and the conservation and protection of water resources. The District is the lead manager of approximately 435,000 acres of these lands.

### LOCATION

Clark Bay Conservation Area covers approximately 5,134 acres in Volusia County, mostly within the Crescent Lake planning basin of the Lower St. Johns River major basin. A small portion of CBCA falls within the Halifax River planning basin of the Northern Coastal Basin. The Property includes seven parcels and is located in numerous sections of Townships 15 and 16 South and Ranges 30 and 31 East.

The Property is located north of U.S. Highway 92 and northeast of the city of DeLand. The DeLand Municipal Airport is approximately a half mile west of the southern end of the Property. Figure 1 depicts the location of the Property, and Figure 2 is a 2021 aerial image of the Property.

The District is the lead manager for CBCA. Volusia County retains 50 percent undivided interest on 4,795 acres of the Property and has entered into an intergovernmental agreement designating the District as the manager.

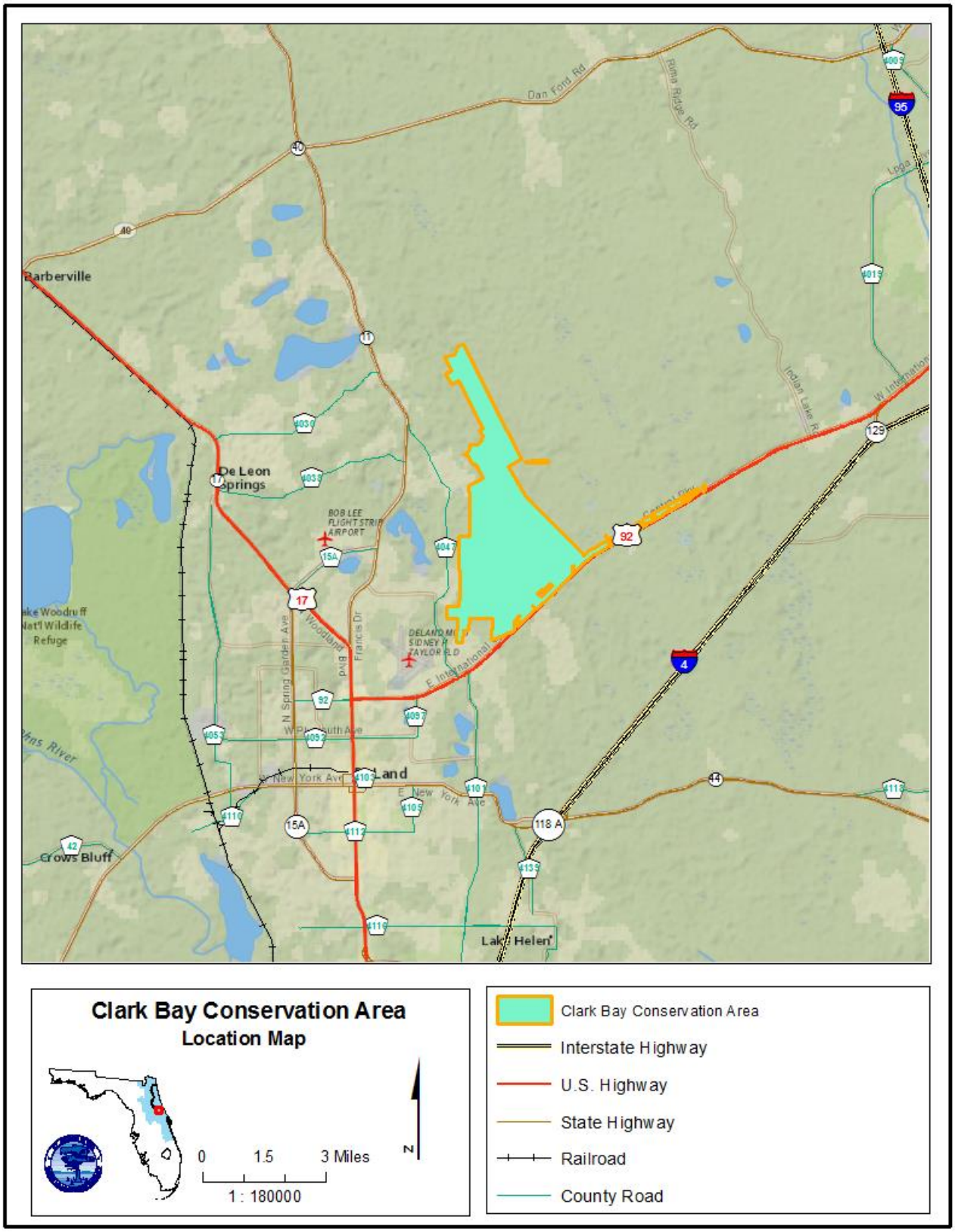


*Figure 1: General Location*

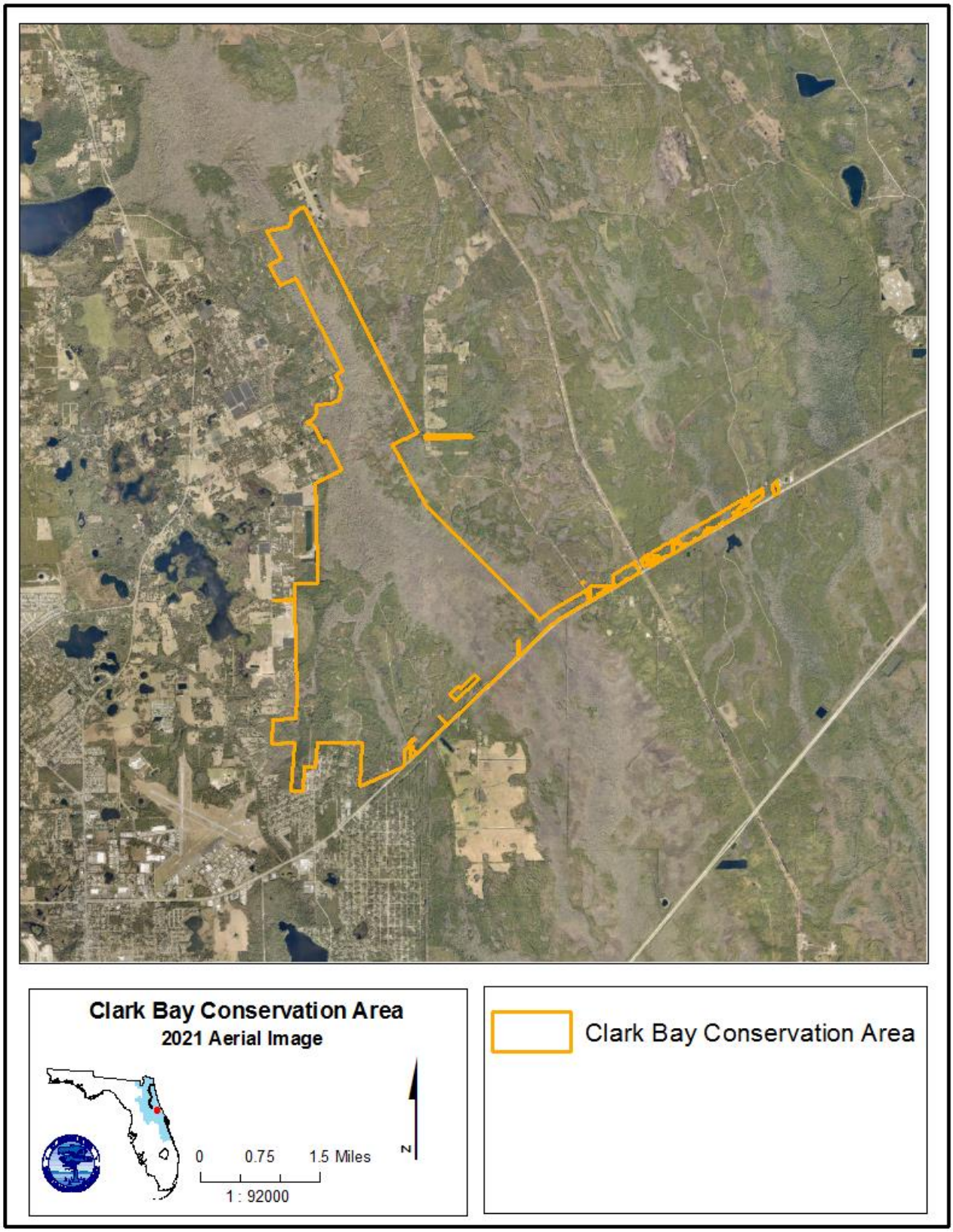


*Figure 2: Aerial Imagery.*

## REGIONAL SIGNIFICANCE

CBCA is an integral component of a larger network of publicly owned lands in Volusia County and provides linkage between a multitude of publicly owned land and conservation easements (Figure 3). These interconnected lands include the Tiger Bay State Forest, Heart Island Conservation Area and Longleaf Pine Preserve as well as several District-held conservation easements (Table 1). This network of lands provides for the protection of water quality and storage, native plant and wildlife species, as well as numerous natural resource-based recreational opportunities. CBCA lies within the Volusia Conservation Corridor, a Florida Forever project encompassing over 61,000 acres, which acts as a wildlife corridor around the Orlando area.

*Table 1: Proximate conservation areas*

| Lead Manager | Conservation Area |
|---|---|
| Relay Timberlands LLC | Relay Tract Conservation Easements |
| City of Port Orange | Port Orange City Forest |
| District | Crescent Lake Conservation Area |
| District | Heart Island Conservation Area |
| District | Hull Swamp Conservation Area |
| District | Lake George Conservation Area |
| District | Lake Norris Conservation Area |
| Florida Department of Environmental Protection (DEP) | Bulow Creek State Park |
| DEP | Haw Creek Preserve State Park |
| DEP | Lower Wekiva River Preserve State Park |
| DEP | Tomoka State Park |
| Florida Forest Service (FFS) | Lake George State Forest |
| FFS | Tiger Bay State Forest |
| U.S. Fish and Wildlife Service | Lake Woodruff National Wildlife Refuge |
| U.S. Forest Service | Ocala National Forest |
| Volusia County | Deep Creek Preserve |
| Volusia County | Doris Leeper Spruce Creek Preserve |
| Volusia County | Lake George Forest |
| Volusia County | Longleaf Pine Preserve |
| Volusia County | University Highlands Parcels |
| Weyerhaeuser Natural Resources | Plum Creek Volusia/Pineland Conservation Easement |

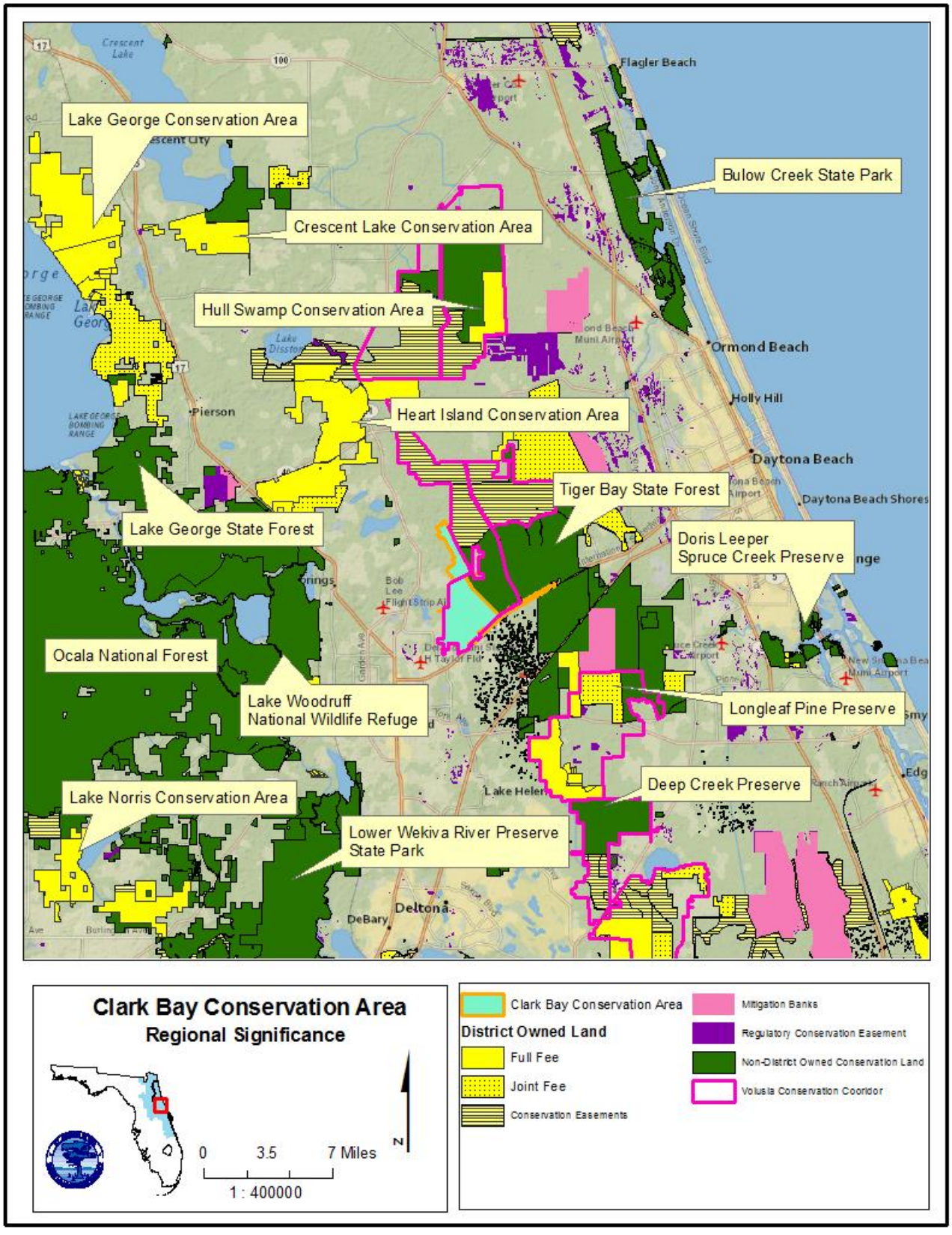


*Figure 3: Regional significance.*

## ACQUISITION HISTORY

Acquisition of the parcels that comprise CBCA provides for the protection of important water resources and ecological functions. These acquisitions are consistent with the goals of the Northern Coastal and Lower St. Johns River basins projects as set forth in the District's Five-Year Strategic Plan and the mitigation goals for the Florida Department of Transportation (FDOT). These goals, as they apply to CBCA, include:

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

Additionally, the Property is within the Florida Forever – Volusia Conservation Corridor and the acquisition of this Property is consistent with the goals of the Volusia Forever program. The primary management goals within this project area are:

- To maintain and conserve the natural environment and provide access for the enjoyment and education of the public.
- To provide resources to ensure sufficient water is available to meet current and future needs.
- To meet the need for high-quality resource based outdoor recreation opportunities, greenways, trails, and open space.
- To ensure that natural resource values of such lands are protected, and the public has the opportunity to enjoy the lands to their fullest potential.

CBCA comprises seven (7) parcels and an access easement totaling 5,134 acres (Figure 4). The parcels that currently comprise CBCA are listed below, and all acreage reported is derived from Geographic Information System (GIS) calculations.

Plum Creek-Volusia 5 and 6 and Zemel (7,303 acres), Land Acquisition number 1994-046-P6:

The Plum Creek-Volusia 5 and 6 and Zemel parcels total 7,303 acres and were acquired by the District on July 30, 2002, for $8,281,200 using Florida Forever funds. Following survey adjustments for rights-of-way on the Plat of Remados that resulted in a reduction of the purchase acres to 7,287 acres, the District was reimbursed $24,646. Volusia County, as part of their Volusia Forever program, contributed $2,126,806.52 to the purchase and retains 50-percent undivided interest in this parcel. A transfer of 3,536 acres of this parcel to the Board of Trustees for the Internal Improvement Trust Fund (BTIIF) occurred on June 10, 2004, with payment to the District in the amount of $4,000,619.70, to be managed by the FFS as part of the adjacent Tiger Bay State Forest. Ending in 2010, FDOT has contributed $2,126,806.52, the equivalent of the District's share of the original purchase price, in mitigation funds.

Plum Creek Volusia 5 Cell Tower Site (0.2 acres), Land Acquisition number 1994-046-P7:

The Plum Creek Volusia 5 Cell Tower Site totals 0.2 acre and was retained by the District during the transaction with the BTIIF that occurred on June 10, 2004, for $215.45 using Florida Forever funds. This parcel contains a communication tower that generates income for the District.

Timberlands Consolidated (1,047 acres), Land Acquisition number 2003-001-P1:

The Timberlands Consolidated parcel totals 1,047 acres and was acquired by the District on July 2, 2003, for $587,058.75 using Florida Forever funds and $587,058.75 from Volusia County's Volusia Forever program for a total purchase price of $1,174,117.50. The County retains 50-percent undivided interest in this parcel.

Downs Clark Bay (10 acres), Land Acquisition number 2012-007-P1:

The Downs Clark Bay parcel totals 10 acres and was acquired by the District for monitoring well access on Dec. 13, 2012, for $54,889 using ad valorem funds.

Clark Bay Addition Spaz (298 acres), Land Acquisition number 2011-003-P1:

The Clark Bay Addition Spaz parcel totals 298 acres and was acquired by the District on April 11, 2014, for $857,548.80 using FDOT mitigation funds.

Plum Creek City of Remados (0.4 acre), Land Acquisition number 2014-007-P1:

The Plum Creek City of Remados parcel totals 0.4 acre and was a donation from Plum Creek, being an outparcel in 2011-003-P1-Clark Bay Addition Spaz. FDOT mitigation funds were used to pay the District's costs of accepting the donation.

Clark Bay Addition Spaz Tax Deed (14 acres), Land Acquisition number 2011-003-P2:

The Clark Bay Addition Spaz Tax Deed parcel totals 14 acres and was acquired by the District on April 20, 2021, for $10,000 using Florida Forever funds.

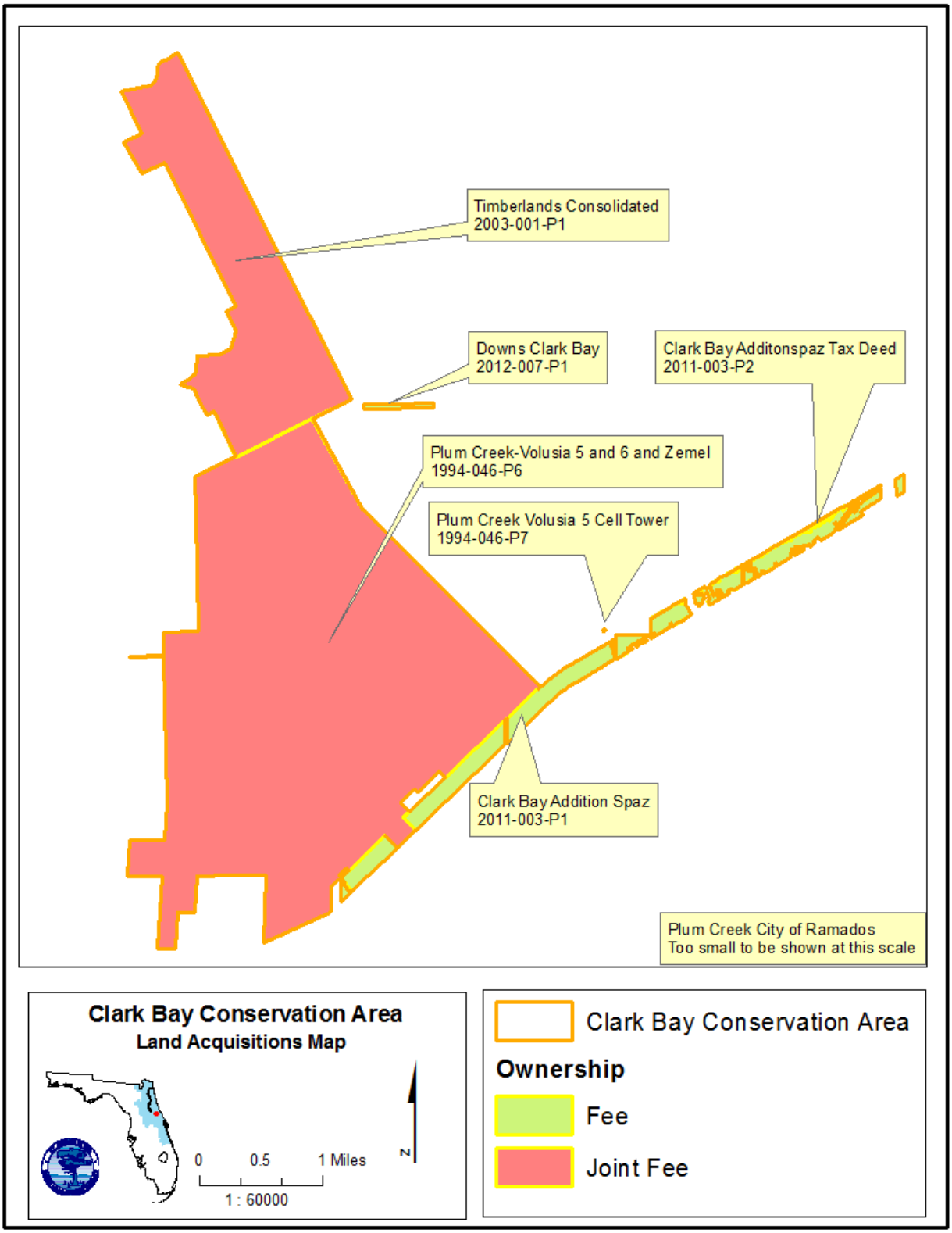


*Figure 4: Acquisition*

### LOCAL GOVERNMENT LAND USE DESIGNATION

Volusia County

According to the 2022 update to the Volusia County Comprehensive Plan, the Future Land Use designation for CBCA is Conservation. This land provides the framework for the preservation, protection, and enhancement of the County's natural resources. This designation divides the goals, objectives, and policies of Volusia County, relating to natural resources, into four broad categories: water resources; natural communities and wildlife; air quality; and mineral resources (Volusia County Growth and Resource Management, 2022).

Other land use designations for property that surrounds the CBCA include:

- Agricultural Resource – This designation consists of lands suited for intensive cultivation, ranching, aquaculture, and timber farming. The maximum residential density shall not exceed one (1) dwelling unit per ten (10) acres.
- Forestry Resource – Areas of land that are primarily suited for silviculture. The maximum residential density shall not exceed one (1) dwelling unit per twenty (20) acres.
- Environmental Systems Corridor – These areas of land are important ecological corridors consisting of environmentally sensitive and ecologically significant lands. The maximum residential density shall not exceed one (1) dwelling unit per twenty-five (25) acres.
- Rural – This designation consists of areas that are a mixture of agriculture and low-density residential development of one (1) dwelling unit per five (5) acres.

## NATURAL RESOURCES

### WATER RESOURCES

CBCA is not located within an Aquatic Preserve or an Area of Critical State Concern pursuant to Section 380.05, Florida Statutes. The majority of the property is located within the Little Haw Creek–Lake Disston sub-basin in the Crescent Lake planning basin of the Lower St. Johns River Basin. The Crescent Lake planning basin covers 605 square miles and is the largest planning basin within the Lower St. Johns River Basin. The major waterbodies of this planning basin include Little Haw and Middle Haw Creek, Crescent Lake, and Lake Disston. A small portion of the eastern part of the Property is within the Halifax River planning basin of the Northern Coastal Basin (Figure 5).

Downstream of the Property, there are several 303(d) listed water bodies, including Lake Disston, Little Haw Creek, and Haw Creek above Crescent Lake. Impairments include lead and macrophyte nutrients (FDEP, 2008).

Important habitat areas include the Deep Creek and Tomoka River/Bulow Creek corridors, Long Swamp, Tiger Bay State Forest, and Bennett Swamp.

Silviculture is the principle surrounding land use to the east and north with development from nearby DeLand affecting the west boundary of the Property.

