TROY SPRING STATE PARK
Park Chapter

SUWANNEE RIVER REGION

TROY SPRING STATE PARK

LAFAYETTE COUNTY, FLORIDA

0 150 300 Feet

N W E S

Suwannee River

LITTLE RIVER CONSERVATION AREA

MESIC HAMMOCK

ALLUVIAL FOREST

FLOODPLAIN SWAMP

Troy Spring

Buoy Line

Dock (No Public Access)

Boat Ramp

Cabin

Swimming Platform

Springhead Walkway

Restroom

Shop

MESIC HAMMOCK

UPLAND MIXED WOODLAND

BOTTOMLAND FOREST

Artificial Pond

Artificial Pond

UPLAND MIXED WOODLAND

Stable

PINE PLANTATION

Staff Residence

PASTURE

SUCCESSIONAL HARDWOOD

PINE PLANTATION

TROY SPRING RD

TO US 27 NORTH/ MAYO

NE JEFF WALKER RD

TROY SPRING RD

TO US 27 SOUTH/ BRANFORD

TROY SPRING CONSERVATION AREA

TROY SPRING CONSERVATION AREA

PARK FEATURES

- Park Boundary
- Structures
- Parking Lot
- Walkways
- Trails
- Park Road Paved
- Park Road Stabilized
- Park Road Unstabilized

SURROUNDING LAND COVER

- Agriculture
- Forests
- Silviculture
- Wetlands

INTRODUCTION

LOCATION AND ACQUISITION HISTORY

Troy Spring State Park is located in Lafayette County (see Vicinity Map). Access to the park is from County Road 425 off of U.S. Highway 27 (see Reference Map). The Vicinity Map also reflects significant land and water resources existing near the park.

Troy Spring State Park was initially acquired on June 12, 1995, with funds from the Conservation and Recreation Lands (CARL) program. Currently, the park comprises 78.4 acres. The Board of Trustees of the Internal Improvement Trust Fund (Trustees) hold fee simple title to the park and on March 10, 1997, the Trustees leased (Lease No. 4143) the property to the Division of Recreation and Parks (DRP) under a 50-year lease. The current lease will expire on March 9, 2047.

Troy Spring State Park is designated single-use to provide public outdoor recreation and conservation. There are no legislative or executive directives that constrain the use of this property (see Appendices). A legal description of the park property can be made available upon request to the Florida Department of Environmental Protection (DEP).

SECONDARY AND INCOMPATIBLE USES

In accordance with 253.034(5) F.S., the potential of the park to accommodate secondary management purposes was analyzed. These secondary purposes were considered within the context of DRP's statutory responsibilities and resource values. This analysis considered the park's natural and cultural resources, management needs, aesthetic values, visitation and visitor experiences. It was determined that no secondary purposes could be accommodated in a manner that would not interfere with the primary purpose of resource-based outdoor recreation and conservation.

DRP has determined that uses such as water resource development projects, water supply projects, stormwater management projects, linear facilities and sustainable agriculture and forestry (other than those management activities specifically identified in this plan) would not be consistent with the management purposes of the park.

In accordance with 253.034(5) F.S., the potential for generating revenue to enhance management was also analyzed. Visitor fees and charges are the principal source of revenue generated by the park. It was determined that no additional revenue generating activities are appropriate during this planning cycle. Generating revenue from consumptive uses or from activities that are not expressly related to resource management and conservation is not under consideration.

PURPOSE AND SIGNIFICANCE OF THE PARK

Park Purpose

The purpose of Troy Spring State Park, as a CARL acquisition, is to protect the environmentally unique and irreplaceable hydrogeological and cultural features of the site and to provide land for recreational use.

Park Significance

- The park protects the 70-foot deep, first-magnitude Troy Spring and its 325-foot spring-run stream that discharges into the Middle Suwannee River. These aquatic karst features and surrounding uplands, alluvial forest, bottomland forest and floodplain swamp provide varied habitat for a diversity of imperiled species, including pallid cave crayfish, Suwannee bass, Suwannee alligator snapping turtle, gopher tortoise and little blue heron.

- The park preserves two prehistoric midden sites representing the Indian Pond culture of the Weeden Island Period and the wreckage of the Civil War-era Confederate steamboat, the Madison, which served as a general store on the Suwannee River during the 1850s.

- The park offers resource-based recreational opportunities for diving and swimming in the spring, boating on the Suwannee River.

Central Park Theme

The mysterious waters of Troy Spring hold sunken history along the Suwannee River that inspires explorers to dive deeper.

Troy Spring State Park is classified as a state park in the DRP unit classification system. In the management of a state park, a balance is sought between the goals of maintaining and enhancing natural conditions and providing various recreational opportunities. Natural resource management activities are aimed at the management of natural systems. Development in the park is directed toward providing public access to and within the park and to providing recreational facilities that are both convenient and safe. Program emphasis is on interpretation of the park's natural, aesthetic and educational attributes.

OTHER DESIGNATIONS

The unit is not within an Area of Critical State Concern as defined in section 380.05; Florida Statutes and is not presently under study for such designation. The park is a component