**Geomorphology**

The CBCA lies within the Atlantic Coastal Complex Province of the Barrier Island Sequence District. This coastal province consists of Quaternary barrier islands, beach ridges, dunes, and estuaries extending from Duval County in the north to Palm Beach County in the south. Many of the province's rivers, creeks, and wetlands developed in swales between the beach ridges. Holocene tidal marshes occur in the north, along the estuarine coastlines and transition to mangrove swamps in the south (Williams, et al, 2022).

Ninety percent of the elevations lie between sea level and 44 feet MSL (NAVD88). The boundary of the Atlantic Coastal Complex Province with the DeLand Ridge Province is where the lower elevation, ridge-and-swale terrain of the Atlantic Coastal Complex Province transitions to higher elevations and greater relief terrain in the DeLand Ridge Province (Williams, et al., 2022). This boundary is depicted in Figure 6, where the low elevations comprising the CBCA transition to higher elevations adjacent and to and west of the CBCA.

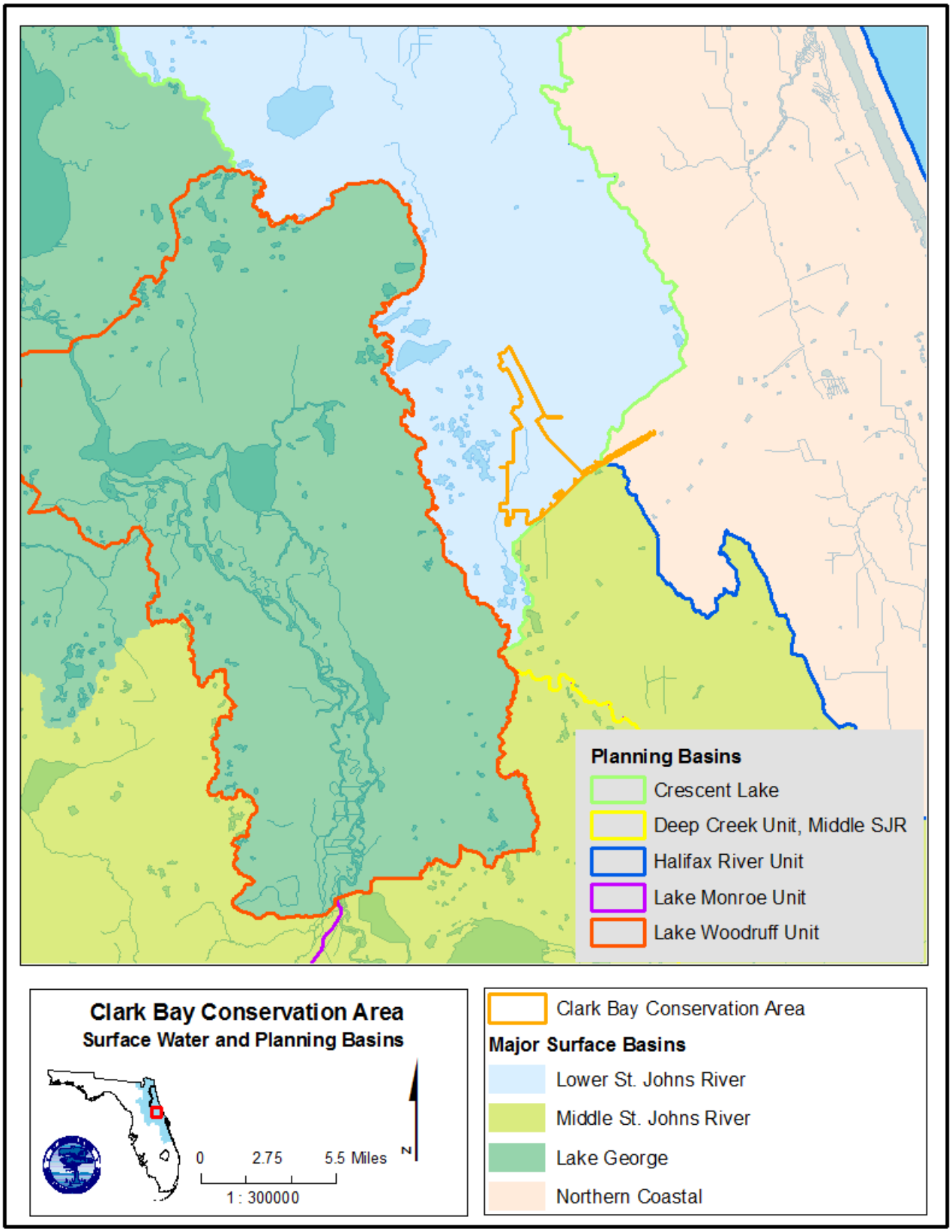


*Figure 5: Location within Planning Basins.*

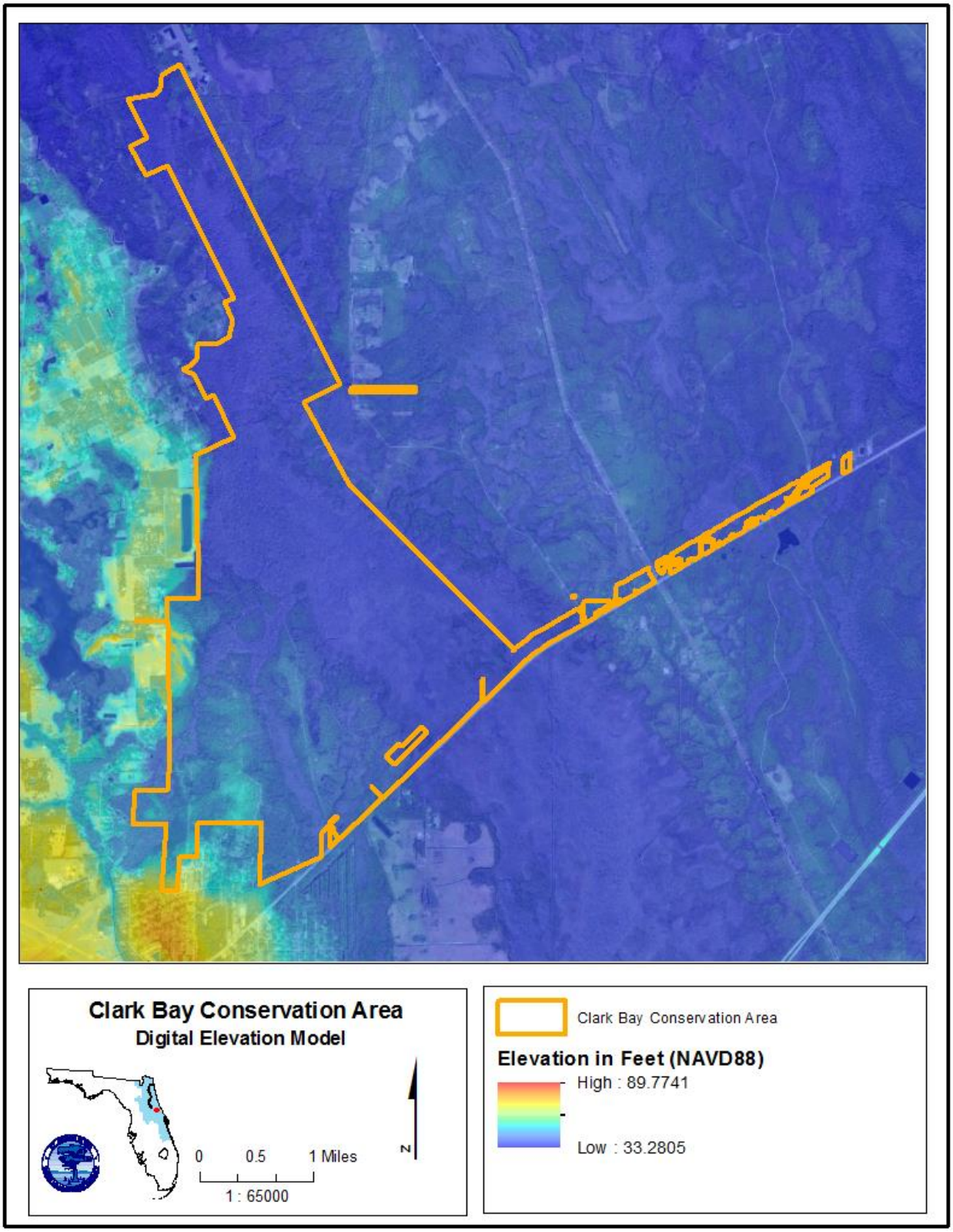


*Figure 6: Clark Bay Conservation Area topography.*

**Water Levels**

The District has active groundwater monitoring well sites located on the Downs Parcel of the Property, which are identified as V-1243 (Upper Floridan aquifer) and V-0802 (Lower Floridan aquifer). Historic water levels for both sites are depicted in Figure 7. Both water levels are plotted together to show the relative elevations (NAVD 1988) of the water levels in each aquifer.

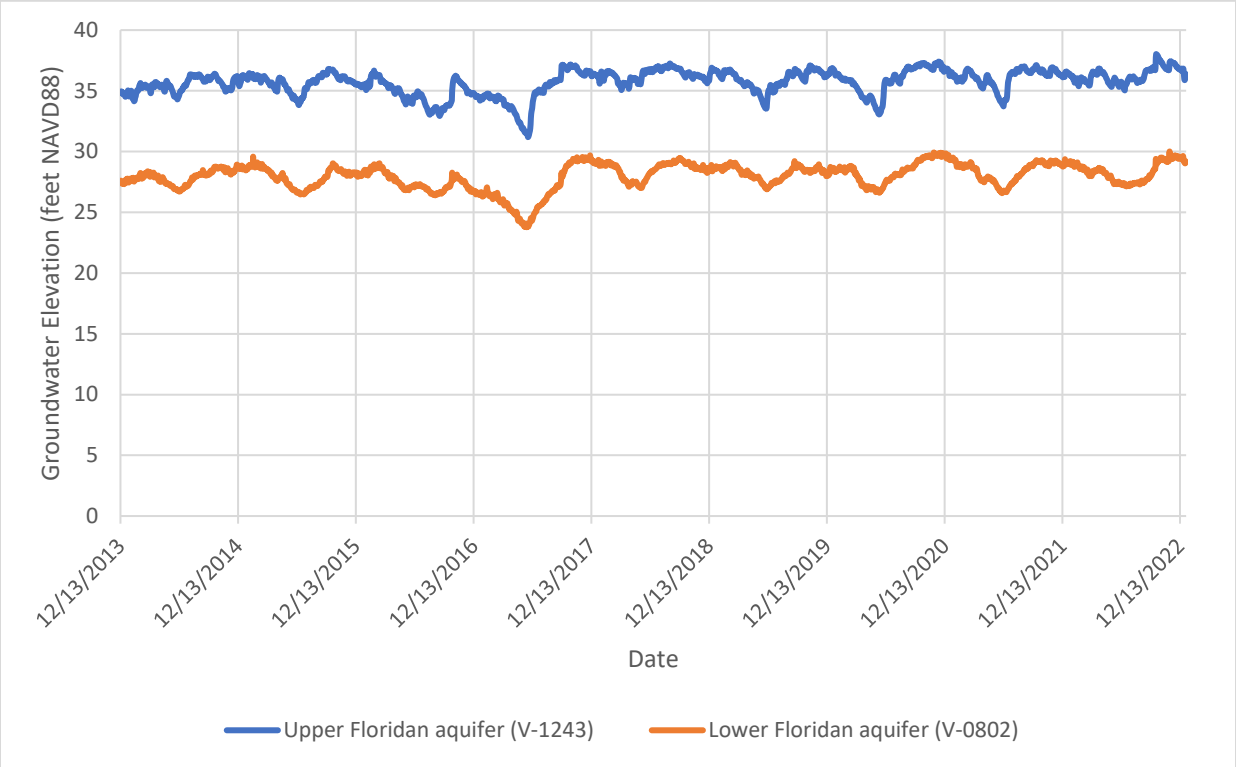


*Figure 7:Clark Bay Conservation Area Groundwater Observation Well Sites V-1243 & V-0802*

**Water Chemistry**

The District monitors surface water quality at over 200 long-term sampling stations at rivers, streams, lakes, canals, and estuaries throughout the 18-county service area. Water quality status is an indication of the condition of a water body. The District's 2022 Status and Trends Report is a 15-year assessment that uses data from Jan. 1, 2007, to Dec. 31, 2021. Water quality trends indicate whether a water quality parameter is increasing or decreasing over time. (SJRWMD, 2022 https://floridaswater.maps.arcgis.com).

Basic water chemistry data are collected at two sites connected to Clark Bay's watershed: (1) Lake Winona (WIO), located west of the Little Haw Creek drainage, and (2) Center of Lake Disston (CLD), located upstream of the Property (Figure 8). Water chemistry data are typically collected on a bimonthly basis. Field data including water temperature, pH, specific conductivity, and dissolved oxygen are collected, as well as grab samples analyzed for nutrients, minerals, and metals. Water chemistry parameters discussed in this section include total phosphorus (phosphorus), total nitrogen (nitrogen), salinity, dissolved oxygen (DO), hydrogen ion potential (pH), total suspended solids (TSS) and Chlorophyll-*a* (Chl-a).

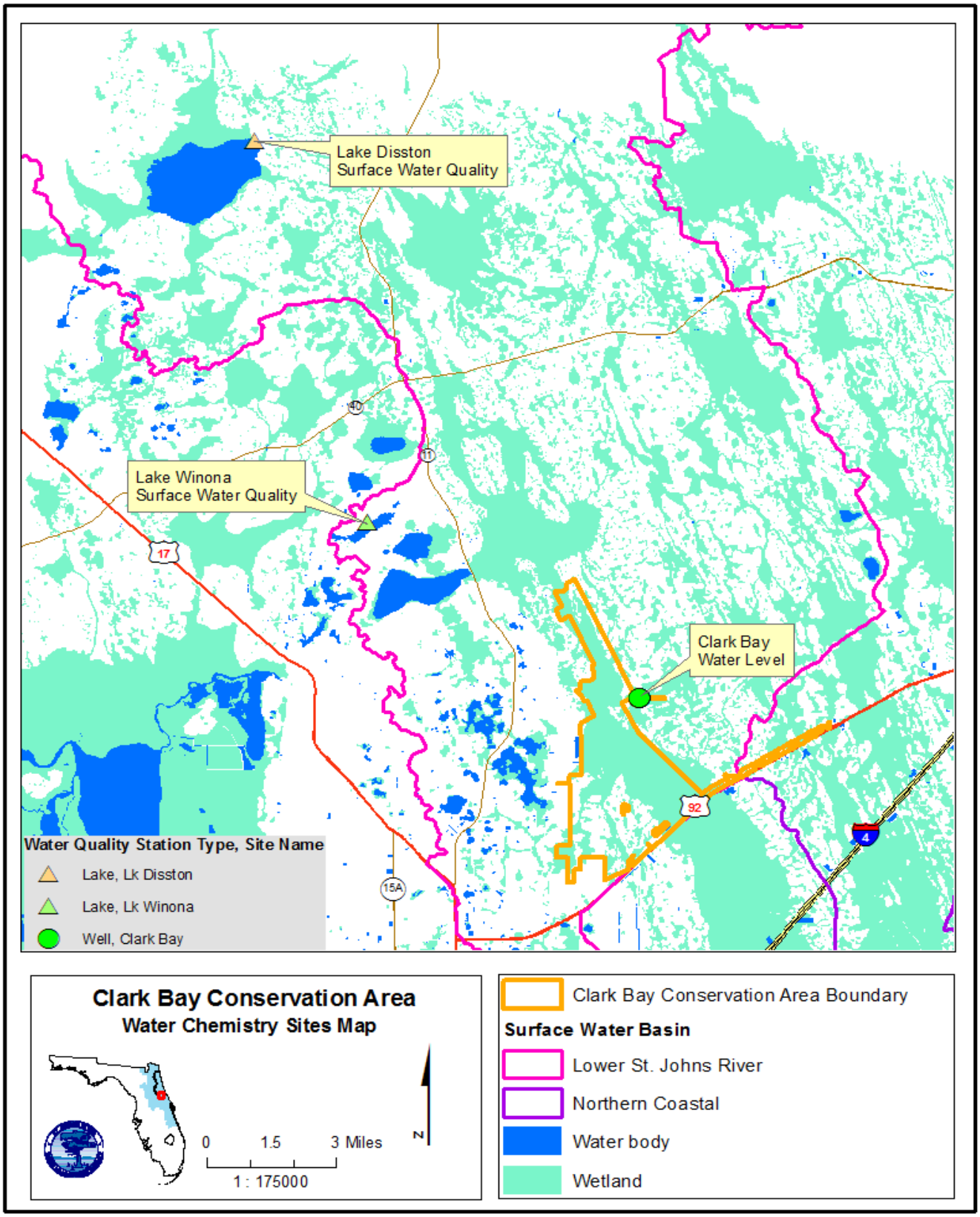


*Figure 8: Water Chemistry Sites.*

The following parameters are discussed in relative terms for the past 15-year period as described in the 2022 Status and Trends Report.

Station WIO
Phosphorous, nitrogen, TSS, salinity and pH are in the low-range and stable. Chl-a is in the mid-range and stable. DO is in the high range and stable.

Station CLD
Phosphorous, TSS, and pH are in the low-range and stable. Nitrogen, Chl-a, and DO are in the mid-range and stable. Salinity is in the low range and decreasing at 1.5 percent annually.

Surface water chemistry data do not exist within the Property itself, but these two sites provide insight to water quality conditions in the watershed. These data could have implications for the ecosystem health and the extensive wetlands within the Property. Acquisition and protection of CBCA help protect water storage for the Little Haw Creek system, which is associated with the headwaters of the Crescent Lake.

**NATURAL COMMUNITIES**
The 5,134 acres that comprise CBCA consist primarily of basin swamp, mesic flatwoods, wet flatwoods, and scrub (Figure 9). Information relative to the natural communities within the Property is derived from several sources including timber stand assessments, land cover codes, and observations by District staff. Additionally, the general natural communities descriptions are characterized using the Florida Natural Areas Inventory's (FNAI) 2010 *Guide to the Natural Communities of Florida.*

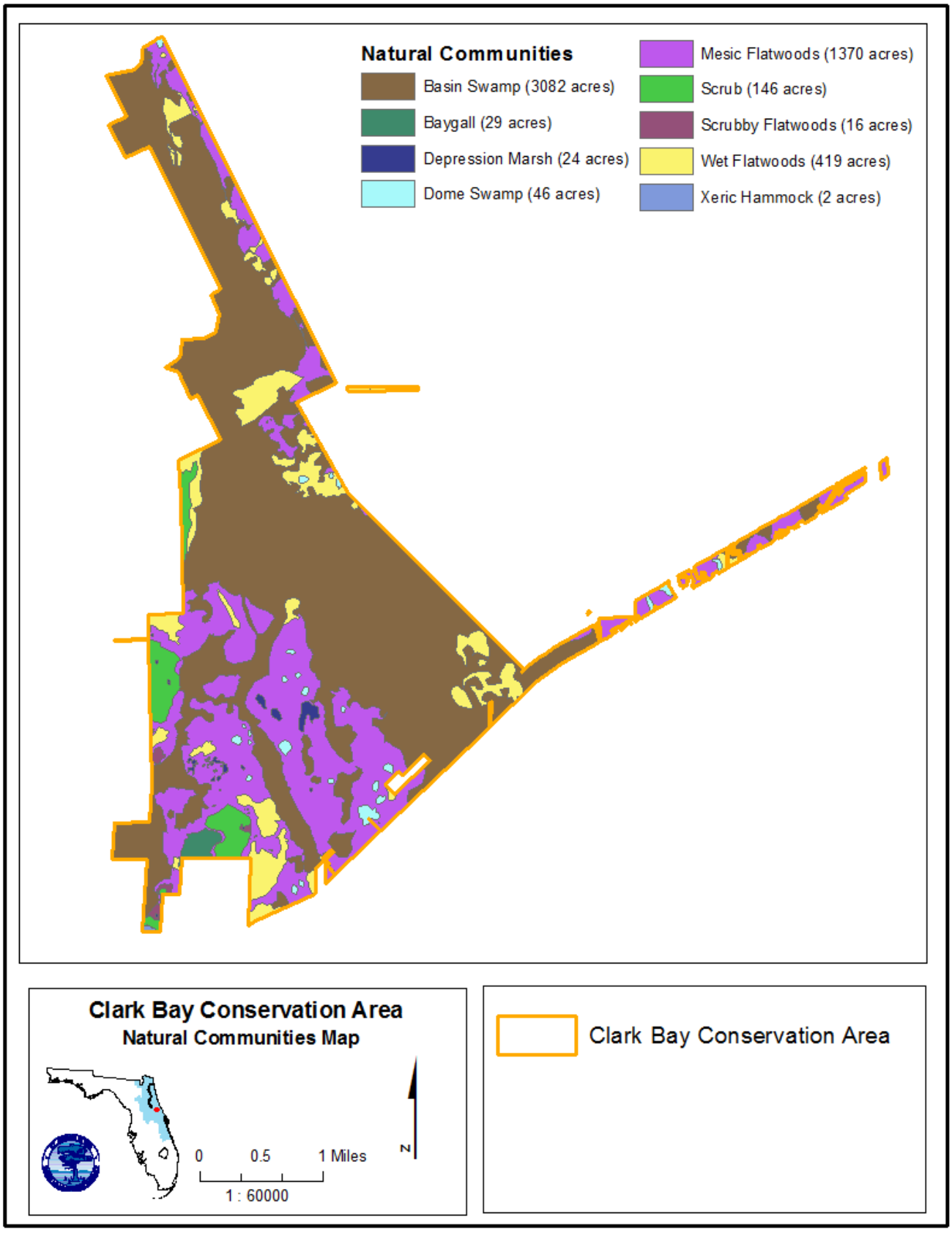


*Figure 9: Natural Communities.*

**Basin Swamp** (3,082 acres, 60%)
Basin swamps are large irregularly shaped basins not associated with rivers. Basin swamps are thought to have developed in oxbows of former rivers or in ancient coastal swales and lagoons that existed during higher sea levels. This plant community is generally characterized by the presence of buttressed and hydrophytic trees such as pond cypress (*Taxodium ascendens*) and swamp tupelo (*Nyssa sylvatica* var. *biflora)*. Other typical canopy and subcanopy trees include slash pine, red maple (*Acer rubrum*), dahoon (*Ilex cassine*), and loblolly bay (*Gordonia lasianthus*). Soils that support basin swamp communities are acidic, nutrient-poor peats often overlying a clay lens or other impervious layer. This clay lens or impervious layer may cause a perched water table above that of the adjacent uplands, causing standing water for most of the year. While basin swamps are not associated with rivers, they may contain streams and sloughs that flow during periods of high water (FNAI, 2010).

The basin swamps within CBCA are either dominated by or have a heavy component of cypress with typical hydroperiods of approximately 200-300 days and though infrequent, fire is essential for the maintenance of these natural communities. Fire return intervals in basin swamps are variable, but necessary to restrict peat accumulation and the expansion of hardwoods into adjacent communities. The edges of basin swamps may be exposed to frequent fire, often burning in concert with surrounding natural communities. Much of this natural community is associated with Little Haw Creek though there is little discernable channel within much of this natural community except the channelized section of the creek located in the western portion of the property.

**Mesic Flatwoods** (1,370 acres, 27%)
Soils that support mesic flatwoods communities are generally poorly drained, acidic, and sandy soils deposited on ancient, shallow seabeds. Many flatwoods communities have a clay or organic hardpan. Hardpan soils become saturated during the rainy season causing the accumulation of surface water. These soils are often droughty during dry periods. The presence of the hardpan translates to seasonal fluctuations in the amount of water available to support plant life. These seasonal hydroperiods are essential in the maintenance of the flatwoods system.

Intact mesic flatwoods typically have a layered appearance, with a distinct, high, discontinuous canopy, low shrub layer, and diverse herbaceous layer. The canopy densities are variable and may include (depending on location) longleaf pine (*Pinus palustris*), slash pine (*Pinus elliottii*), loblolly pine (*Pinus taeda*), or pond pine (*Pinus serotina*). The shrub layer may include a mixture of species or be dominated by species such as saw palmetto (*Serenoa repens*), wax myrtle (*Myrica cerifera*), and numerous ericaceous plants. The herbaceous coverage may be dominated by wiregrass (*Aristida stricta*); however, species abundance and diversity are often dictated by the openness of both shrub and canopy layers (FNAI, 2010).

The mesic flatwoods communities within the Property vary in levels of disturbance, with the most significant impacts in the areas of historic silvicultural operations. Historic management practices for all parcels within the Property were primarily for commercial timber production. Previous site preparation methods for these areas included silvicultural bedding, and as such most of these areas exhibit suppressed shrub and groundcover assemblages with only the most resilient and disturbance-adapted species remaining. Some areas are void of these components completely, likely a result of both silvicultural bedding and shading from densely planted pines. The majority

of mesic flatwoods communities within the Property are affected by silvicultural activities. Species planted during historic silvicultural operations include slash pine and loblolly pine. Reforestation efforts throughout the Property include the reintroduction of longleaf pine in mesic flatwoods.

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

**Wet Flatwoods** (419 acres, 8 percent)
Soils that support wet flatwoods communities are generally very poorly drained sandy soils that may have a mucky texture in upper horizons. Wet flatwoods occur as ecotonal areas between the drier mesic flatwoods and wetland areas. They may also occur in broad, low flatlands embedded within these communities.

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

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

**Scrub** (146 acres, 3 percent)
Scrub is characterized as a community composed of evergreen shrubs, with or without a canopy of sand pine. Scrub systems are found on dry, infertile sandy ridges. Soils that support these systems are low-nutrient acid sands with little organic matter. There are three recognized variants of scrub: oak scrub, rosemary scrub, and sand pine scrub. All three variants include areas of exposed bare sand and exhibit sparse groundcover assemblages. Components of each type are found on the Property and are described below.

- The most common form of scrub in Florida is oak scrub, which is dominated by myrtle oak, sand live oak, and Chapman's oak. Oak scrub also includes some saw palmetto and rusty staggerbush and may include some sand pine and rosemary. An example of oak scrub within the Property is located along the southern boundary, bisected by the white blazed recreation trail. While disturbed from past silvicultural activities, this area exhibits

many of the signature species of the oak scrub system. Shrubs average between 3 and 5 feet in height with a few patches of taller shrubs. The pine component includes natural sand pine and planted longleaf pine established in 2007. The longleaf pine planting occurred after a clearcut sand pine salvage operation due to wind-through caused by a hurricane. The site was prepared for planting using a roller drum chopper and imazapyr herbicide was applied at a rate of 48 ounces Per acre. Trees were machine planted at a density of 605 trees per acre. Current volume summary of this stand derived from a timber cruise conducted in 2020 shows a density of 315 trees per acre, which includes sand pines that have seeded in since the planting. Any future site prep and tree planting projects on the Property's scrubs should consider the poor survival of this planting even with the significant site preparation. Tree heights range from 5 to 25 feet with the taller trees being closer to transitional areas. This area includes large areas of barren sand and numerous active gopher tortoise burrows.

- Sand pine scrub is dominated by a canopy of sand pine that may range from widely scattered trees with a short, spreading growth form to tall thin trees that form a dense canopy. The sand pine scrub understory may include the suite of scrub oaks and rosemary. Examples of this type of scrub are located along the western boundary of the Property. The sand pine canopy in this area is not contiguous and the trees tend to be shorter and exhibit the more spreading growth form. The understory includes scrub oaks, saw palmetto, rusty staggerbush, and rosemary. The scrub near the Sandy Lane gate was roller drum chopped in 2021 reducing the shrub heights in this area to an average 3 to 5 feet in 2023. The scrub north of this site will be roller drum chopped once road improvements are made to gain access to the site.

Scrub communities are fire maintained with a fire return interval of five to 20 years, though the upper range of the interval may extend to 80 years. The high variability of fire intervals within scrub systems is relative to the productivity of the site (Myers, 1990). Highly productive sites will have a lower return interval. Maintaining the shorter fire return interval will result in an oak scrub system with fewer sand pines. A longer fire return interval will allow for a sand pine-dominated system in areas where sand pine is present. All the scrub at CBCA interacts with the wildland-urban interface making fire management a challenge. Scrub is globally imperiled, according to FNAI, due to the relative rarity of occurrence and vulnerability to extirpation.

**Dome Swamp** (46 acres, 1 percent)
Dome swamp communities typically occur embedded within well-maintained pyric plant communities such as flatwoods. The dome swamp communities within Clark Bay occur primarily within the mesic flatwoods. Dome swamps are typically found on flat terraces, where they develop when the overlying sand has slumped into a depression in the limestone underlayment. Soils that support dome swamp communities are variable but may include a layer of peat that thickens towards the center. The peat layer is typically underlain with acidic sands or marl and then limestone or a clay lens. An important physical factor associated with the shaping and maintenance of the dome swamp is the hydroperiod. Water levels in dome swamps fluctuate seasonally with rainfall changes. Normal dome swamp hydroperiods are from 180–270 days per year (FNAI, 2010).

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

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

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

**Depression Marsh** (24 acres, 1 percent)
Depression marsh communities typically occur embedded within a matrix of well-maintained pyric plant communities including flatwoods. The depression marsh communities within the Property occur within the flatwoods and are altered from the silvicultural activities, with the primary alteration being hydrologic changes and soils disturbances from site preparation techniques such as silvicultural bedding. Additionally, some depression marshes within the Property include planted pine.

Depression marshes are typically found on flat landscapes throughout Florida. They develop when the overlying sand has slumped into a depression in the limestone underlayment. Soils are typically depressional phases of fine sands. An important physical factor associated with the shaping and maintenance of the depression marsh is the hydroperiod. Depression marshes are maintained in part against woody shrub invasion by fluctuations in water levels associated with rainfall.

Typical of the depression marsh system, the examples of this community type within the Property include concentric bands of vegetation which include species such as Carolina redroot (which often colonizes after soil disturbances), Elliott's yellow-eyed grass (*Xyris elliottii*), and pickerel weed *(Sagittaria lancifolia*). These seasonal ponds are important habitat for numerous species of wildlife but are particularly important for many amphibians that require breeding sites that are free of predatory fish. (Moler, 1987)

Without frequent fire, herbaceous components of the depression marsh systems may give way to woody shrub species. The frequency of fire within these areas is determined by the fire frequency

of the surrounding natural community. The depression marshes within the CBCA will have fire return intervals influenced by the fire frequency of the surrounding flatwoods.

**Scrubby Flatwoods** (17 acres, >1 percent)
Scrubby flatwoods communities generally occur on moderately well drained, sandy soils. This community type occurs on slight rises within mesic flatwoods and in broad transitional areas. Standing water is uncommon in scrubby flatwoods as the depth to the water table is generally higher than adjacent mesic flatwoods.

Scrubby flatwoods have a stratified appearance and are characterized as an open canopy forest of widely scattered pine trees with a sparse shrubby understory and numerous areas of barren white sand. The vegetation in these ecotonal areas is a combination of mesic flatwoods and scrub species. Canopies of the scrubby flatwoods in northern and central Florida may include longleaf or slash pine. Shrub layers will often include scrub oaks, saw palmetto and various ericaceous plants. Groundcover, while generally sparse, may include wiregrass.

Scrubby flatwoods communities within CBCA are disturbed. The most significant areas of alterations occur within the silvicultural areas and are primarily a result of prolonged fire exclusion. The shrub layer in these areas is overgrown, and groundcover assemblages are sparse with only the most resilient species remaining. Pine canopies within these areas include sand pine and planted slash and longleaf pine. Additionally, some areas of scrubby flatwoods along the southwest boundary are highly disturbed and include remnant windrows with plant assemblages including grapevine and pokeberry.

Fire is an integral component in the perpetuation of this community type. The open areas of bare sand, sparse groundcover vegetation, and coverage of largely incombustible oak leaf litter typical of most scrubby flatwoods results in a fire return interval of between five and 15 years. Examples of scrubby flatwoods with a higher herbaceous or saw palmetto component may burn at a lower fire return frequency.

**Xeric Hammock** (2 acres, >1 percent)
Xeric hammock is characterized as an evergreen forest with a low canopy and few understory plants other than palmetto, or a multi-storied forest of tall trees with an open or closed canopy. Several gradations between these extremes may occur. The xeric hammock natural community is typically an advanced successional stage of scrub or sandhill. It is a climax community, having been protected from fire for 30 or more years. When fire does occur in the xeric hammock, it is under extreme conditions, burns catastrophically, and may revert the community back to an earlier successional stage.

The xeric hammocks within CBCA are typical as described by FNAI (2010) in that they have succeeded from sandhill. Many of these areas are dominated by a dense canopy of laurel and live oak but retain remnant sandhill vegetation including turkey oak and wiregrass. Due to this natural community's proximity to development in the southwest corner of the Property, it has a higher-than-average invasive species concentration compared to the rest of the Property.

### SOILS
According to the U.S. Department of Agriculture (USDA) Soil and Conservation Service, 15 different soil types are within CBCA. The Volusia County Soil Survey provided information used to develop descriptions of the predominant soil series found within the Property. The soil descriptions are in Appendix A.

### 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 Property. If any sites are located, District staff will document and report the sites to the Division of Historical Resources.

## IMPLEMENTATION
The following sections outline land management strategies for resource protection, land use, and administration on Clark Bay for the next 10 years. Management Review Teams, as outlined in Section 373.591, Florida Statutes, are convened every five years to ensure the goals and strategies listed below are achieved.

### RESOURCE PROTECTION AND MANAGEMENT

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

Strategies:
- Install culverts, water bars, turnouts, and low water crossings where needed, focusing on Road 1, Road 24 and Jolly Ford Road.
- Maintain roads and culverts to prevent erosion.
- Level silvicultural beds from timber harvest areas if restoration is feasible.

While most wetland protection was accomplished through acquisition, portions of the wetlands within the Property have a history of disturbance. Hydrologic disturbances within the Property include roads, ditches, culverts, and silvicultural beds. The Property was impacted by the 1998 wildfires which included suppression fireline construction. The footprints of these firelines are evident presently. While their presence may have altered hydrology at the time surrounding their construction, attempts to restore them may cause further degradation as all have been since stabilized by trees and other vegetation.

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

Roads and culverts in the northern extent of the Property will be evaluated for repair (Figure 10). Most are constructed nearly level with the surrounding grade and drain poorly. These roads are the only haul route for the forest resources in that portion of the Property. Road 1 will be the

priority for repair within the scope of this plan. Scope of repairs will likely include culvert replacement, ditch earthwork, additional fill and roadbed stabilization. For the roads spurring from Road 1 (Roads 2-9), costs to repair these roads shall be weighed against the potential revenue generated from forest management operations to be conducted via these roads.

Jolly Ford Grade is in need of three to four low water crossings to replace washed out culverts which have resulted in the road becoming impassable. These low water crossing installations will aid in access to the scrub on the upper western boundary of the Property where there is no formal access. This access improvement will facilitate a multitude of land management and restoration practices.

The remnants of a bridge over Little Haw Creek which connected Road 24 with the western side of the Property will need to be replaced with a culvert crossing in the scope of the plan. The existing wood bridge has not been passable for over a decade. As with the Jolly Ford repairs, this bridge will facilitate fire management operations, fuels reduction projects in the wildland-urban interface of the Property, and timber stand improvement projects. It will also provide a connection to the Sandy Lane gate, the only access point to a public road on the western side of the Property.

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

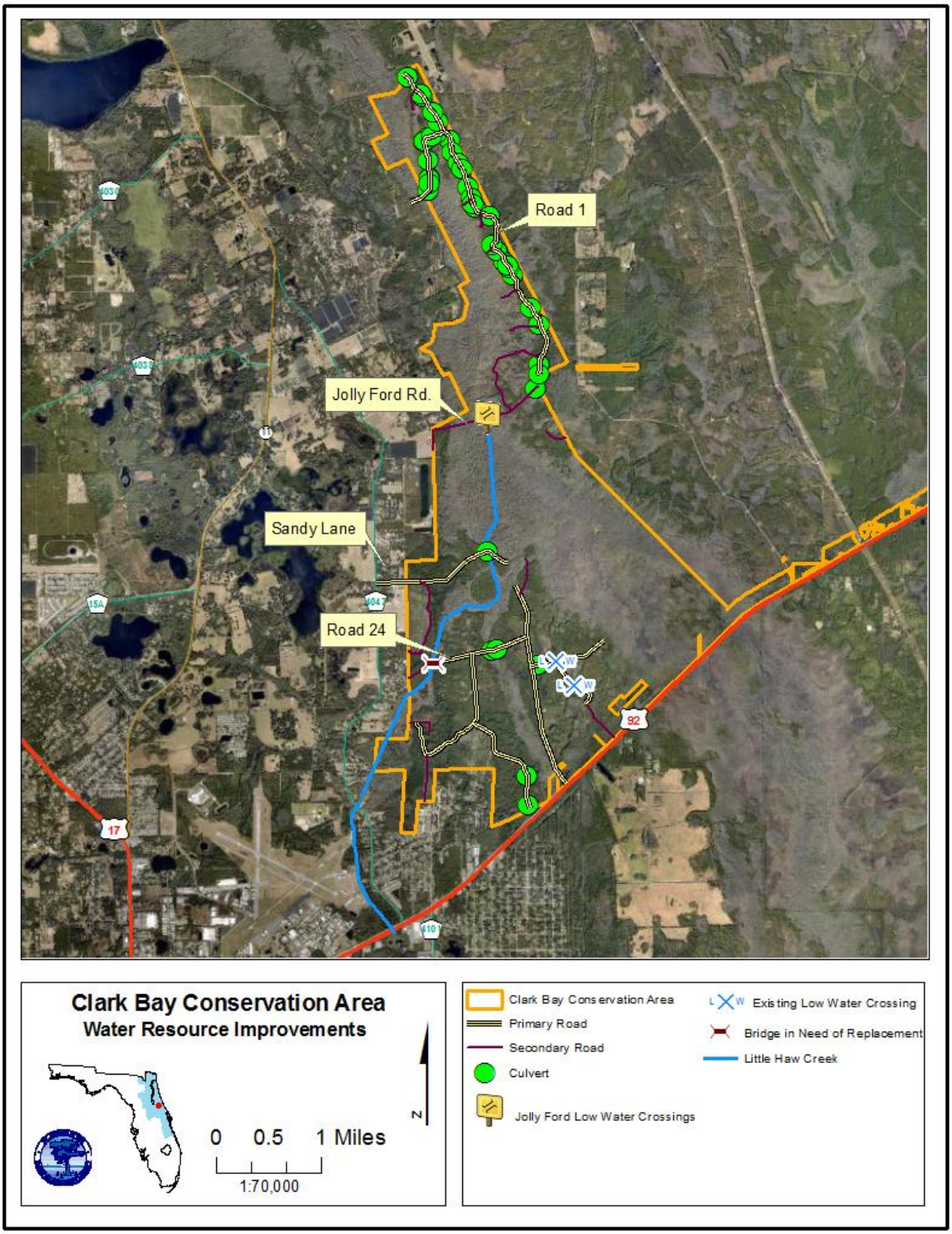


*Figure 10: Water Resource Improvements*

## Forest Management

Goal: Maintain, improve, and restore forest resources.

Strategies:

- Update forest management database.
- Thin and/or clearcut 919 acres of timber.

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

The management objectives of the Property will require pine harvesting. In addition to planned forest management activities, the District will remove trees as needed in the case of insect infestations, disease, and damage from severe weather, wildfire, or other occurrences that could jeopardize the health of natural communities. Harvesting may also provide some protection against wildfires and pine beetle outbreaks. The District will abide by Florida Silviculture Best Management Practices, Florida Forestry Wildlife Best Management Practices for State Imperiled Species and will target the achievement of appropriate overstory species in proper stand densities as described in the District Forest Management Plan (Appendix B).

Prior to public acquisition, much of the uplands within the Property were utilized in commercial silviculture operations, the majority of which were bedded and planted in slash pine. Additionally, some areas have been managed for the natural regeneration of sand pine.

At the time of acquisition, Plum Creek Timberlands L.P., retained the right to harvest timber from select areas within the Property for a period of time. This timber reservation has expired, and all management responsibilities have reverted to the District.

CBCA is partitioned into forest management compartments and each compartment is further divided into stands. Management decisions are made on the stand level. Silvicultural management is an intrinsic component of the overall management of the upland portions of the CBCA; therefore, an annual timber inventory is conducted on a small percentage of the Property. Stand level values derived from the inventory include number of trees per acre, the basal area, and volume of trees by product type and species. After each inventory cycle growth and yield projections are calculated on all active plots. The inventory data output is then incorporated into the District's forest management database. Harvest operations and reforestation events that may occur over time are also recorded in the database. This information is used to help land management staff forecast needs and make forest management decisions.

Forest management activities anticipated during the scope of this plan include contract cruising inventory plots, reforestation, and thinning operations. Reforestation projects may be preceded by various site preparation techniques including mechanical treatments, such as discing to remove silvicultural bedding, roller chopping and mowing, herbicide applications, and prescribed fire. These techniques may be used singularly or in combination as site conditions

warrant. First thinning operations typically occur the 16th year for slash and loblolly pine and 20th to 25th year for longleaf, and second thinning operations are conducted, on average, 10 years after the first. These times are largely dependent on ecological factors such as site quality, crown closure, basal area, diameter at breast height (dbh), and height of the trees. Figure 11 depicts pine coverage by species across the Property.

Through periodic thinning, the District will remove the poorest trees to reduce crown density and allow the better trees to develop full, vigorous crowns. Since 2010, a total of 454 acres have been thinned and 117 acres have been clearcut. In 2012, 76 acres of longleaf pine were planted.(Figure 12). There are six pine thinnings are planned on the Property between 2023–2033 totaling 919 acres (Figure 13). Depending on stand conditions, portions of these sales may include clearcut harvests. Mean annual increment measurements as well as stand conditions will be used to determine the harvest type. Clearcut harvests will be reforested with site-appropriate pine species.

Site conditions at CBCA can be challenging for timber operations. Stands can remain extremely wet over a long duration, rendering them inoperable for timber harvests. This can result in timber harvest contracts being extended and, at times, rebid due to long periods of significant soil moisture.

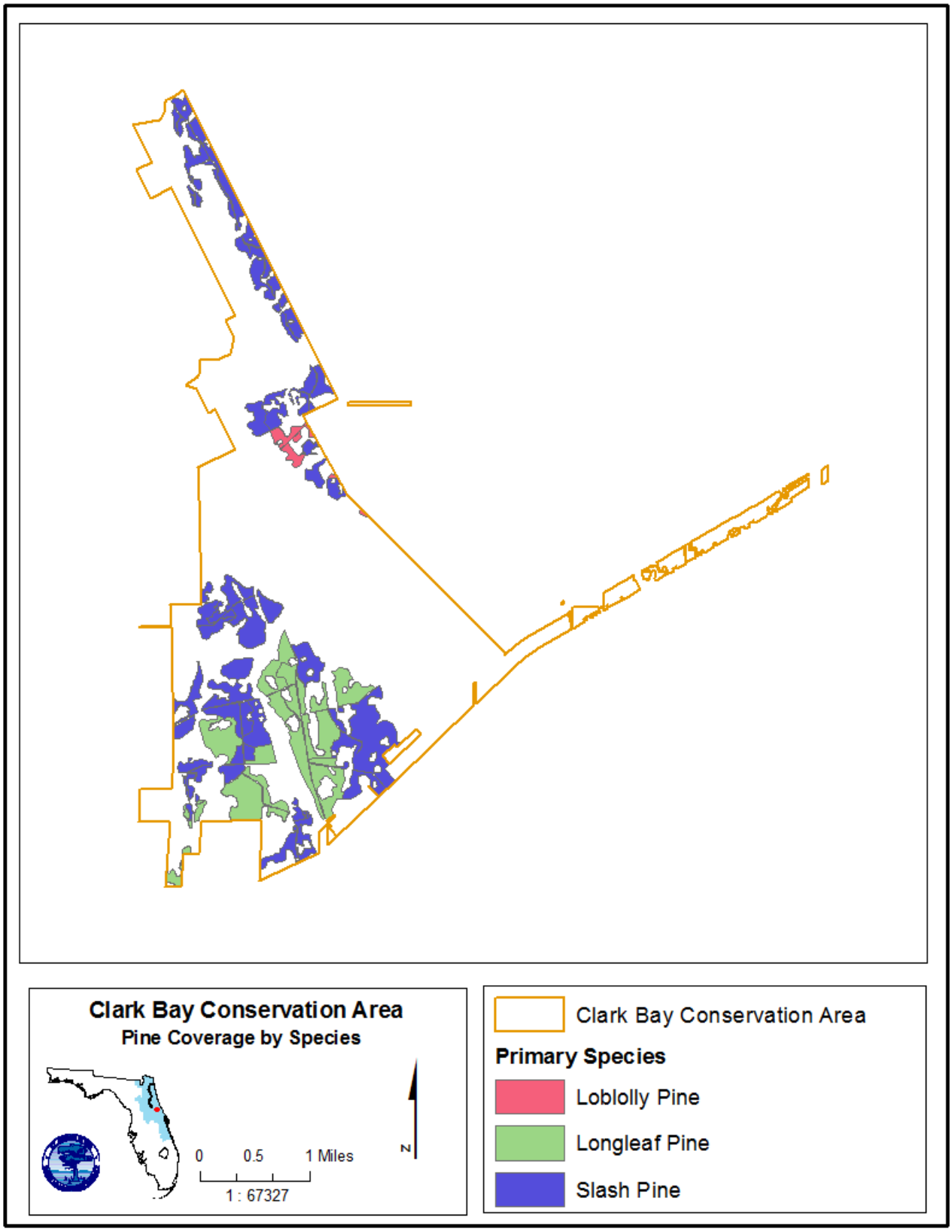


*Figure 11: Pine Coverage by Species.*

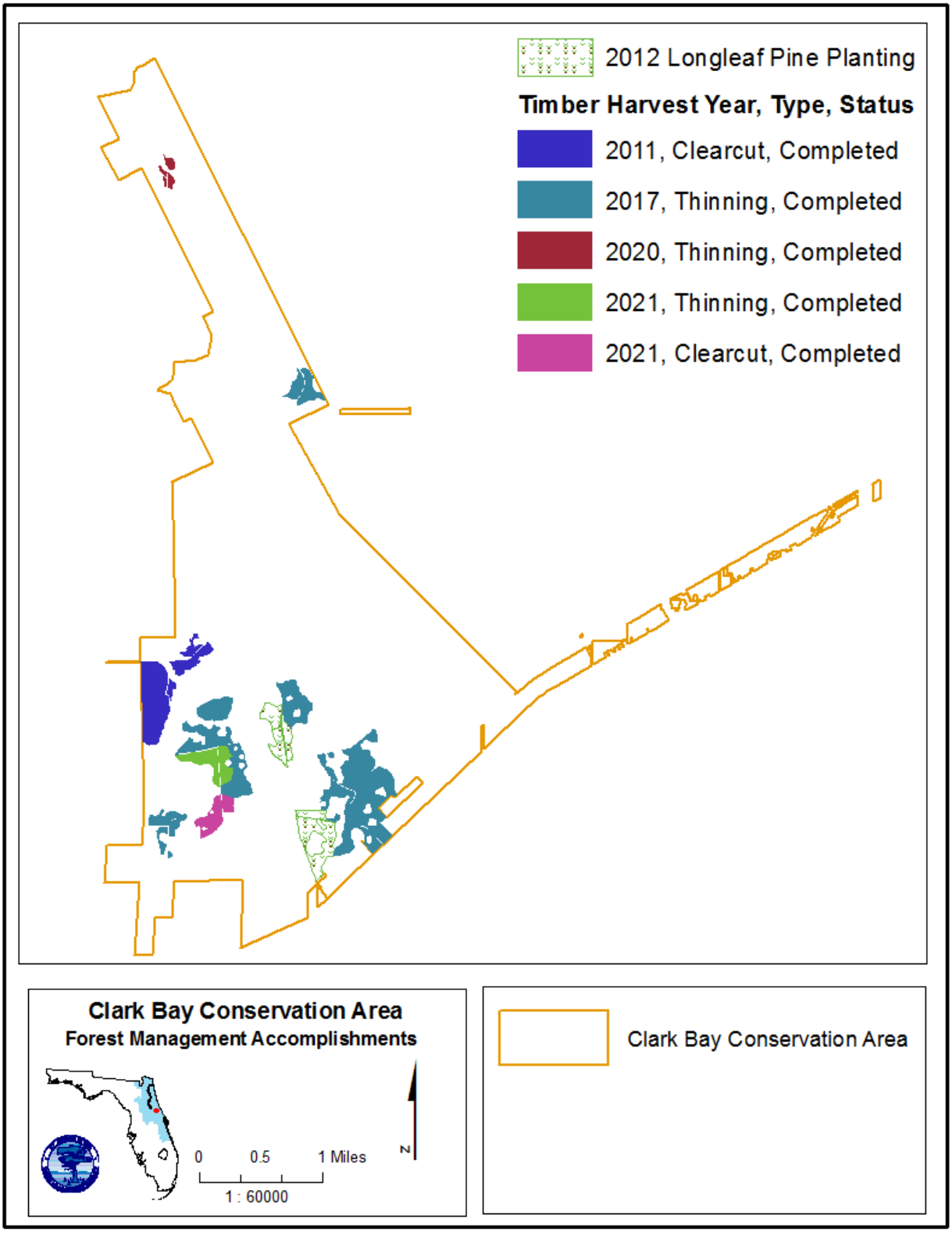


*Figure 12: Forest Management Accomplishments.*

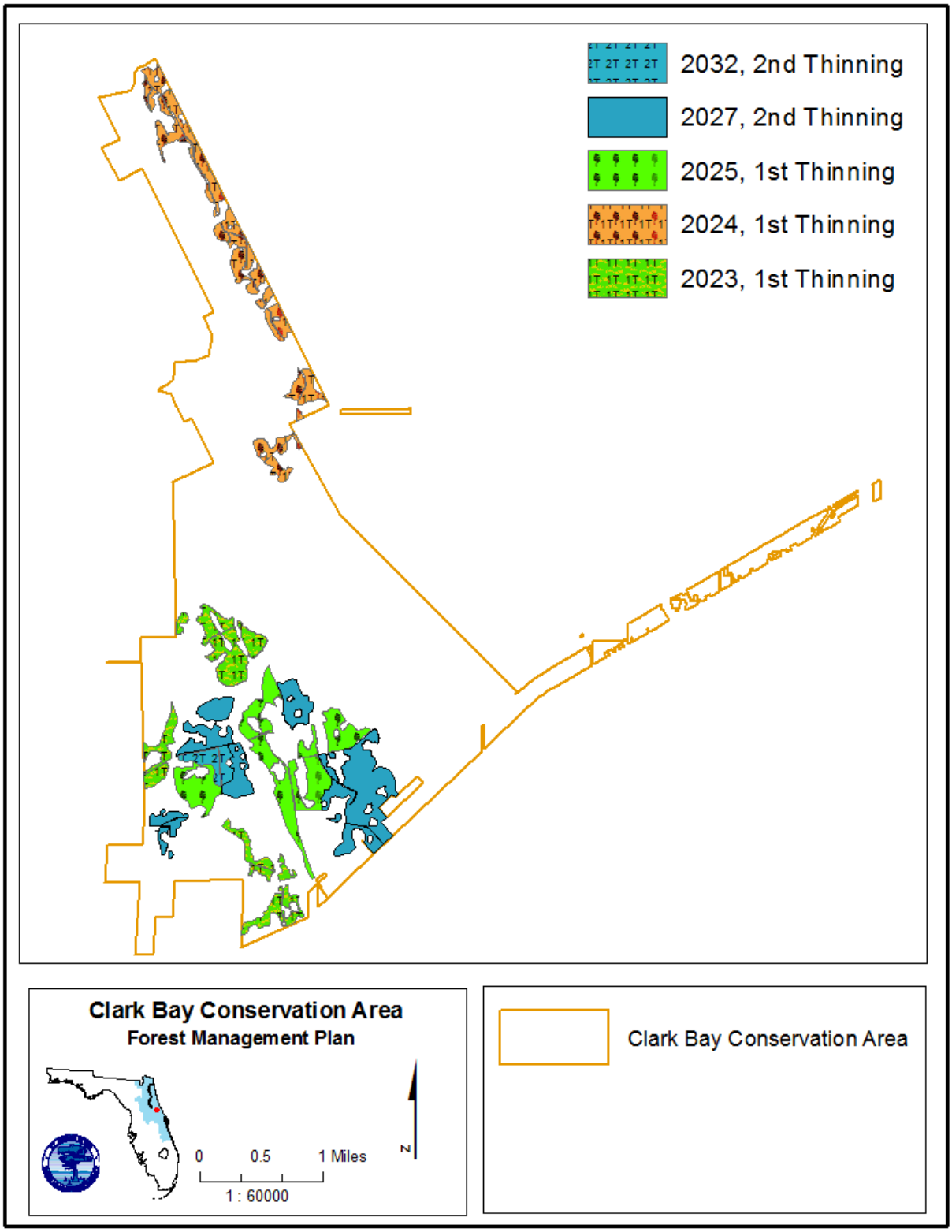


*Figure 13: Forest Management Plan.*

**Fire Management**

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

Strategies:

- Apply fire to 151 acres of flatwoods annually, averaged over the 10-year planning period.
- Apply fire to 61 acres of scrub at least once, averaged over the 10-year planning period.
- Conduct dormant season burns in pine plantations and areas of high fuel loading and/or for reintroducing fire into a unit with no recent burn history.
- Maintain and create new firebreaks.
- Use mechanical fuel reduction as a fire surrogate in areas where it is difficult to burn due to high fuel loads.
- Develop annual burn plans and populate the fire management database on an annual basis.

Forest and fire management activities within the Property are critically important and integrally linked. The planning and implementation of forest and fire management activities must be coordinated to achieve restoration and management goals.

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. All the upland natural communities at the CBCA are fire adapted, making prescribed fire an important tool for use in the restoration and maintenance of plant communities within the Property. Since the writing of the last plan, approximately 41 acres have received prescribed fire and 326 acres have burned in wildfires (Figure 14).

Historically, most fires occurring on what is now CBCA 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, high fuel loading, and proximity to smoke-sensitive areas may predicate the use of dormant season burning.

Figure 15 shows the approximately 1,331 acres of fire-maintained natural communities within the Property (26 percent of CBCA). For the 19 fire management units (FMUs) that are classified as flatwoods natural communities, a four-year fire return interval has been established. For the two FMUs that are classified as scrub dominant natural communities, an eight-year fire return interval has been established. For flatwoods natural communities the annual burn goal is 151 acres, which is half the ecological objective of that natural community on the Property at 302 acres annually. For the two FMUs that are classified as scrub dominant

natural communities, the annual burn goal is seven acres, which is half the ecological objective of that natural community on the Property at 14 acres annually. For the entire Property, the annual burn goal is 158 acres, averaged over the 10-year planning period. For FMUs that have two or more burns, including wildfires, applied to them within the past 10 years, timing of future prescribed fires should focus on growing/lightning season (April–August) application but not exclude any opportunity to conduct a prescribed fire during the typical prescribed fire season of December–August.

The Property has 5.5 miles of pre-suppression firebreaks to allow for access and control of prescribed and wildfires. These breaks are disked one to two times a year to maintain the footprint of the break and provide a mineral soil fuel break. Interior roads are also used as firebreaks. In addition to these existing breaks, 9.4 miles of firebreaks are conceptualized for construction within the scope of this plan. These conceptual breaks will be along U.S. Highway 92, the Property's northeast boundary along Tiger Bay State Forest, as well as areas of wildland-urban interface along the western boundary. To accurately establish the location of these firebreaks, a retracement survey shall be conducted prior to construction. Survey cost should be considered when planning for this project. As these breaks are constructed, this will allow additional FMUs to be incorporated into the Property's prescribed fire goals.

While prescribed fire is the preferred tool for restoration and maintenance within the Property, 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, mulching, roller chopping, and overstory manipulation through timber harvest.

Limiting factors narrowing the window of opportunity for the application of prescribed fire on the portions of the Property is the proximity to critical smoke sensitive areas, including U.S. Highway 92, County Road 11, Marsh Road, Kepler Road, U.S. Highway 17, the DeLand Municipal Airport, and developed areas such as the City of DeLand. Additionally, a small private airport is located immediately north of the Property. 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. A major challenge in implementing prescribed fire within the Property is the necessity of keeping fire from penetrating the basin swamp communities, where the organic soils, under dry conditions will smolder for extended periods of time, creating a problematic smoke management situation. Appropriate soil and fuel moisture conditions will be selected to mitigate this potential.

All implementation of prescribed fire within the Property will be conducted in accordance with the District's Fire Management Plan, the Clark Bay Conservation Area Fire Management Plan (Appendix C), and the annual burn plan for the property. Prescribed fires and wildfires will be reported in the Prescribed and Wildfire Report in Survey123.

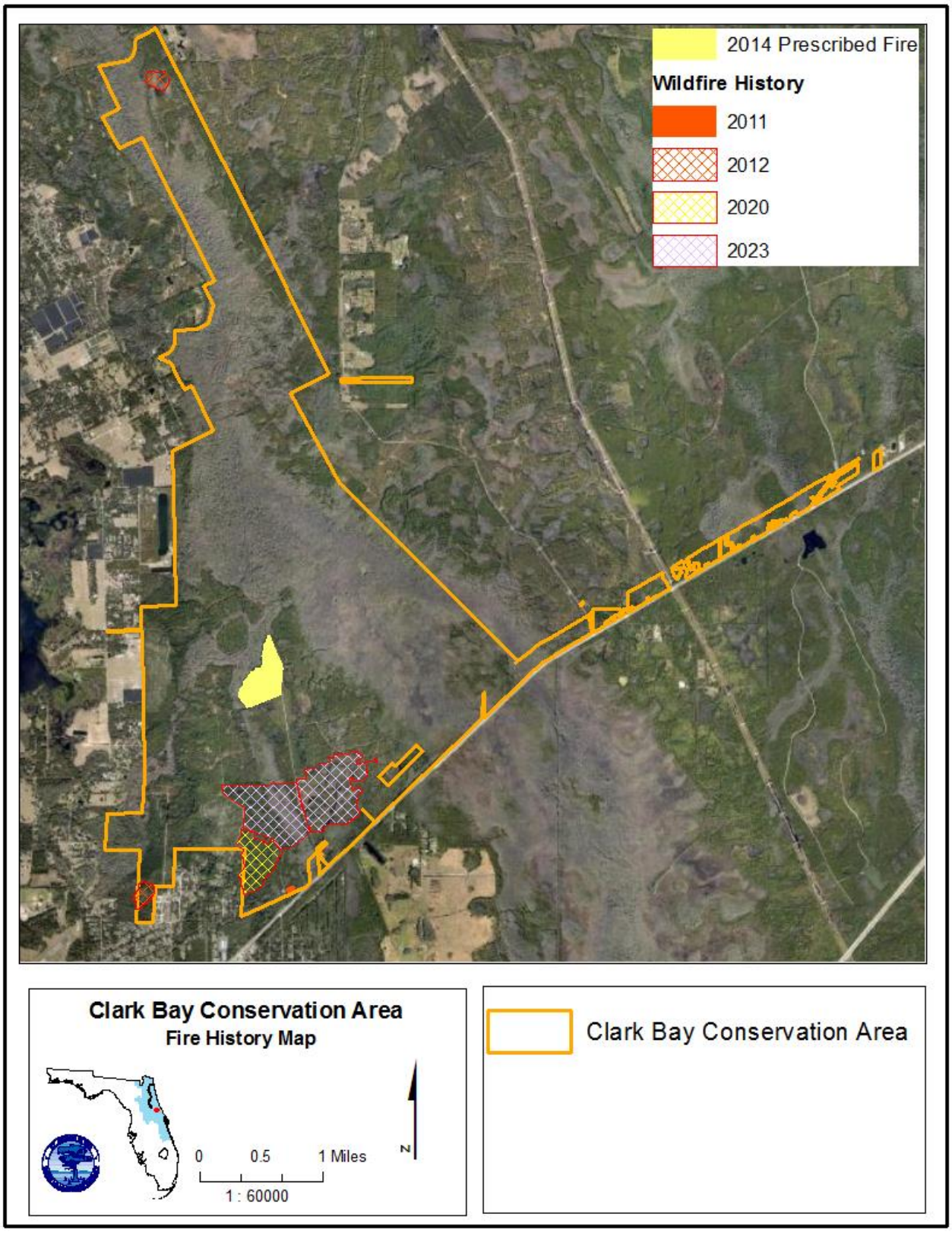


*Figure 14: Fire history map.*

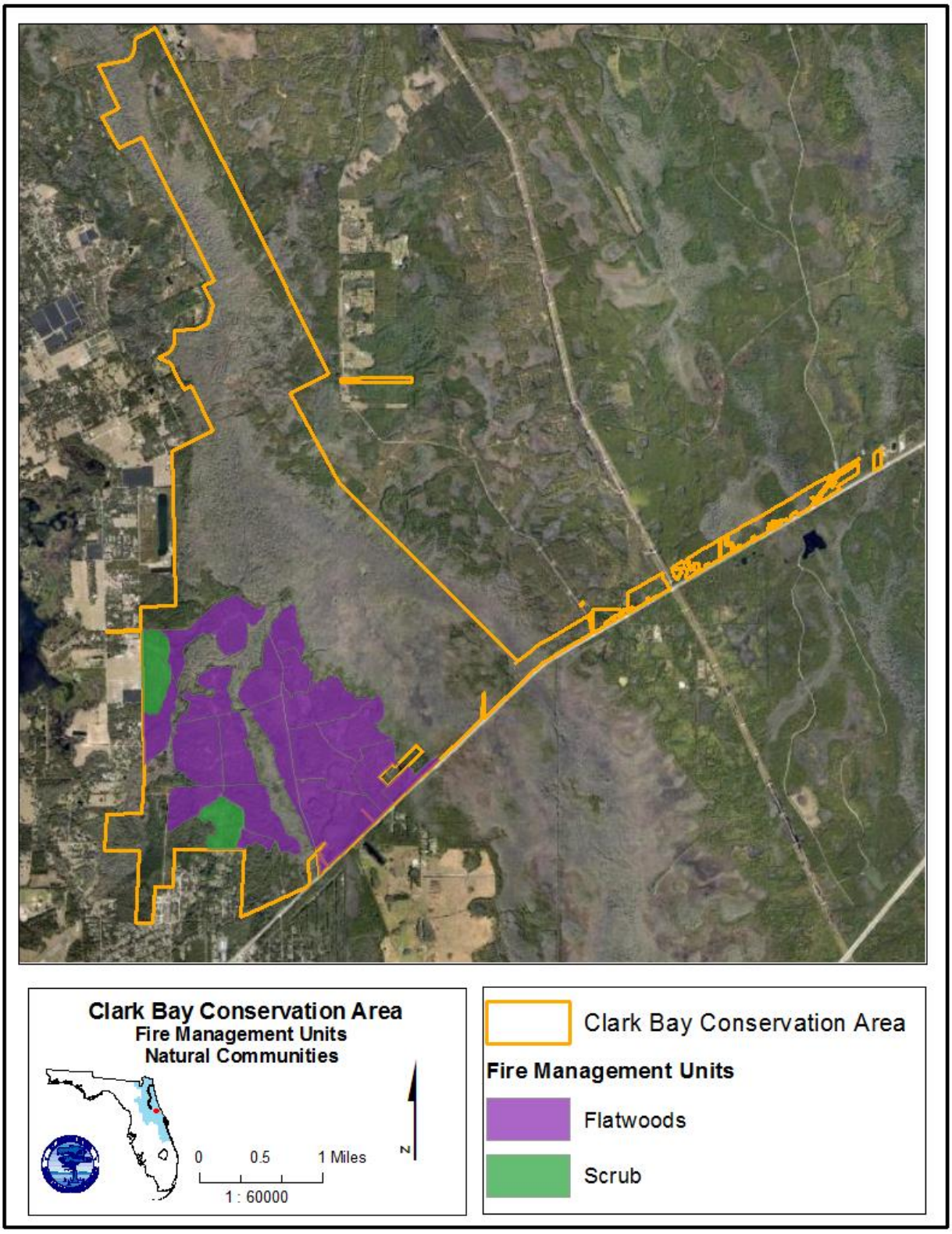


*Figure 15: Fire Management Units*

A system of Fire Regime Condition Class measures was originally developed by the Nature Conservancy and the USDA Forest Service in 2003 to assess ecosystem health. The system is based on a relative measure and describes the degree of departure from the historical natural fire regime of a given ecosystem (Hann, et al., 2003). This departure results in changes to one or more of the following ecological components: species composition, structural stages, stand age, canopy closure, or mosaic pattern. The District adopted the system in 2008 to establish a reference for ecosystem health and land management effectiveness. While fire is the preferred disturbance that maintains most natural communities in Florida, other disturbances, such as timber harvest or mechanical fuels treatments, 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 into Condition Class 3. If the plant community has gone without disturbance so long that fire alone can no longer restore the area, it is in Condition Class 4. CBCA has approximately 3,100 acres that are not maintained by fire or disturbance, such as the basin swamp natural community, which are not included in the Condition Class report.

District staff will make annual condition class assessments and incorporate them into annual burn and work plans. The overall condition class distribution of the Property zones in 2022 was 38 percent Condition Class 1, 19 percent Condition Class 2 and 43 precent Condition Class 3. In 2022, no zones fell within Condition Class 4. Zones classified as Condition Class 1 received disturbance from mechanical fuels treatments and timber harvesting operation. Since 2018, there has been an overall increase in the percentage of zones in Condition Classes 1 and 2, and a decrease in Condition Class 3 (Figure 16). All implementation of prescribed fire within the Property will be conducted in accordance with the District's Fire Management Plan, the Clark Bay Fire Management Plan (Appendix B), and the annual burn plan for the property.

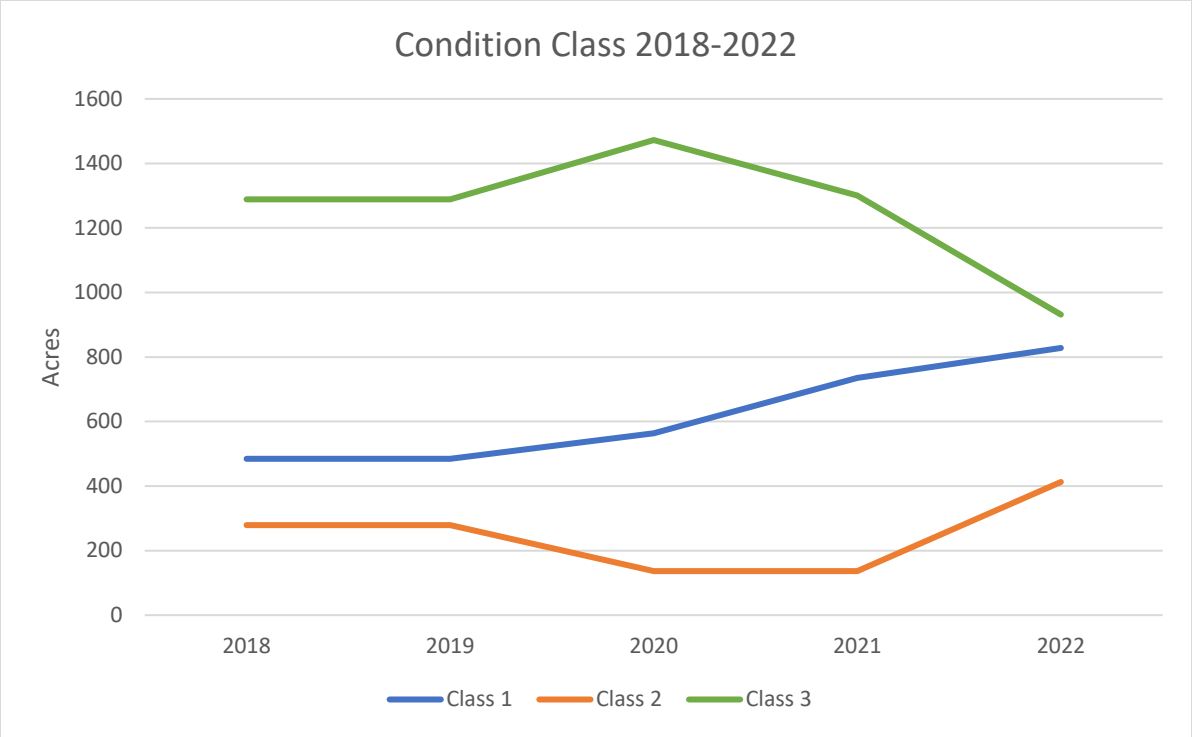


*Figure 16: Condition lasses.*

**Flora and Fauna**

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

Strategies:

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

CBCA has a diverse assemblage of natural communities providing significant habitat for a variety of floral and faunal species. The Property provides habitat for the Florida black bear (*Ursus americanus floridanus*). Numerous species of wading birds occur in the wetland portions of the Property. A wading bird rookery is located on nearby Lake Daugharty.

Plant, insect, and animal lists are contained in Appendix D. Lists were compiled using observations gathered on site visits by District staff, FWC and FNAI species occurrence data as well as crowd-sourced biological data websites. The Property will be managed to improve natural community diversity and quality, resulting in diverse wildlife habitat.

*Gopher Tortoise*

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

and natural fire return intervals, which will benefit gopher tortoise. Any management activities will occur in accordance with the FWC's Gopher Tortoise Management Plan (FWC, 2012).

*Wood Stork*
CBCA lies within the core foraging area for two nesting colonies of the federally threatened wood stork (*Mycteria americana*). Wood storks have been documented on the Property. A rookery is documented approximately 10 miles southwest of the Property on Hontoon Island and 13 miles northwest of the Property at Lake Disston (USFWS, 2019), and the entire Property lies within the foraging area radii limits established for north Florida wood stork rookeries. The District will adhere to the guidelines established in the January 1990 U.S. Fish and Wildlife Service's (USFWS) Habitat Management Guidelines for the Wood Stork in the Southeast Region.

## Invasive Species Management

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

Strategies:
- Treat at least 1.5 acres of invasive species annually.
- Continue feral hog removal as needed.
- Locate, map, and treat any new infestations of invasive and/or exotic plant species.

Invasive plants known to occur within the Property include camphor tree (*Cinnamomum camphora*), old world climbing fern (*Lygodium microphyllum*), cogongrass (*Imperata cylindrica*), and Chinese tallow tree (*Triadica sebifera*). Invasive species control is necessary to inhibit the continued proliferation of invasive plants and integral in the maintenance and restoration of natural plant communities. The District uses a variety of techniques including fire, mechanical, and chemical treatments. Herbicide is applied per label rates using the most appropriate method of application for the target species.

While it is unlikely that the District will eradicate invasive plants within the Property, achieving maintenance control of such species is targeted within the scope of this plan. Invasive plant infestations are light across the Property, and the Property is regularly monitored and treated as necessary. All known occurrences of Florida Invasive Species Council (FISC) Category I and II invasive plants at CBCA are currently at a maintenance level. District staff have treated approximately 15 acres of invasive vegetation within the Property since 2010. An annual goal of treating 1.5 acres of invasive plants will be established. The most significant infestations are located in the xeric hammock, in the southwest portion of the Property adjacent to the neighborhoods accessed by Magnolia Avenue.

Exotic wildlife species known to occur within the Property include feral hogs (*Sus scrofa*), brown anole (*Anolis sagrei*), and nine-banded armadillos (*Dasypus novemcinctus*). The District currently utilizes feral hog removal agents through a Special Use Authorization (SUA) process to assist in the control of feral hogs. The District keeps records of hog removal from the Property. On other District-managed properties, the District has coordinated via contract with the USDA to assist in

the removal of feral hogs. Beginning in 2019, feral hog removal agents have removed 52 hogs from CBCA. The number of hogs taken by hunters utilizing the WMA is unknown.

### Cultural Resource Protection

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

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

A review of the DHR data indicates no documented Florida Master Site File cultural sites within the Property. If any sites are located, District staff will document and report sites to the DHR. District land management activities that may affect or impact these resources will be evaluated and modified to reduce the potential for disturbance of the identified sites. Additionally, detrimental activities discovered on these sites will also be reported to the DHR and appropriate law enforcement agencies. Due to District and State policy, the locations of such cultural sites are not identified on public maps.

## LAND USE MANAGEMENT

### Access

Goal: Maintain access to and around the Property to facilitate both land management and resource protection.

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

Currently 13 gates provide management access to and across the Property. These gates are monitored regularly for maintenance and/or repair needs. Approximately 16.8 miles of interior management roads traverse the Property. To manage road maintenance, the District utilizes a roads classification system. This system includes the following classifications:

A. Paved Road – any road that is paved (there are no paved roads on the Property).
B. Primary Road – any road that requires routine maintenance of any kind.
C. Secondary Road – any road that does not require routine maintenance, only periodic or no maintenance.

Approximately 11 miles within the Property are classified as primary roads, and 5.8 miles are classified as secondary roads, with the majority consisting of native surface without stabilization material. District staff will update the roads database to reflect changes to the road network within the Property, as necessary.

Roads will be regularly inspected and receive maintenance and repair, as necessary. Figure 17 depicts the location of the roads, gates, and planned improvements on the Property. Specific details on planned infrastructure improvements are outlined in the Resource Protection and Management – Water Resources section above.

Ditch and swale maintenance is a significant portion of road maintenance at CBCA. Most of the road network was created utilizing fill from roadside ditch construction. Ditches offer catchment areas and convey water away from the road system. Ditches should be clear of trees and shrubs with the backslope cleared and reworked on a three-to-five-year interval. District staff and contractors will be utilized in the maintenance of ditches.

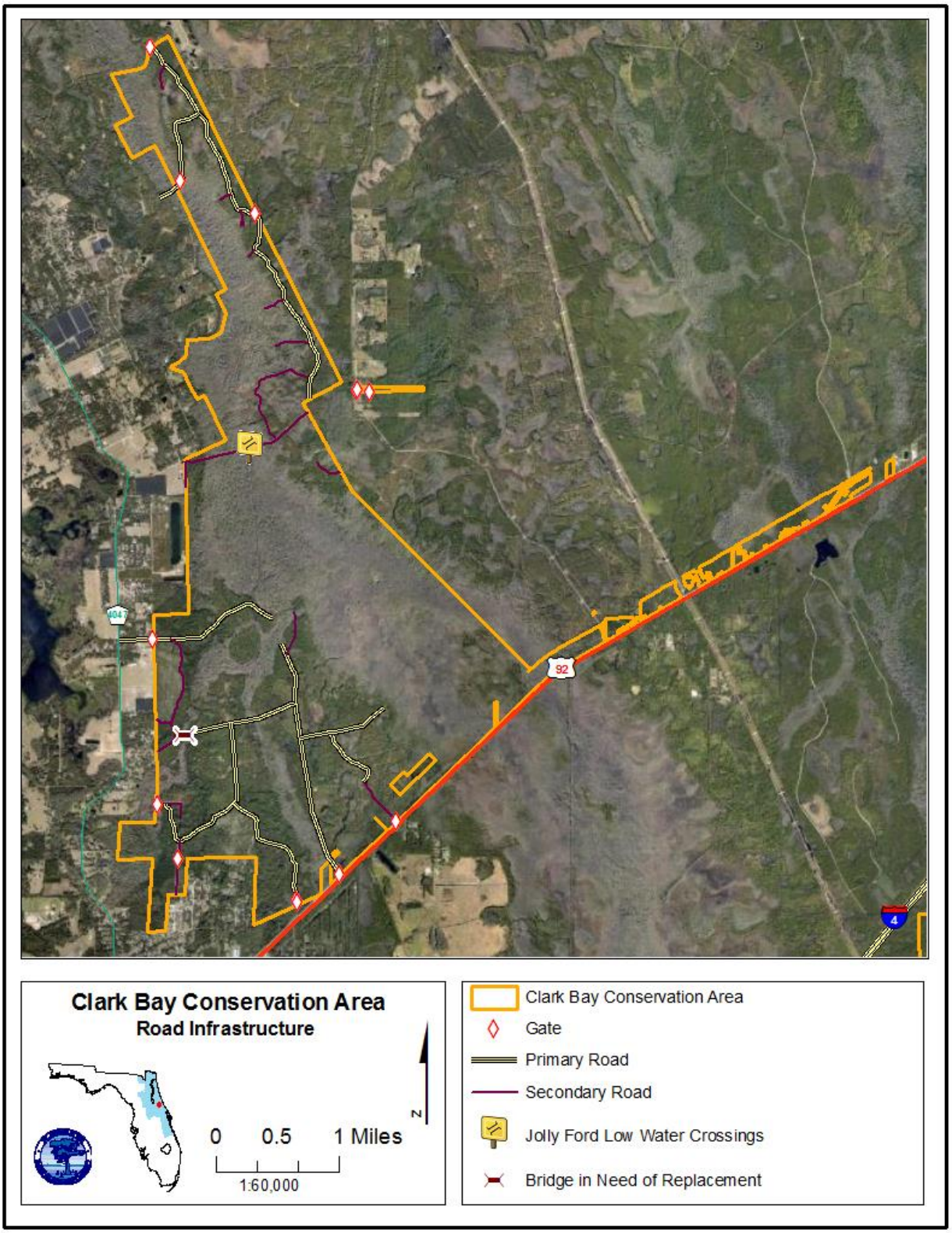


*Figure 17: Road Infrastructure*

**Recreation**

Goal: Provide public recreation opportunities on the Property

Strategies:

- Maintain five miles of trails and parking area/entrance.
- Maintain agreement allowing FWC to administer the Tiger Bay Wildlife Management Area (WMA) on the Property.
- Replace board fence at parking area as needed.
- Reduce vegetation around parking area to decrease illegal dumping and vandalism.

Recreation at CBCA includes bicycling, hiking, horseback riding, hunting, and wildlife viewing. Five miles of multi-use trails are located in the southern portion of the Property accessed by a single trailhead. This trailhead, a kiosk and parking area, are located at 2580 Old Daytona Road in DeLand (Figure 18). The trail is maintained by a District contractor with staff oversight.

Illegal dumping is an ongoing issue at the parking area. Old Daytona Road is not a heavily traveled road, which can be a contributing factor in illegal dumping sites. Staff have spent considerable time on the Property removing dumped material ranging from household trash to derelict vehicles. Staff intend to reduce the vegetation around the parking area to allow for increased sightlines into the lot.

Hunting opportunities are provided on 3,745 acres of the Property as part of the approximately 30,720-acre Tiger Bay WMA (Figure 19). The WMA encompasses part of CBCA and the adjacent Tiger Bay State Forest. The WMA is administered by FWC with input from the District. The portion of the WMA that occurs on the Property allows for a walk-in-only quota hunt and is accessed via the parking area on Old Daytona Road. Through consultation with District and FWC staff, the footprint of the WMA may be expanded within the scope of this plan. For specific hunt dates, regulations and maps, access FWC's website, https://myfwc.com/hunting/regulations/.

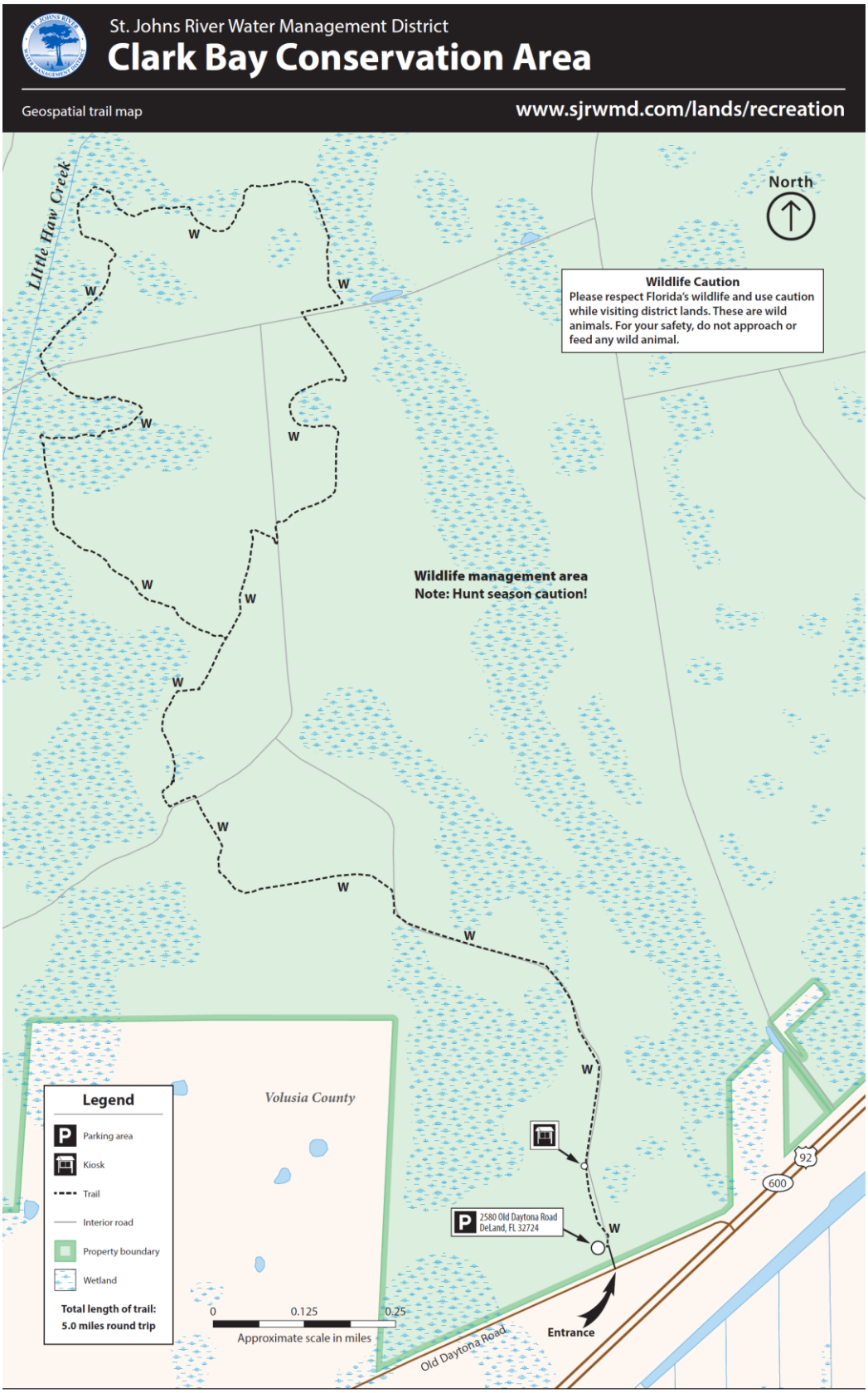


*Figure 18: Recreation Trail Map*

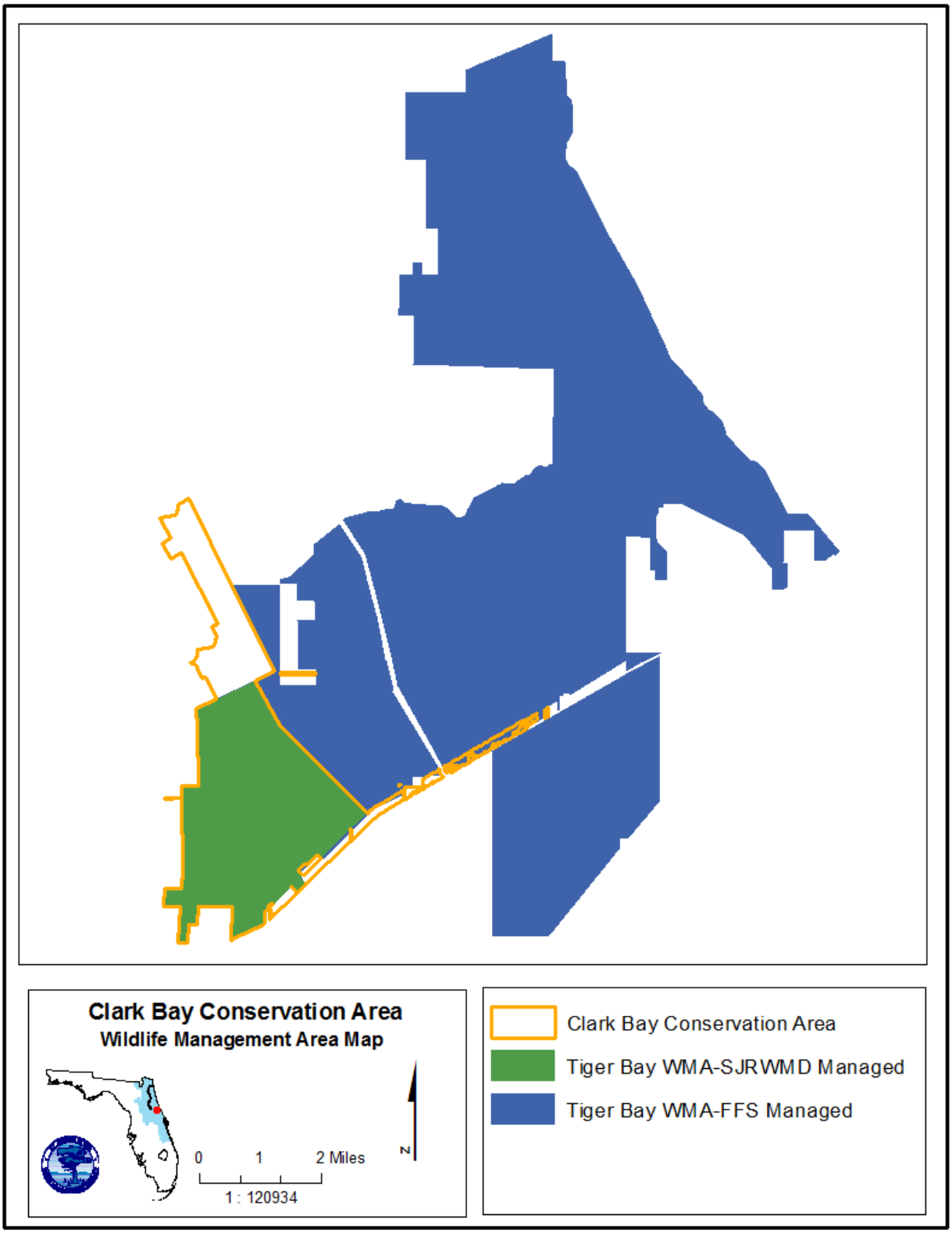


*Figure 19: Wildlife Management Area*

### Security

Goal: Provide and maintain the site's security.

Strategies:

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

Security concerns within CBCA include illegal motorized vehicle access, poaching, vandalism, and dumping. The District coordinates with FWC and local law enforcement to administer security within the Property.

## ADMINISTRATION

### Real Estate Administration

Goal: Explore opportunities for adjacent property acquisition, transfer or surplus.

Strategy:

- Evaluate adjacent properties for potential acquisition.
- Evaluate potential to transfer portions of or the entire Property to the Florida Forest Service or Volusia County.

A total of 713 acres adjacent to the Property were identified as potential acquisitions (Figure 20). These acquisitions would provide additional access and assist with wildland fire management by reducing the reliance on wetlands for firebreaks. In addition, several of these parcels have timber resources that could be incorporated into the overall forest management objectives of the Property. If these or other neighboring parcels become available, they will be evaluated for acquisition by District staff. Examples of the significance of neighboring parcels include increased continuity between the Property and Tiger Bay State Forest to the east, providing additional protection for Little Haw Creek, or allowing for restoration of impacted land.

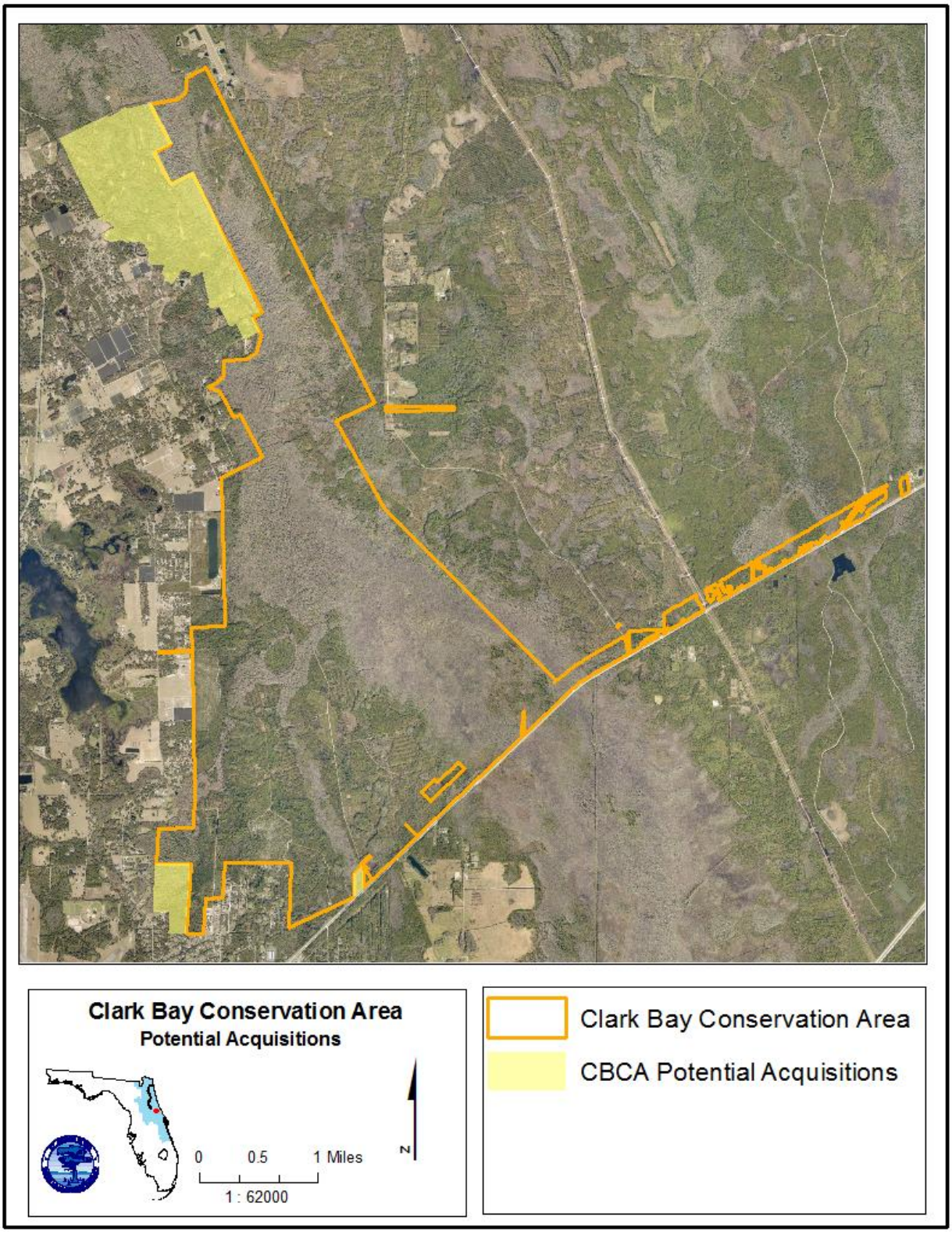


*Figure 20: Potential Acquisitions*

Pursuant to Section 373.089, Florida Statutes, the District may explore and pursue surplusing portions of its land. The District's interest in surplusing land may arise from a variety of considerations, including but not limited to:

- A property purchased as part of a larger acquisition and the surplus portion is not needed for District purposes but was included to complete a larger acquisition.
- Original project for which a property was purchased was ultimately not built.
- A property is part of a patchwork of conservation ownership, managed by another agency or local government and the surplus is to transfer the ownership to the entity managing the property for conservation purposes.
- Actions by adjacent owners that lower a property's conservation values or increase management costs.

When surplusing a property, the District commonly retains a conservation easement over the property and/or the deed contains a reverter clause. This provides for the future conservation of the property and the ability for the District to regain fee ownership if conservation or preservation is threatened in the future.

Any surplus of District-owned property requires the approval of the District's Governing Board. If the property in question was originally purchased for conservation purposes, the Governing Board shall determine that the land is no longer needed for conservation purposes, which requires two-thirds vote (§ 373.089, F.S.).

While no parcels have been identified for surplus at CBCA, several have been identified for transfer to the Board of Trustees for the Internal Improvement Trust Fund (BTIITF) to be managed by the FFS which manages the adjacent Tiger Bay State Forest. The Spaz acquisitions (Land Acquisition numbers 2011-003-P1, P2), which filled a gap in ownership between U.S. Highway 92 and CBCA and the State Forest, may be transferred to FFS within the scope of this plan. The parcels east of the eastern boundary of CBCA are subject to this potential transfer, totaling 186 acres (Figure 21). Discussions have also occurred for the transfer of CBCA in its entirety to BTIITF, to be managed by FFS or to Volusia County to consolidate management responsibilities in the region.

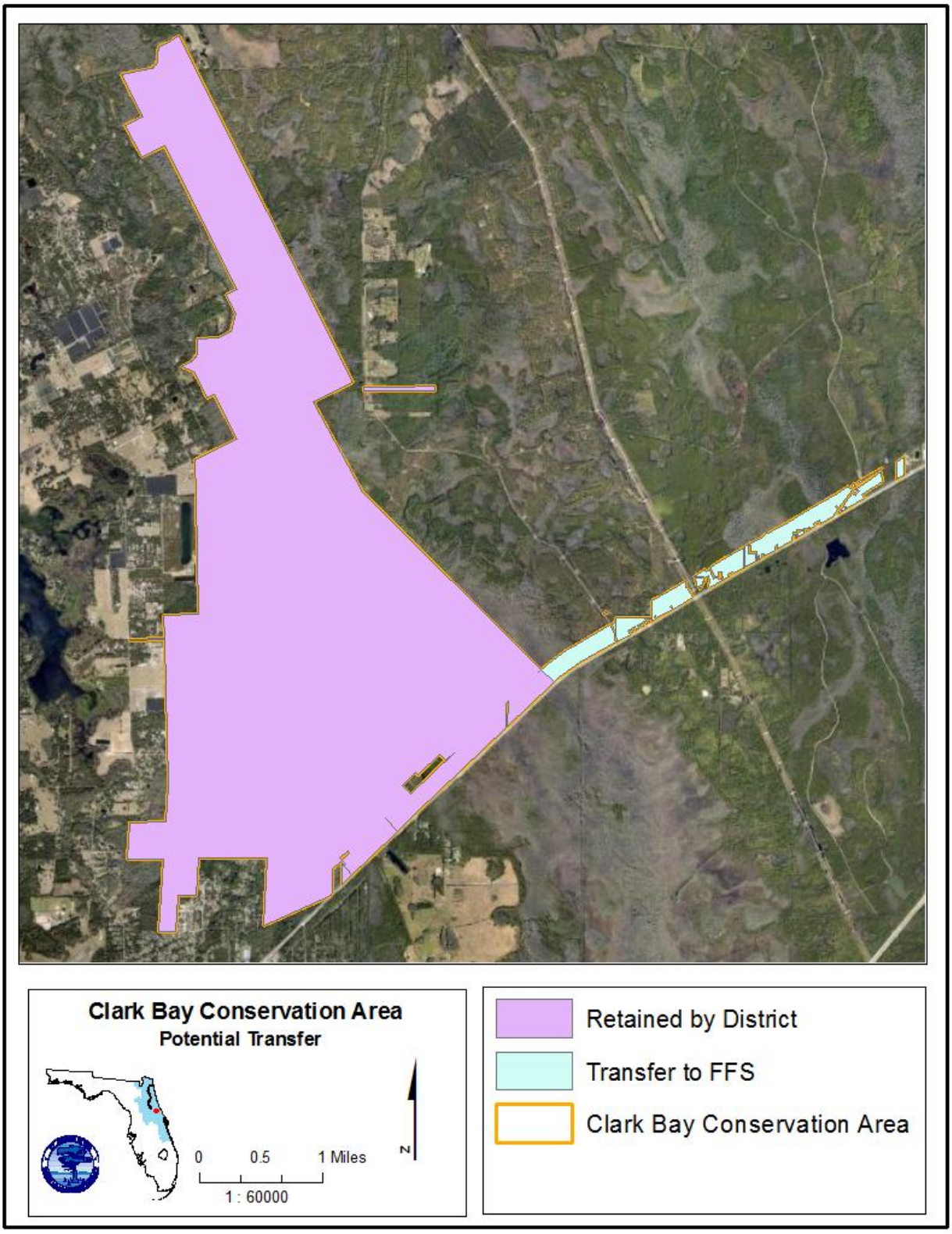


*Figure 21: Potential Transfer*

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

Goal: Evaluate, pursue, and manage cooperative opportunities.

Strategies:

- Maintain intergovernmental agreements.
- Maintain communications tower lease.
- Maintain access easements.
- Evaluate new lease and Special Use Authorization opportunities for compatibility with conservation and management goals.
- Continue to cooperate with researchers and universities as appropriate.

Section 373.1391, Florida Statutes, authorizes and encourages the District to enter into cooperative land management agreements with state agencies or local governments to provide for the coordinated and cost-effective management of lands to which the water management districts, the Trustees, or local governments hold title. District Policy #820 promotes the District entering into agreements with other agencies and private parties for cooperation and coordination of management of the District's lands.

In addition, the District is authorized to enter into Cooperative Agreements, Cooperative Management Leases, Leases, Easements and SUA's to protect the District's water management interests and to enhance the management and public value of the land. Leases can be a useful tool to accomplish land management objectives and will be evaluated and implemented where appropriate. Common examples include cattle grazing and apiaries, and the District remains open to considering other types of leases that help achieve management goals. Table 2 details the agreements, leases, and SUA's in effect at CBCA during the writing of this plan.

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

| Agreement Number | Type/Purpose | Agreement Name | Term |
|---|---|---|---|
| 2452 | Lease/Apiary | D&J Apiary | September 2028 |
| 375 | Lease/Communications Tower | GTP Towers VII | February 2025 plus four 10-year renewals until 2065 |
| 1696 | SUA/Hog Removal | Vossberg Hog Removal | July 2024 |
| 2268 | SUA/Research | Kansas State University District Wide Lobelia and Soil Sampling | September 2026 |
| 1008 | Intergovernmental Agreement/ WMA Establishment | Cooperative Agreement with FWC for WMA | May 2034 |
| 1111 | Intergovernmental Agreement/ Fire Management | SJRWMD and Volusia County-Cooperative Fire Management Agreement | September 2040 |
| 107 | Intergovernmental Agreement/ Management Designation | Agreement between District and Volusia County designating District as lead manager of Clark Bay Conservation Area | December 2033 with automatic 20-year renewals unless terminated by either party |

Two access easements are associated with the Property (Figure 22). One allows for access on Clark Bay Road, on the eastern side of the Property. This is a reciprocal easement that allows access for the District, FFS (as well as hunter access), and several property owners within an inholding of Tiger Bay State Forest. This easement provides District access to the northern Timberland Consolidated parcel of CBCA, the Downs parcel where a District monitoring well is located, and the small parcel where the communications tower is located. The other allows for access on the north and west side of the Property. This easement is contained within the deed of the Timberland Consolidated parcel and provides ingress, egress, and public utility access for the property owner.

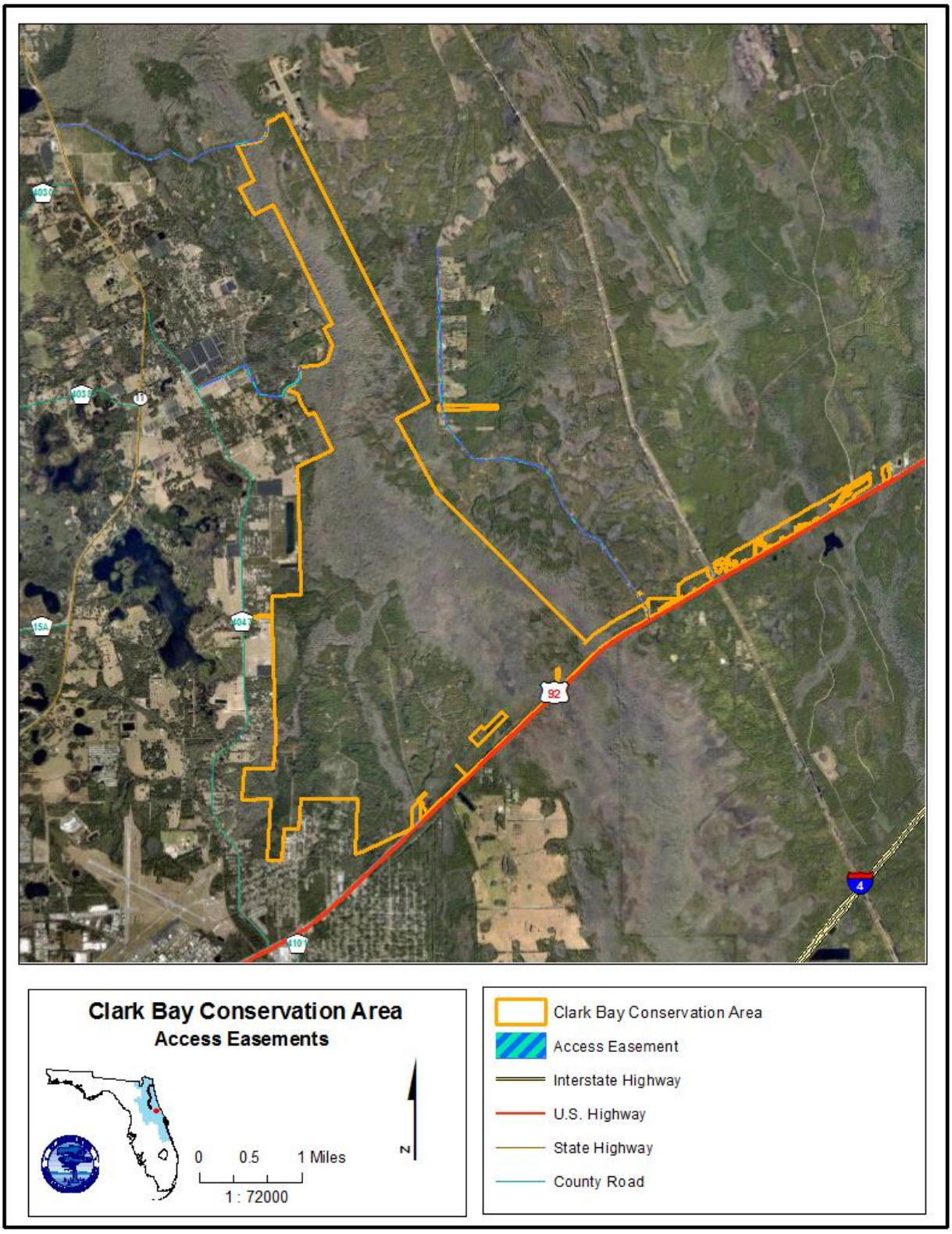


*Figure 22: Access Easements*

## Management Revenues and Costs

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

Strategies:

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

This section reviews costs and revenues since the last land management plan update (2011-2023) as well projects costs and revenues for the upcoming planning period (2024-2033). All generated revenue will be applied toward the District's land management budget to offset management costs for the Property.

Tables 3 and 4 provide the received revenue and land management costs for CBCA since the last land management plan update in 2011. Most of the revenue was produced by the communications tower lease while the greatest cost was associated with wildfire suppression.

*Revenues and Costs Since Last Land Management Plan Update (2011)*
Revenues since the last land management plan update, 2011-2023, total $631,349 (Table 3). Costs between 2011 and 2023 have totaled $417,984 (Table 4).

*Table 3 Revenues from 2011-2023*

| Activity | Revenue Year | Revenue |
|---|---|---|
| 2011 Timber Sale | 2011 | $15,145 |
| 2016 Timber Sale | 2016-2017 | $166,074 |
| 2020 Timber Sale | 2020 | $16,814 |
| 2021 Timber Sale | 2021-2023 | $26,556 |
| Apiary Lease | 2019-2023 | $1,655 |
| Communications Tower Lease | 2011-2022 | $405,105 |
| **Total** | | **$631,349** |

*Table 4: Management Costs from 2011 to 2023*

***Recurring Annual Costs***

| **Activity** | **Annual Number of Units** | **Units** | **Annual Cost** | **Total Cost (Since 2011)** |
|---|---|---|---|---|
| Staff time | 120 | Hours | $3,000 | $36,000 |
| Invasive plant control | 1.6 | Acres | $ 187 | $2,246 |
| Firebreak disking | 15 | Miles | $4,950 | $59,400 |
| Road maintenance | 17 | Miles | | $30,000 |
| Mowing (roads) | 41 | Acres | $2,742 (average) | $32,905 |
| Trails and parking lot mowing | Five miles of trails; one parking lot | | | $20,096 |
| Wildfire Suppression | 326 | Acres | $118,744 | $118,744 |
| *Total Annual Costs 2011-2023* | | | | *$299,391* |
| ***One Time Activity Costs*** | | | | |
| **Activity** | **Total Number of Units** | **Units** | **Cost** | **Total** |
| 2013 Tree planting/site prep | 72 | Acres | $19,797 | $19,797 |
| 2014 Prescribed fire | 41 | Acres | $3,085 | $3,085 |
| 2018 Forest inventory | 75 | Plots | $24 | $1,733 |
| 2019 Forest inventory | 6 | Plots | $26 | $154 |
| 2020 Fuel reduction chopping | 87 | Acres | $152 | $13,224 |
| 2020 Forest inventory | 26 | Plots | $22 | $568 |
| 2022 Forest inventory | 16 | Plots | $22 | $352 |
| 2022 Fuel reduction mowing | 332 | Acres | $240 | $79,680 |
| *Total One Time Activity Cost 2011-2023* | | | | *$118,593* |
| **Total Cost Since 2011** | | | | **$417,984** |

*Projected Land Management Revenues and Costs (2024-2033)*

Costs and revenues for CBCA are projected into the future. However, prices of timber fluctuate depending on the markets. Projected revenue generated by timber sales, shown in Table 5, is an estimate based on 2023 market prices.

The projected revenues from the communications tower lease, forest management, and apiary lease at CBCA between 2024–2033 are $670,604 (Table 5). Projected management costs for CBCA from 2024–2033 are $468,790 (Table 6). Years in which activities take place are estimated.

*Table 5: Projected revenues between 2024 to 2033*

| Activity | Year | Revenue |
|---|---|---|
| Timber sale | 2024 | $114,903 |
| Timber sale | 2025 | $24,575 |
| Timber sale | 2027 | $52,706 |
| Timber sale | 2032 | $6,218 |
| Apiary lease | 2024–2033 | $5,625 |
| Communications tower lease | 2024–2033 | $466,577 |
| **Total** | | **$670,604** |

*Table 6: Projected Management costs from 2024-2033*

***Recuring Annual Costs***

| Activity | Number of Units (annual) | Units | Annual Cost | 10 Year Total Cost |
|---|---|---|---|---|
| Staff time | 120 | Hours | $3,360 | $33,600 |
| Invasive plant control | 1.6 | Acres | $187 | $1,872 |
| Prescribed fire | 157 | Acres | $4,334 | $42,338 |
| Fireline disking | 15 | Miles | $5,250 | $52,500 |
| Road maintenance | 17 | Miles | $3,000 | $30,000 |
| Mowing (roads) | 41 | Acres | $4,000 | $40,000 |
| Trails and parking lot mowing | 5 miles of trails; one parking lot | | $2,050 | $20,500 |

***One Time Activity Costs***

| Activity | Total Number of Units | Units | Cost | Total |
|---|---|---|---|---|
| 2023-2032 Timber inventory | 400 | Plots | $10,380 | $10,380 |
| 2026 Tree planting | 80 | Acres | $ 8,600 | $8,600 |
| 2026 Timber marking | 280 | Acres | $23,000 | $23,000 |
| 2026 Firebreak construction | 9.4 | Miles | $66,000 | $66,000 |
| 2026 Low water crossing and bridge replacement | 4 | Projects | $70,000 | $70,000 |
| 2028 Fuels reduction mowing | 200 | Acres | $60,000 | $60,000 |
| 2030 Parking lot fence replacement | 350 | Liner feet | $10,000 | $10,000 |
| **Total cost over 10 years** | | | | **$468,790** |

Table 7 provide goals and strategies to implement the CBCA Land Management Plan for the next 10 years. Each strategy has a specific measurement and timeframe for completion. This schedule will be used by the Management Review Team during Land Management Reviews.

*Table 7: Land Management Plan Implementation Schedule*

## RESOURCE PROTECTION AND MANAGEMENT

**Water Resources**

| Goal | Protect water quality and quantity, restore hydrology to the extent feasible, and maintain the restored condition | Measure | Planning Period |
|---|---|---|---|
| Strategy A | Maintain roads and culverts to prevent erosion. | Roads and culverts maintained | Annually by September |
| Strategy B | Install culverts, water bars, turnouts, and low water crossings where needed, focusing on Road 1, Road 24 and Jolly Ford Road. | Water bars, turnouts, and low water crossings installed | 5-10 Years |
| Strategy C | Level silvicultural beds from timber harvest areas if restoration is feasible. | Removed beds | 5-10 Years |

**Forest Management and Restoration**

| Goal | Maintain, improve, and restore forest resources | Measure | Planning Period |
|---|---|---|---|
| Strategy A | Update forest management database. | Updated forest management database | Annually by November |
| Strategy B | Thin or clearcut 919 acres of timber. | Acres of timber managed | 10 Years |

**Fire Management**

| Goal | Implement a prescribed burning program in accordance with District's Fire Management Plan | Measure | Planning Period |
|---|---|---|---|
| Strategy A | Apply fire to 151 acres of flatwoods annually, averaged over the 10-year planning period | Number of acres burned | 10 Years |
| Strategy B | Apply fire to 61 acres of scrub at least once, averaged over the 10-year planning period. | Number of acres burned | 10 Years |

| | | | |
|---|---|---|---|
| Strategy C | Conduct dormant season burns in pine plantations and areas of high fuel loading and/or extended fire exclusion. | Acres burned in dormant season | Ongoing |
| Strategy D | Maintain and create new firebreaks. | Miles maintained or constructed | Annually by October |
| Strategy E | Use mechanical fuel reduction as a fire surrogate in areas where it is difficult to burn due to high fuel loads. | Number of acres mowed or roller chopped | 5-10 Years |
| Strategy F | Develop annual burn plans and populate the fire management database on an annual basis. | Burn plan and reports | Annually by September. |

**Flora and Fauna**

| **Goal** | **Maintain, improve, or restore native and listed species populations** | **Measure** | **Planning Period** |
|---|---|---|---|
| Strategy A | Conduct plant and wildlife surveys and develop species lists. | Updates to species list | Ongoing |
| Strategy B | Monitor the presence of listed species and adjust management actions appropriately. | Updates to species list and adjusted management actions | Ongoing |
| **Goal** | **Manage invasive and/or exotic plants and animals** | **Measure** | **Planning Period** |
| Strategy A | Treat at least 1.5 acres of invasive species annually | Acres treated | Annually by September |
| Strategy B | Conduct feral hog removal activities as needed. | Number of hogs removed | Annually by September |
| Strategy C | Locate, map, and treat any new infestations of invasive and/or exotic plant species. | Mapping and treatment of new infestations | Ongoing |

**Cultural Resource Protection**

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

| | | | |
|---|---|---|---|
| Strategy B | Identify and report any detrimental activities to the sites to the DHR and law enforcement. | Sites identified and reported | Ongoing |

## LAND USE MANAGEMENT

**Access**

| **Goal** | **Maintain access to and around the Property to facilitate both and land management and resource protection** | **Measure** | **Planning Period** |
|---|---|---|---|
| Strategy A | Maintain, gates, roads and associated swales/ditches. | Gates, roads and swales/ditches maintained | Ongoing |
| Strategy B | Update District database on maintenance of existing and creation of new signs, gates, trails, and roads. | Database updated | Ongoing |

**Recreation**

| **Goal** | **Provide public recreation opportunities on the Property** | | |
|---|---|---|---|
| Strategy A | Maintain five miles of trails and parking lot | Miles maintained | Annual, ongoing |
| Strategy B | Maintain agreement allowing FWC to administer the Tiger Bay WMA on the Property | Submit any changes to FWC | Annually by April |
| Strategy C | Replace board fence at parking lot | Liner feet replaced | 5 years |
| Strategy D | Reduce vegetation around parking lot to decreasing illegal dumping and vandalism | Visible reducing in vegetation | Ongoing |

**Security**

| **Goal** | **Provide and maintain the site's security** | **Measure** | **Planning Period** |
|---|---|---|---|
| Strategy A | Maintain boundary signage, gates, and locks. | Signs, fences, gates, and locks maintained | Ongoing |

| | | | |
|---|---|---|---|
| Strategy B | Continue coordination with FWC and local law enforcement. | Secure property | Ongoing |

## ADMINISTRATION

**Real Estate Administration**

| **Goal** | **Explore opportunities for adjacent property acquisition** | **Measure** | **Planning Period** |
|---|---|---|---|
| Strategy A | Evaluate adjacent properties for potential acquisition. | Properties evaluated | Annually by September |
| Strategy B | Evaluate potential to transfer portions of or the entire Property to the Florida Forest Service | Parcels transferred | 5-10 years |

**Cooperative Agreements, Leases, Easements, and Special Use Authorizations (SUA)**

| **Goal** | **Evaluate, pursue, and manage cooperative opportunities** | **Measure** | **Planning Period** |
|---|---|---|---|
| Strategy A | Maintain intergovernmental agreements | Agreements administered | Ongoing |
| Strategy B | Maintain communications tower and apiary leases | Leases administered | Ongoing |
| Strategy C | Maintain access easements | Easements administered | Ongoing |
| Strategy D | Evaluate new lease and Special Use Authorization opportunities for compatibility with conservation and management goals. | Leases and SUA's evaluated | Ongoing |
| Strategy E | Continue to cooperate with researchers and universities as appropriate. | Research SUA's evaluated | Ongoing |

**Management Revenues and Costs**

| **Goal** | **Analyze and report projected and actual costs and revenues** | **Measure** | **Planning Period** |
|---|---|---|---|
| Strategy A | Analyze and report revenues. | Annual report | Annually by November |
| Strategy B | Analyze and report land management costs. | Annual report | Annually by November |

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# APPENDIX A: CLARK BAY CONSERVATION AREA SOILS

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

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

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

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

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

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

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

**Farmton**
The Farmton series consists of very deep, poorly drained soils formed in sandy and loamy marine sediments. Most areas are planted in pines or are in natural vegetation with an overstory of

longleaf and slash pines and an understory of saw palmetto, wax myrtle, gallberry, fetterbush, lyonia, creeping bluestem, chalky bluestem, and pineland threeawn.

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

**Immokalee**
The Immokalee series consists of deep to very deep and poorly drained to very poorly drained soils that formed in sandy marine sediments. They occur on flatwoods and in depressions of Peninsular Florida. Slopes tend to be 0 – 2 percent, but may range to 5 percent. Principle vegetation is longleaf and slash pine with undergrowth of saw palmetto, gallberry, wax myrtle, and pineland threeawn. In depressions, water tolerant plants such as cypress, loblolly bay, gorodonia, red maple, sweetbay, maidencane, bluestem, sand cordgrass, and blue joint panicum are more common. Most areas with Immokalee soils are in rangeland and forests.

**Malabar**
The Malabar series consists of very deep, poorly to very poorly drained soils in sloughs, shallow depressions, and along flood plains. Formed in sandy and loamy marine sediments. Slopes in areas where these soils are found range from 0-2 percent. Native vegetation consists of scattered slash pine, cypress, wax myrtle, cabbage palm, pineland threeawn, and maidencane. In depressions, the vegetation is dominantly St. Johns Wort or maidencane.

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

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

**Paisley**
The Paisley series consists of deep, poorly drained, slowly permeable soils that formed in clayey marine sediments influenced by underlying calcareous materials. These soils are on nearly level, low board coastal plains with slopes of less than 1 percent. Native vegetation consists of slash,

longleaf, and loblolly pine, swamp white oak, swamp maple, and sweetgum with an understory of wax myrtle, cabbage palmetto, bluestem, and native grasses.

**Paola**
The Paola series consists of very deep, excessively drained, very rapidly permeable soils on uplands. They formed in thick sandy marine deposits. These soils are on uplands of the Coastal Plain. Native vegetation consists of sand pine, slash pine, longleaf pine, scrub live oak, scattered turkey oak, and bluejack oak. The undergrowth consists of cacti, mosses, lichens, creeping dodder, rosemary, and scattered saw palmetto.

**Pineda**
The Pineda series consists of deep and very deep, poorly and very poorly drained, very slowly permeable soils in depressions, low hammocks, poorly defined drainageways, broad low flats, and floodplains. Formed in thick beds of sandy and loamy marine sediments on the lower coastal plain. Slopes in areas where these soils are found range from 0-2 percent. Native vegetation consists of slash pine, cypress, myrtle, cabbage palm, blue maidencane, chalky bluestem, blue point panicum, sedges, pineland threeawn, and sand cordgrass.

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

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

**Quartzipsamments** – Soil usually associated with a borrow pit site.

**Riviera**
The Riviera series consists of very deep, poorly drained, very slowly permeable soils on broad, low flats and in depressions in the lower coastal plain. They formed in stratified sandy and loamy marine sediments on the lower coastal plain. Slopes in areas where these soils are found range from 0-2 percent. Native vegetation consists of slash pine, cabbage, and saw palmetto, scattered cypress, maidencane, and pineland threeawn.

**Samsula**
The Samsula series consists of very deep, very poorly drained, rapidly permeable soils that formed in moderately thick beds of hydrophytic plant remains and are underlain by sandy marine sediments. These soils are in swamps, poorly defined drainage ways, and flood plains. Slopes are

less than 2 percent. Natural vegetation is loblolly bay, with scattered cypress, maple, gum, and trees with a ground cover of greenbriers, ferns, and other aquatic plants.

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

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

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

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

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

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

**Wabasso**

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

**Wauchula**

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

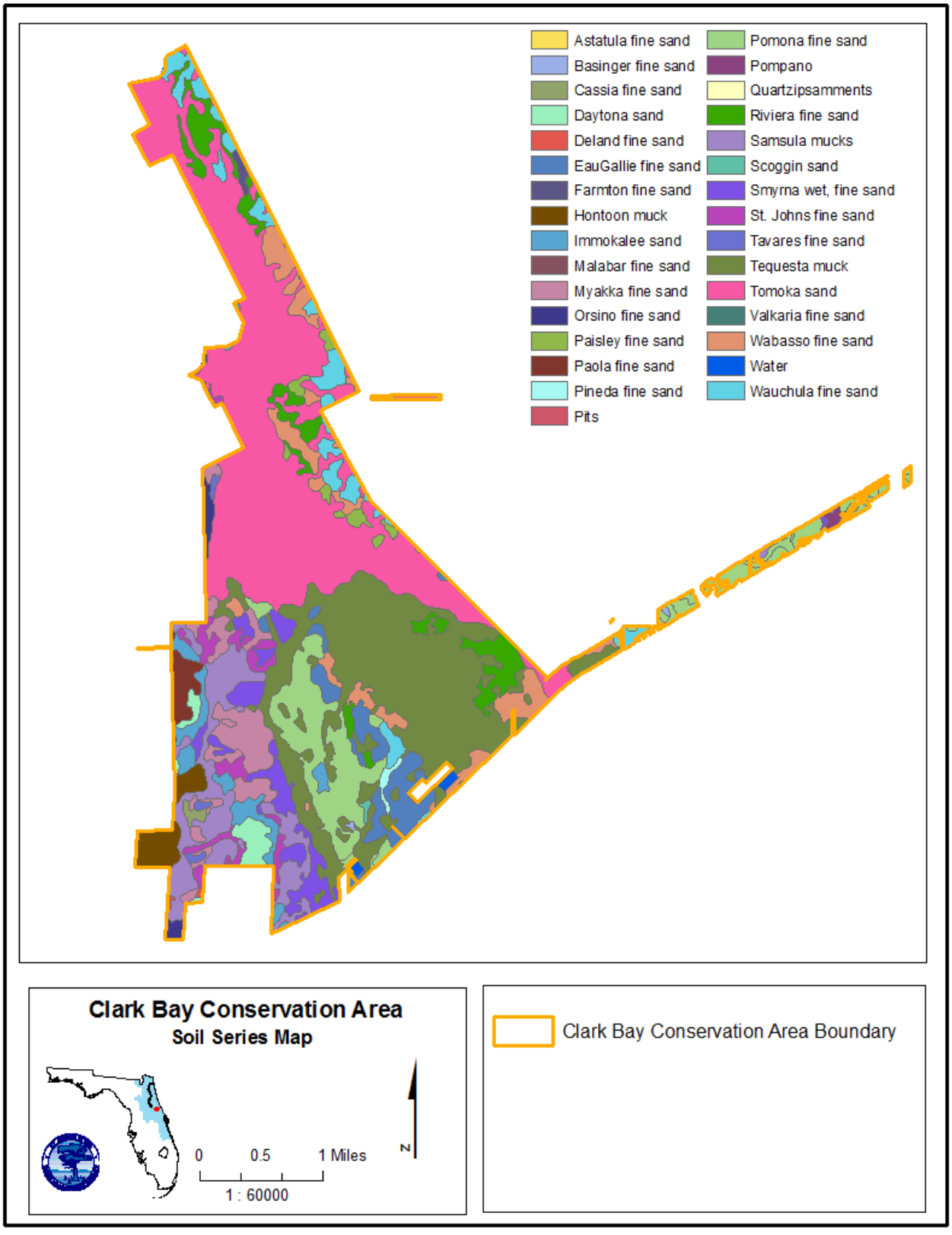


*Figure 1: Soil types at Clark Bay Conservation Area.*

# APPENDIX B: DISTRICT FOREST MANAGEMENT PLAN

In 1998, the Florida Legislature charged all state land management agencies with managing the forest resources on the lands they have acquired. To date, the St. Johns River Water Management District (District) has acquired over 775,000 acres of land. Approximately 43 percent of these acres are forested. Prior to 2000, no overall long-term plan existed to provide guidance and coordination for the management of the District's forest resources. This plan will provide that guidance and continuity.

Even prior to the legislative directive, the District had been managing its forest resources. Timber sales began in 1991 with a salvage sale at Lake George Conservation Area following a wildfire. From 1991-2023, nearly 200 timber sales have been completed.

## PURPOSE OF FOREST MANAGEMENT

The District manages forest resources for the:

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

### Restoring Natural Communities

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

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

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

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

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

**Maintenance of the Health and Vigor of the Natural Communities**

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

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

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

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

As land managers, the District also has an obligation to protect neighboring landowners from any large-scale wildfire, insect or disease outbreaks that may originate on District land and spread to adjacent lands. This obligation prohibits the District from employing a truly natural management system to control overstory species, density, and composition and requires the District to utilize a more interactive management program.

## Generation of Revenues

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

## FOREST RESOURCES INVENTORY

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

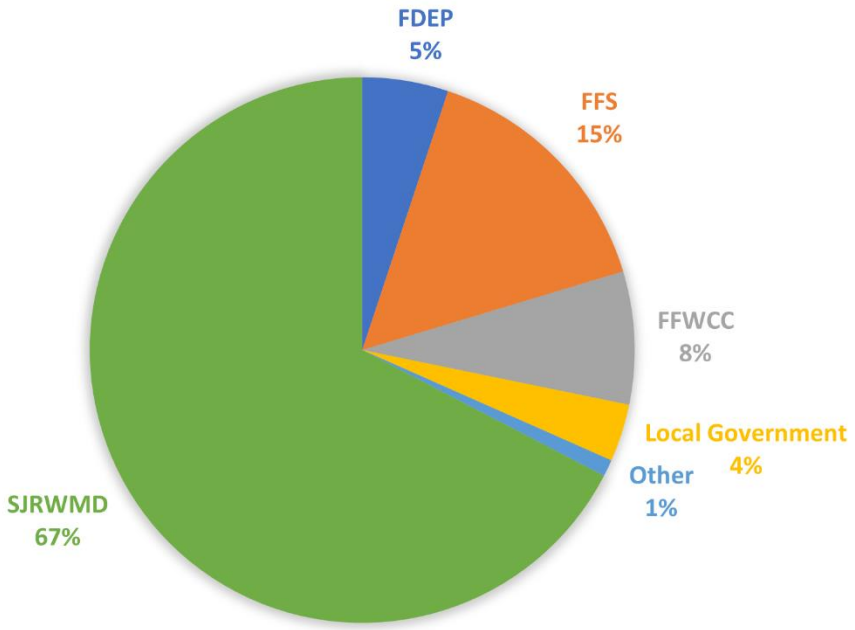


*Figure 1: District Owned Land by Lead Manager. Updated January 2020*

The District's Land Management Rule, agreements and philosophy call for the lead manager's rules and policies to direct the management of the affected lands, therefore this plan will be focused on the lands where the District is identified as the lead manager. The District serves as the lead manager on 430,000 acres. These acres managed by the District are broken down as follows (Figure 2).

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

## OBJECTIVES OF FOREST MANAGEMENT

The District's forest management objectives are to:

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

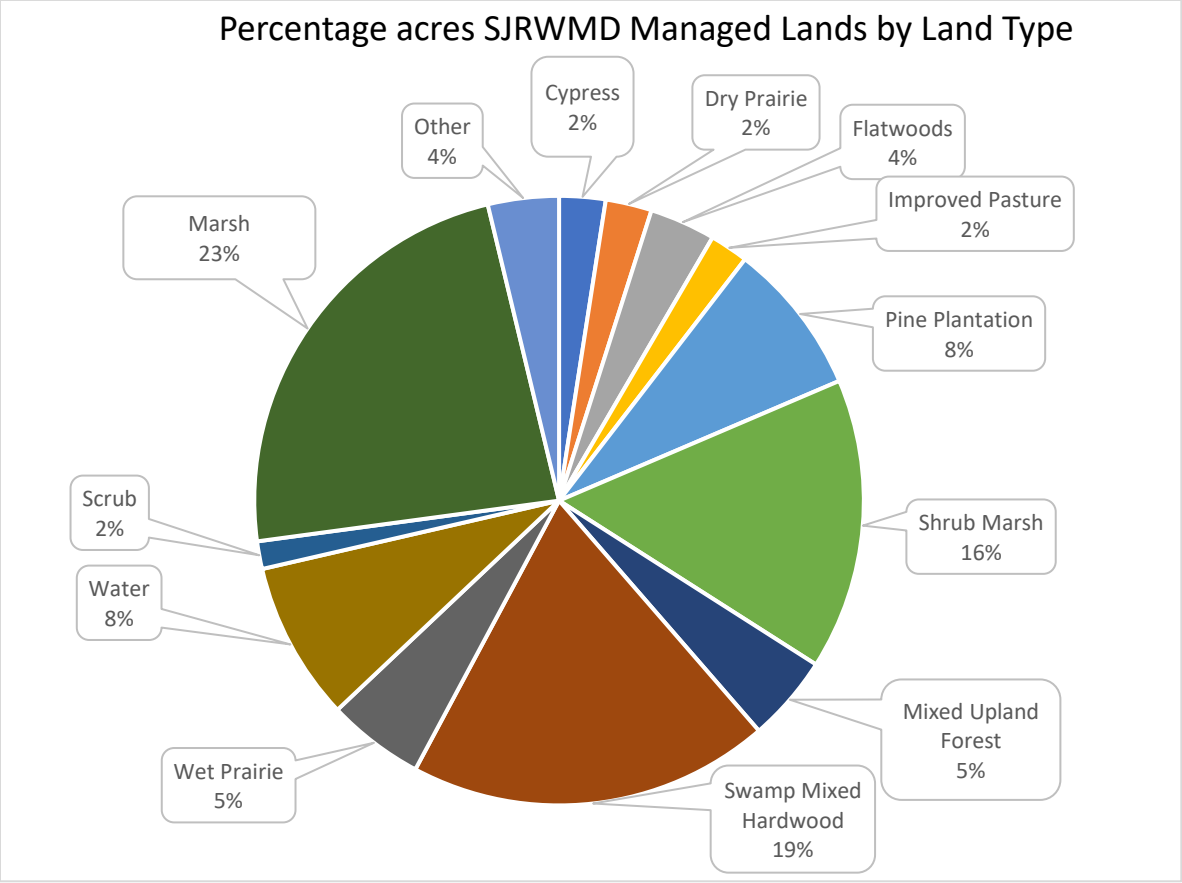


*Figure 2: Percentage acres SJRWMD Managed Lands by Land Type. Updated January 2020*

**Techniques of Forest Management**

*Inventory*

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

*Harvesting*

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

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

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

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

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

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

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

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

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

*Site Preparation*

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

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

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

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

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

*Regeneration*

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

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

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

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

## OVERALL METHODOLOGY

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

### Pine Forests

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

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

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

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

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

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

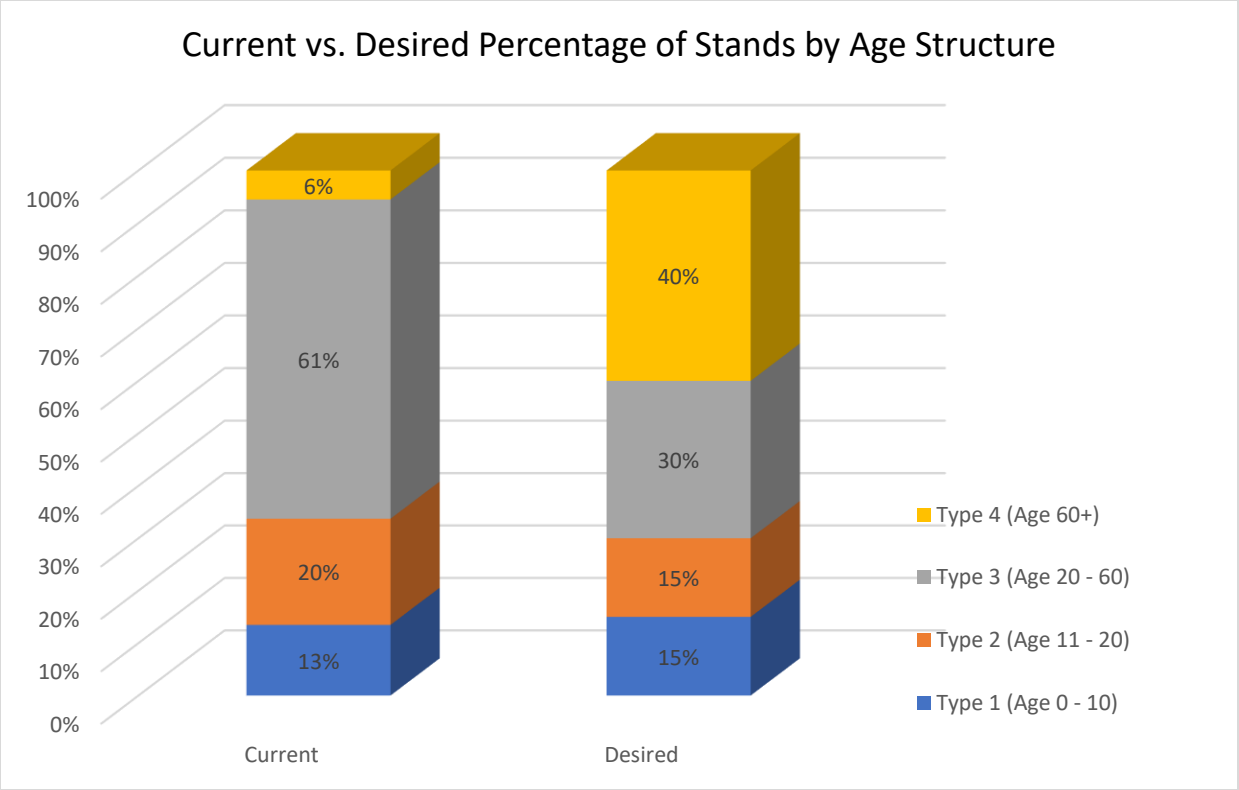


*Figure 3: Current vs. Desired Percentage of Stands by Type. Updated January 2020*

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

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

**UPLAND HARDWOODS**

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

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

## WETLAND HARDWOODS AND CYPRESS

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

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

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

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

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

# APPENDIX C: CLARK BAY CONSERVATION AREA FIRE MANAGEMENT PLAN

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

## Introduction and Objectives

Clark Bay Conservation Area covers approximately 5,134 acres in Volusia County. The Property includes six parcels and is located in numerous sections of Townships 15 and 16 South and Ranges 30 and 31 East.

The Property is located north of U.S. Highway 92 and northeast of the city of DeLand. The DeLand Municipal Airport is approximately a half mile west of the southern end of the Property.

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 Property include:

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

The achievement of these goals requires that the Property be partitioned into manageable burn units prior, termed fire management units (FMU), 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 Property.

## 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 Property 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).

*Table 1: Natural Community Fire Return Interval*

| Natural Community Type | FNAI Fire Return Interval |
|---|---|
| Mesic Flatwoods (Pine Plantation*) | 2-4 years |
| Wet Flatwoods (Pine Plantation*) | 1-3 years in grass dominated systems; 5-7 years in shrubbier systems. |
| Depression Marsh | 2-7 years; frequency of fire varies depending on the hydrology of the marsh and its exposure to fire from surrounding areas. |
| Basin Swamp | This is not a fire-adapted community. |
| Dome Swamp | 3-5 years along the outer edges (or as adjacent communities burn); 100-150 years interior. |
| Scrub | 5-20 years; ideal interval 8-10 years |
| Scrubby Flatwoods | 5-15 years |
| Xeric Hammock | Infrequent; may burn with adjacent pyric plant communities. |
| Baygall | Infrequent; may burn with adjacent pyric plant communities. |

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

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

Mesic and wet flatwoods are the most prevalent fire-adapted natural community types found within the Property. Prior to public acquisition, most of these areas were utilized in commercial silviculture operations. As a result, much of the historic mesic and wet flatwoods are planted in slash pine (*Pinus elliottii*). Additionally, the mid-story and groundcover species within these pine plantations are altered and, in some areas, absent. The primary fine fuels for carrying fire across dense pine areas is needle litter. These natural communities have been impacted by many of the wildfires that have occurred on CBCA since the last plan update. Several stands have been thinned or received mechanical fuels treatments. These sites where disturbance has recently occurred will be the priority for upcoming prescribed fires. Initially, dormant season prescribed fires should be the focus to reduce the standing fuel loads with growing season prescribed fires being incorporated into the prescribed fire plan for the Property.

The 146 acres of scrub natural community is highly dependent on fire, though on a longer interval that flatwoods. Approximately 100 acres of scrub has received mechanical fuels treatments since the last land management plan update. These communities on CBCA are a priority due to their ecological importance and overall scarcity in the State. Scrub can be challenging to conduct prescribed fire operations in. Fuel continuity is generally poor compared with flatwoods where grasses and pine litter carry surface fire well. This results in patchy burns which are ecologically beneficial, but can lead to reburning of the burn unit, increasing the need for mop up and post burn monitoring. Under conditions where scrub would burn completely, control of the prescribed fire would likely be difficult. Scrub can produce embers that can travel far and retain heat, increasing the potential for long range (greater than 50 feet from the point of ignition) spotting. As with flatwoods mentioned above, dormant season prescribed fires should initially be the focus with growing season prescribed fires being incorporated in time. Additional mechanical treatments may be necessary for long unburned scrub sites at CBCA.

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

The small scrubby flatwoods section that is embedded within mesic flatwoods on the western side of the Property will be burn with the surrounding natural community. While wet and mesic flatwoods have a shorter return interval that scrubby flatwoods, the scrubby flatwoods are likely to burn more completely, every other burn applied to the surrounding flatwoods. On CBCA, this community continues onto adjacent property, decreasing the likelihood that this natural community will receive a prescribed fire until a firebreak is constructed along CBCA's boundary.

Depression marsh is a fire-adapted community. Though fire may not carry entirely through each marsh during every burn, it is an important factor in the maintenance and serves to restrict encroachment of woody plant species. Natural fire regime coincides with that of the adjacent habitat. Approximately 24 acres of depression marshes are adjacent to the uplands within the Property. In general, depression marsh fires are carried through the herbaceous layer. Many of these marshy areas have been disturbed by past land use, but all still occupy an important niche in providing habitat for numerous species of wildlife. Fire may be applied to these marshes any time surrounding natural communities are burned.

Dome swamps are scattered throughout the Property. As site conditions and safety permits, fire will be allowed to burn into the domes to maintain the characteristic open edges of the domes while preventing excessive peat accumulation. Checking the soil moisture within and along the edge of the swamps should be conducted prior to prescribed fire operations to limit the chance of smoldering ignition.

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

Baygalls are not generally targeted specifically for fire management, and pockets of bay trees will begin to move into adjacent mesic and wet flatwoods natural communities over time. The natural community is located along a boundary in the wildland-urban interface. This makes fire operations more challenging than normal. The likelihood that prescribed fire will be applied to this natural community is low, though not unattainable, due to its location.

The small xeric hammock will not be a target for prescribed fire. It is not a fire maintained natural community. It's location within the wildland-urban interface makes it a low priority for restoration and reintroduction of fire.

**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 April through mid-August. 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 Clark Bay is large with an ample smoke shed including adjacent conservation lands, the Property is a candidate for implementing prescribed fire with the use of a helicopter. Aerial ignition allows District staff to ignite fire management units quickly, which results in faster burnout and reduces smoke management concerns. Additionally, convection produced by igniting an area can help move the smoke up and away more quickly. Aerial ignition also allows staff to introduce fire into areas that may be inaccessible from the ground, ensuring that prescribed fire is introduced into even the most remote areas within the fire management units. Aerial ignition allows staff to burn more acres in a shorter period, which in time will aid District staff in maintaining optimal fire return frequencies. An aerial burn safety plan (Exhibit 1) will accompany the individual burn prescriptions and be onsite and on the ground the day of any aerial burn. Coordination with the DeLand Municipal Airport will be needed prior to and during aerial ignition operations.

**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, firelines, 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) Sufficient resources are 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 Property should report them to the Florida Department of Agriculture and Consumer Services, Florida Forest Service, the District, or by dialing 911.

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

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

While CBCA has an acceptable smoke shed in which to place a smoke column from a prescribed fire, there are smoke sensitive areas that surround the Property and may affect the smoke management of each burn unit. Smoke management is a limiting factor in the application of prescribed fire within the Property. Figure 1 illustrates the smoke management area for CBCA. As development increases in the area, smoke management will become more difficult. Proximity to the City of DeLand as well as increasing daily traffic on U.S. Highway 92 and I-95 will further impair the District's ability to implement prescribed burns at the appropriate fire return intervals within the Property. Currently, this property still has an acceptable smokeshed, within the Property and to the east of its boundary, in which to place a smoke column from a prescribed fire.

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

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

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

**Mechanical and Chemical Treatments**

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

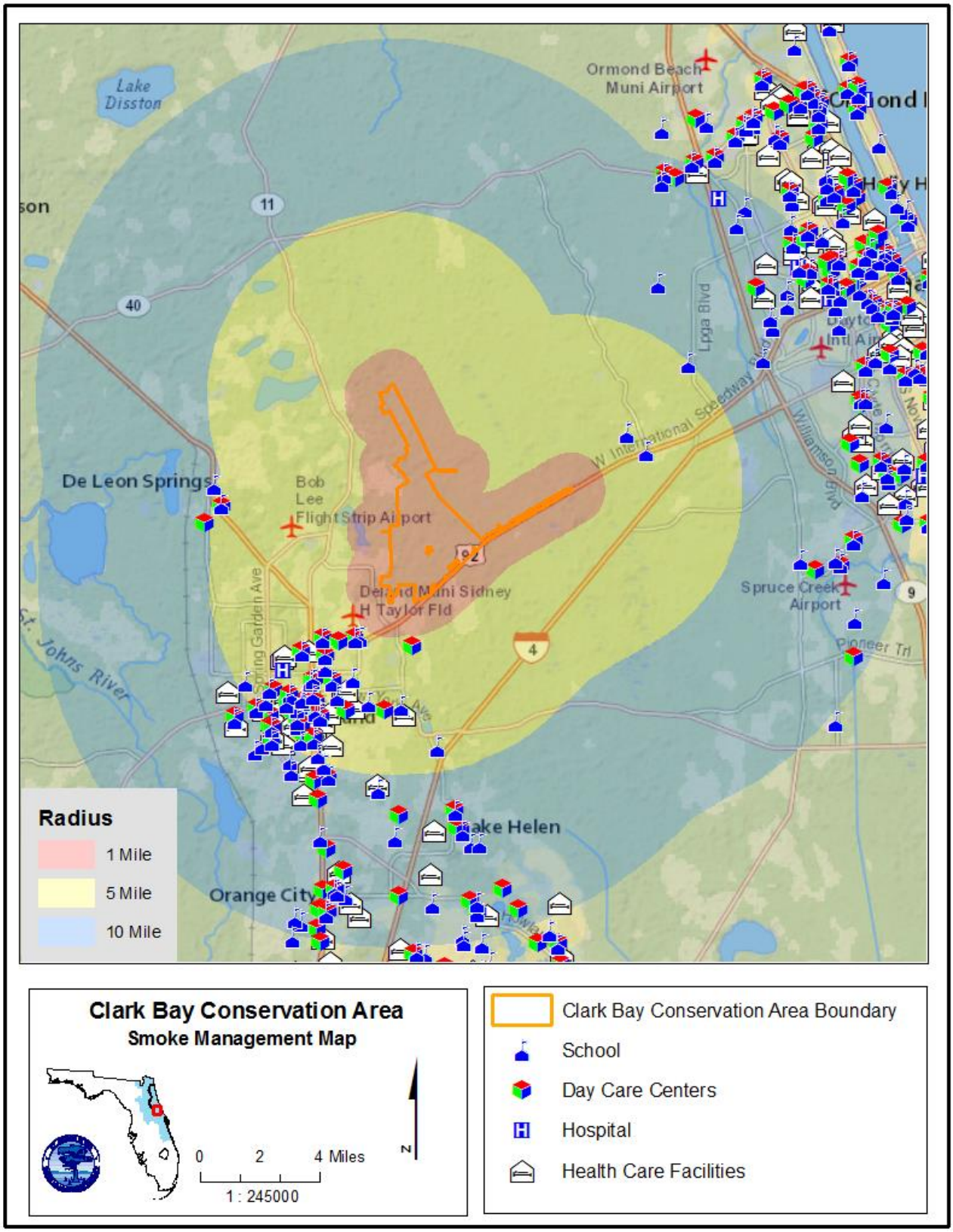


*Figure 1: Fire management – smoke sensitive areas.*

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

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

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

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

All FMUs 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
## Clark Bay Conservation Area

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

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

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

# Crash Rescue Plan

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

INCIDENT COMMANDER or BURN BOSS

1. **Notify 911**
2. Notify Volusia County Fire Rescue (386)-313-4200.
3. Notify Volusia Sheriff's Office (386)-313-4911
4. Assume responsibility of the Rescue Operation.
5. Notify National Transportation Safety Board (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 Incident Commander (IC) or Burn Boss with resource and personnel needs for the rescue operation.
3. If the IC is in the helicopter, second in command will assume rescue operation responsibilities and assign the most qualified to fire control.

## Emergency Phone Numbers

**AIR RESCUE UNITS**

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

**BURN UNIT LOCATIONS**

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

**FLORIDA FOREST SERVICE**

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

**NTSB**

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

## APPENDIX D: CLARK BAY CONSERVATION AREA SPECIES LIST

### Plants

| Genus species | Common Name (Conservation Status) |
|---|---|
| *Acer rubrum* | Southern red maple |
| *Aletris lutea* | yellow colicroot |
| *Ambrosia artemisiifolia* | Common ragweed |
| *Andropogon glomeratus* | Bushy bluestem |
| *Andropogon virginicus var. glaucus* | Chalky bluestem |
| *Andropogon virginicus var.virginicus* | Broomsedge bluestem |
| *Aristida stricta var. beryichiana* | Wiregrass |
| *Asclepias pedicellata* | savannah milkweed |
| *Asimina incana* | Woolly pawpaw |
| *Asimina pygmea* | Dwarf pawpaw |
| *Baccharis halimifolia* | Saltbush |
| *Bacopa caroliniana* | lemon bacopa |
| *Bidens alba* | white beggarsticks |
| *Bidens mitis* | smallfruit beggarticks |
| *Buchnera floridana* | florida bluehearts |
| *Callisia ornata* | scrub roseling |
| *Campanula floridana* | Florida bellflower |
| *Carphephorous odoratissimus* | vanillaleaf |
| *Carphephorous paniculatus* | hairy chaffhead |
| *Cephalanthus occidentalis* | buttonbush |
| *Ceratiola ericoides* | Florida rosemary |
| *Chamaecrista nictitans aspera* | sensitive partridge pea |
| *Chrysopis subulata* | scrubland goldenaster |
| *Cinnamomum camphora* | camphor tree* |
| *Cirsium horridulum* | bristle thistle |
| *Cnidoscolus stimulosus* | spurge nettle |
| *Coreopsis leavenworthii* | Leavenworth's tickseed |
| *Desmodium incanum* | creeping beggarweed |
| *Drosera capillaris* | pink sundew |
| *Elephantopus elatus* | tall elephant's-foot |
| *Eriocaulon decangulare* | ten-angled pipewort |
| *Gaylussacia tomentosa* | blue huckleberry |
| *Gelsemium sempervirens* | yellow jessamine |
| *Gordonia lasianthus* | loblolly bay |
| *Habenaria floribunda* | toothpetal false reinorchid |

| | |
|---|---|
| *Houstonia procumbens* | roundleaf bluet |
| *Hypericum cistifolium* | roundpod St. John's-wort |
| *Hypericum fasciculatum* | peelbark St. Johns-wort |
| *Hypericum gentianoides* | pineweed |
| *Hypericum hypericoides* | St. Andrew's cross |
| *Hypericum tenuifolium* | sandhill St. John's-wort |
| *Hypericum tetrapetalum* | fourpetal St. Johns-wort |
| *Hypoxis juncea* | fringed star grass |
| *Hyptis alata* | musky mint |
| *Ilex cassine* | dahoon holly |
| *Ilex glabra* | gallberry |
| *Imperata cylindrica* | cogongrass* |
| *Indigofera spicata* | creeping indigo |
| *Ipomoea cordatotriloba* | tievine |
| *Ipomoea hederifolia* | scarlet creeper |
| *Jatropha multifida* | coralbush |
| *Juncus scirpoides* | needlepod rush |
| *Lachnanthes caroliniana* | Carolina redroot |
| *Lobelia feayana* | bay lobelia |
| *Lobelia glandulosa* | glade lobelia |
| *Ludwigia maritima* | seaside primrose-willow |
| *Ludwigia peruviana* | peruvian primrose-willow |
| *Lygodium microphyllum* | old world climbing fern* |
| *Lyonia ligustrina* | he-huckleberry |
| *Lyonia lucida* | fetterbush lyonia |
| *Macroptilium lathyroides* | phasey bean |
| *Mikania scandens* | climbing hempvine |
| *Mimosa quadrivalvis floridana* | Florida sensistive briar |
| *Opuntia austrina* | Florida pricklypear |
| *Parthenocissus quinquefolia* | Virginia creeper |
| *Passiflora pallida* | corkystem passionflower |
| *Phyla nodiflora* | turkey tangle frogfruit |
| *Physalis walteri* | dune groundcherry |
| *Piloblephis rigida* | Florida pennyroyal |
| *Pinguicula lutea* | yellow butterwort |
| *Pinguicula pumila* | small butterwort |
| *Pinus clausa* | sand pine |
| *Pinus elliottii* | slash pine |
| *Pinus palustris* | longleaf pine |
| *Pinus taeda* | loblolly pine |
| *Pityopsis graminifolia* | narrowleaf silkgrass |
| *Pluchea odorata* | marsh fleabane |
| *Polygala lutea* | orange milkwort |

| | |
|---|---|
| *Polygala nana* | candyroot |
| *Polygala rugelii* | yellow milkwort |
| *Polygonella polygama* | October flower |
| *Polygonella polygama polygama* | October flower |
| *Portulaca pilosa* | shaggy portulaca |
| *Quercus laurifolia* | laural oak |
| *Quercus myrtifolia* | myrtle oak |
| *Quercus nigra* | water oak |
| *Quercus virginiana* | live oak |
| *Rhexia mariana* | Maryland meadowbeauty |
| *Rhexia nashii* | maid marian |
| *Rhexia petiolata* | short-stemmed meadowbeauty |
| *Rhynchospora colorata* | whitetop sedge |
| *Rotanthella floridana* | Florida bellflower |
| *Rubus pensilvanicus* | Pennssylvania blackberry |
| *Rubus trivialis* | Southern dewberry |
| *Sabal palmetto* | sabal palm |
| *Sabatia brevifolia* | shortleaf rose gentian |
| *Sacoila lanceolata lanceolata* | leafless beaked ladies' tresses |
| *Sagittaria graminea* | grass-leaved Arrowhead |
| *Salvia lyrata* | lyrelead sage |
| *Sambucus canadensis* | American black elderberry |
| *Sarracenia minor* | hooded pitcher plant |
| *Saururus cernuus* | lizard's tail |
| *Scutellaria integrifolia* | helmet skullcap |
| *Serenoa repens* | saw palmetto |
| *Solidago fistulosa* | pine-barren goldenrod |
| *Spermacoce verticillata* | shrubby false buttonweed |
| *Stachys floridana* | Florida hedgenettle |
| *Syngonanthus flavidulus* | yellow hatpins |
| *Taxodium ascendens* | pond cypress |
| *Taxodium distichum* | bald cypress |
| *Tiedemannia filiformis* | water cowbane |
| *Tillandsia bartramii* | Bartram's airplant |
| *Triadica sebifera* | Chinese tallow tree* |
| *Utricularia subulata* | zigzag bladderwort |
| *Vicia acutifolia* | fourleaf vetch |
| *Viola lanceolata* | white bog violet |
| *Vitis rotundifolia* | muscadine |
| *Xyris jupicai* | Richard's yellow-eyed grass |
| *Xyris platylepis* | tall yellow-eyed grass |
| *Zeuxine strateumatica* | centipede grass orchid |

## Birds

| Specific Name | Common Name (Conservation Status) |
|---|---|
| *Accipiter cooperii* | Cooper's Hawk |
| *Agelaius phoeniceus* | Red-winged Blackbird |
| *Aix sponsa* | Wood Duck |
| *Ammodramus savannarum* | Grasshopper Sparrow |
| *Anas acuta* | Northern Pintail |
| *Anhinga anhinga* | Anhinga |
| *Antigone canadensis* | Sandhill crane |
| *Antrostomus carolinensis* | Chuck-will's-widow |
| *Antrostomus vociferus* | Eastern Whip-poor-will |
| *Aramus guarauna* | Limpkin (S3/G5) |
| *Ardea alba* | Great Egret |
| *Ardea herodias* | Great Blue Heron |
| *Arenaria interpres* | Ruddy Turnstone |
| *Baeolophus bicolor* | Tufted Titmouse |
| *Bombycilla cedrorum* | Cedar Waxwing |
| *Botaurus lentiginosus* | American Bittern |
| *Bubo virginianus* | Great Horned Owl |
| *Bubulcus ibis* | Cattle Egret |
| *Bucephala albeola* | Bufflehead |
| *Buteo brachyurus* | Short-tailed Hawk (S1/G4G5) |
| *Buteo jamaicensis* | Red-tailed Hawk |
| *Buteo lineatus* | Red-shouldered Hawk |
| *Butorides virescens* | Green Heron |
| *Calidris alba* | Sanderling |
| *Cardinalis cardinalis* | Northern Cardinal |
| *Cathartes aura* | Turkey Vulture |
| *Catharus guttatus* | Hermit Thrush |
| *Catharus ustulatus* | Swainson's Thrush |
| *Centronyx henslowii* | Henslow's Sparrow |
| *Chaetura pelagica* | Chimney Swift |
| *Charadrius semipalmatus* | Semipalmated Plover |
| *Charadrius vociferus* | Killdeer |
| *Chordeiles minor* | Common Nighthawk |
| *Circus hudsonius* | Northern Harrier |
| *Cistothorus palustris* | Marsh Wren |
| *Cistothorus stellaris* | Sedge Wren |
| *Coccyzus americanus* | Yellow-billed Cuckoo |
| *Colaptes auratus* | Northern Flicker |
| *Colaptes auratus auratus/luteus* | Northern Flicker (Yellow-shafted) |
| *Colinus virginianus* | Northern Bobwhite |
| *Columba livia* | Rock Pigeon |

| | |
|---|---|
| *Columbina passerina* | Common Ground Dove |
| *Contopus virens* | Eastern Wood-Pewee |
| *Coragyps atratus* | Black Vulture |
| *Corthylio calendula* | Ruby-crowned Kinglet |
| *Corvus brachyrhynchos* | American Crow |
| *Corvus ossifragus* | Fish Crow |
| *Cyanocitta cristata* | Blue Jay |
| *Cygnus olor* | Mute Swan |
| *Dendrocygna autumnalis* | Black-bellied Whistling-Duck |
| *Dryobates pubescens* | Downy Woodpecker |
| *Dryobates villosus* | Hairy Woodpecker (S3/G5) |
| *Dryocopus pileatus* | Pileated Woodpecker |
| *Dumetella carolinensis* | Gray Catbird |
| *Egretta caerulea* | Little Blue Heron (S3/G5) |
| *Egretta thula* | Snowy Egret (S3/G5) |
| *Egretta tricolor* | Tricolored Heron (S4/G5) |
| *Elanoides forficatus* | Swallow-tailed Kite (S2/G5) |
| *Eudocimus albus* | White Ibis (S2/G5) |
| *Falco columbarius* | Merlin (S2/G5) |
| *Falco peregrinus* | Peregrine Falcon (S2/G4) |
| *Falco sparverius* | American Kestrel |
| *Fulica americana* | American Coot |
| *Gallinago delicata* | Wilson's Snipe |
| *Gallinula galeata* | Common Gallinule |
| *Gallus gallus* | Red Junglefowl |
| *Gelochelidon nilotica* | Gull-billed Tern (S2/G5) |
| *Geothlypis trichas* | Common Yellowthroat |
| *Haematopus palliatus* | American Oystercatcher (S2/G5) |
| *Haliaeetus leucocephalus* | Bald Eagle (S3/G5) |
| *Helmitheros vermivorum* | Worm-eating Warbler (S1/G5) |
| *Hirundo rustica* | Barn Swallow |
| *Icterus spurius* | Orchard Oriole |
| *Lanius ludovicianus* | Loggerhead Shrike |
| *Larus argentatus* | Herring Gull |
| *Larus delawarensis* | Ring-billed Gull |
| *Leiothlypis celata* | Orange-crowned Warbler |
| *Leucophaeus atricilla* | Laughing Gull |
| *Lophodytes cucullatus* | Hooded Merganser |
| *Megaceryle alcyon* | Belted Kingfisher |
| *Megascops asio* | Eastern Screech-Owl |
| *Melanerpes carolinus* | Red-bellied Woodpecker |
| *Melanerpes erythrocephalus* | Red-headed Woodpecker |
| *Meleagris gallopavo* | Wild Turkey |

| | |
|---|---|
| *Melospiza georgiana* | Swamp Sparrow |
| *Melospiza lincolnii* | Lincoln's Sparrow |
| *Melospiza melodia* | Song Sparrow |
| *Mergus serrator* | Red-breasted Merganser |
| *Mimus polyglottos* | Northern Mockingbird |
| *Mniotilta varia* | Black-and-white Warbler |
| *Molothrus ater* | Brown-headed Cowbird |
| *Mycteria americana* | Wood Stork (S2/G4) |
| *Myiarchus crinitus* | Great Crested Flycatcher |
| *Nannopterum auritum* | Double-crested Cormorant |
| *Nyctanassa violacea* | Yellow-crowned Night-Heron (S3/G5) |
| *Nycticorax nycticorax* | Black-crowned Night-Heron (S3/G5) |
| *Oxyura jamaicensis* | Ruddy Duck |
| *Pandion haliaetus* | Osprey (S3S4/G5) |
| *Parkesia motacilla* | Louisiana Waterthrush (S2/G5) |
| *Parkesia noveboracensis* | Northern Waterthrush |
| *Passer domesticus* | House Sparrow |
| *Passerina caerulea* | Blue Grosbeak |
| *Passerina ciris* | Painted Bunting |
| *Passerina cyanea* | Indigo Bunting |
| *Pelecanus erythrorhynchos* | American White Pelican |
| *Pelecanus occidentalis* | Brown Pelican |
| *Peucaea aestivalis* | Bachman's Sparrow (S3/G3) |
| *Pipilo erythrophthalmus* | Eastern Towhee |
| *Pipilo erythrophthalmus alleni/rileyi* | Eastern Towhee (White-eyed) |
| *Piranga olivacea* | Scarlet Tanager |
| *Piranga rubra* | Summer Tanager |
| *Platalea ajaja* | Roseate Spoonbill (S2/G5) |
| *Plegadis falcinellus* | Glossy Ibis (S3/G5) |
| *Podilymbus podiceps* | Pied-billed Grebe |
| *Poecile carolinensis* | Carolina Chickadee |
| *Polioptila caerulea* | Blue-gray Gnatcatcher |
| *Progne subis* | Purple Martin |
| *Protonotaria citrea* | Prothonotary Warbler |
| *Quiscalus major* | Boat-tailed Grackle |
| *Quiscalus quiscula* | Common Grackle |
| *Rallus crepitans* | Clapper Rail |
| *Rallus elegans* | King Rail |
| *Riparia riparia* | Bank Swallow |
| *Rynchops niger* | Black Skimmer (S3/G5) |

| | |
|---|---|
| *Sayornis phoebe* | Eastern Phoebe |
| *Seiurus aurocapilla* | Ovenbird |
| *Setophaga americana* | Northern Parula |
| *Setophaga caerulescens* | Black-throated Blue Warbler |
| *Setophaga castanea* | Bay-breasted Warbler |
| *Setophaga citrina* | Hooded Warbler |
| *Setophaga coronata* | Yellow-rumped Warbler |
| *Setophaga coronata coronata* | Yellow-rumped Warbler (Myrtle) |
| *Setophaga discolor* | Prairie Warbler |
| *Setophaga dominica* | Yellow-throated Warbler |
| *Setophaga palmarum* | Palm Warbler |
| *Setophaga palmarum hypochrysea* | Palm Warbler (Yellow) |
| *Setophaga palmarum palmarum* | Palm Warbler(Western) |
| *Setophaga pinus* | Pine Warbler |
| *Setophaga ruticilla* | American Redstart (S2/G5) |
| *Setophaga striata* | Blackpoll Warbler |
| *Setophaga tigrina* | Cape May Warbler |
| *Setophaga virens* | Black-throated Green Warbler |
| *Sialia sialis* | Eastern Bluebird |
| *Sitta pusilla* | Brown-headed Nuthatch |
| *Spatula discors* | Blue-winged Teal |
| *Sphyrapicus varius* | Yellow-bellied Sapsucker |
| *Spinus tristis* | American Goldfinch |
| *Spizella passerina* | Chipping Sparrow |
| *Sterna forsteri* | Forster's Tern |
| *Sterna hirundo* | Common Tern |
| *Strix varia* | Barred Owl |
| *Tachycineta bicolor* | Tree Swallow |
| *Thalasseus maximus* | Royal Tern (S3/G5) |
| *Thryothorus ludovicianus* | Carolina Wren |
| *Toxostoma rufum* | Brown Thrasher |
| *Tringa melanoleuca* | Greater Yellowlegs |
| *Tringa semipalmata* | Willet |
| *Troglodytes aedon* | House Wren |
| *Turdus migratorius* | American Robin |
| *Tyrannus tyrannus* | Eastern Kingbird |
| *Vireo flavifrons* | Yellow-throated Vireo |
| *Vireo griseus* | White-eyed Vireo |
| *Vireo olivaceus* | Red-eyed Vireo |
| *Vireo solitarius* | Blue-headed Vireo |
| *Zenaida macroura* | Mourning Dove |
| *Zonotrichia albicollis* | White-throated Sparrow |

## Amphibians

| Specific Name | Common Name (Conservation Status) |
|---|---|
| *Acris gryllus dorsalis* | Florida cricket frog |
| *Hyla cinerea* | Green treefrog |
| *Hyla femoralis* | Pinewoods treefrog |
| *Hyla squirella* | Squirrel Treefrog |
| *Lithobates catesbeianus* | American bullfrog |
| *Osteopilus septentrionalis* | Cuban tree frog* |
| *Lithobate sphenocephala* | Southern leopard frog |
| *Lithobate grylio* | Pig frog |

## Mammals

| Specific Name | Common Name (Conservation Status) |
|---|---|
| *Dasypus novemcinctus* | Nine-banded armadillo* |
| *Didelphis virginana* | Opossum |
| *Lynx rufus* | Bobcat |
| *Odocoileus virginianus* | White-tailed deer |
| *Procyon lotor* | Racoon |
| *Sciurus carolinensis* | Eastern gray squirrel |
| *Sigmodon hispidus* | Hispid cotton rat |
| *Sus scrofa* | Feral hog |
| *Sylvilagus floridanus* | Eastern cottontail rabbit |
| *Ursus americanus floridanus* | Florida black bear |

## Reptiles

| Specific Name | Common Name (Conservation Status) |
|---|---|
| *Alligator mississippiensis* | American alligator |
| *Agkistrodon conanti* | Florida cottonmouth |
| *Anolis carolinensis carolinensis* | Green anole |
| *Anolis sagrei* | Brown anole* |
| *Aspidoscelis sexlineatus* | Six-lined racerunner |
| *Coluber constrictor priapus* | Southern black racer |
| *Diadophis punctatus punctatus* | Southern ringneck snake |
| *Gopherus polyphemus* | Gopher tortoise |
| *Kinosternon baurii* | Striped mud turtle |
| *Nerodia fasciata pictiventris* | Florida watersnake |
| *Nerodia taxispilota* | Brown watersnake |
| *Ophisaurus ventralis* | Eastern glass lizard |
| *Pantherophis guttatus* | Corn snake |
| *Plestiodon inexpectatus* | Southeastern five-lined skink |
| *Pseudemys peninsularis* | Peninsular cooter |
| *Rhineura floridana* | Florida worm lizard |
| *Thamnophis saurita sackenii* | Peninsula ribbon snake |

## Insects and Arachnids

| Specific Name | Common Name |
|---|---|
| *Anartia jatrophae* | White peacock |
| *Antheraea polyphemus* | Polyphemus moth |
| *Blattella asahinai* | Asian cockroach |
| *Bombus pensylvanicus* | American bumblebee |
| *Celithemis eponina* | Halloween pennant |
| *Centruroides hentzi* | Hentz striped scorpion |
| *Dione vanillae* | Gulf fritillary |
| *Efferia aestuans* | Robber fly |
| *Erythemis simplicicollis* | Eastern pondhawk |
| *Eumorpha fasciatus* | Banded sphinx |
| *Eurema daira* | Barred yellow |
| *Halictus poeyi* | Poey's furrow bee |
| *Ischnura hastata* | Citrine forktail |
| *Junonia coenia* | Common buckeye |
| *Libellula auripennis* | Golden-winged skimmer |
| *Libellula axilena* | Bar-winged skimmer |
| *Malacosoma disstria* | Forest tent caterpillar moth |
| *Melanolestes picipes* | Black corsair |
| *Menemerus bivittatus* | Gray wall jumping spider |
| *Neoscapteriscus borellii* | Southern mole cricket |
| *Neoscona domiciliorum* | Spotted orbweaver |
| *Perillus strigipes* | stinkbug |
| *Pogonomyrmex badius* | Florida harvester ant |
| *Romalea microptera* | Eastern lubber grasshopper |
| *Strategus antaeus* | Ox beetle |
| *Toxomerus boscii* | Thin-lined calligrapher |
| *Utetheisa ornatrix* | Ornate bella moth |
| *Vanessa virginiensis* | American lady |
| *Xenox tigrinus* | Tiger bee fly |
| *Xylophanes tersa* | Tersa sphinx |

***Exotic**

**FNAI GLOBAL RANKING**

**G1** = Critically imperiled globally because of extreme rarity (5 or fewer occurrences or less than 1000 individuals) or because of extreme vulnerability to extinction due to some natural or man-made factor.
**G2** = Imperiled globally because of rarity (6 to 20 occurrences or less than 3000 individuals) or because of vulnerability to extinction due to some natural or man-made factor.
**G3** = Either very rare and local throughout its range (21-100 occurrences or less than 10,000 individuals) or found locally in a restricted range or vulnerable to extinction from other factors.
**G4** = Apparently secure globally (may be rare in parts of range).
**G5** = Demonstrably secure globally.
**G#T#** = Rank of a taxonomic subgroup such as a subspecies or variety; the G portion of the rank refers to the entire species and the T portion refers to the specific subgroup; numbers have same definition as above (e.g., G3T1).

**FNAI STATE RANKING**

**S1** = Critically imperiled in Florida because of extreme rarity (5 or fewer occurrences or less than 1000 individuals) or because of extreme vulnerability to extinction due to some natural or man-made factor.
**S2** = Imperiled in Florida because of rarity (6 to 20 occurrences or less than 3000 individuals) or because of vulnerability to extinction due to some natural or man-made factor.
**S3** = Either very rare and local in Florida (21-100 occurrences or less than 10,000 individuals) or found locally in a restricted range or vulnerable to extinction from other factors.
**S4** = Apparently secure in Florida (may be rare in parts of range).
**S5** = Demonstrably secure in Florida.

**FEDERAL LEGAL STATUS**

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

**STATE LEGAL STATUS**

**Animals:**

**FT(S/A) =** Threatened due to similarity of appearance
**FEL** = L**i**sted as Endangered Species at the Federal level by the USFWS
**FT =** Listed as Threatened Species at the Federal level by the USFWS
**ST =** State population listed as Threatened by the FFWCC. Defined as a species, subspecies, or isolated population which is acutely vulnerable to environmental alteration, declining in number at a rapid rate, or whose range or habitat is decreasing in area at a rapid rate and as a consequence is destined or very likely to become an endangered species within the foreseeable future.
**SSC =** Listed as a Species of Special Concern by the FFWCC. Defined as a population which warrants special protection, recognition, or consideration because it has an inherent significant vulnerability to habitat modification, environmental alteration, human disturbance, or substantial human exploitation which, in the foreseeable future, may result in its becoming a threatened species.
**N =** Not currently listed, nor currently being considered for listing.

**Plants:**

**E =** Endangered: species of plants native to Florida that are in imminent danger of extinction within the state, the survival of which is unlikely if the causes of a decline in the number of plants continue; includes all species determined to be endangered or threatened pursuant to the U.S. Endangered Species Act.
**T =** Threatened: species native to the state that are in rapid decline in the number of plants within the state, but which have not so decreased in number as to cause them to be Endangered.
**N =** Not currently listed, nor currently being considered for listing.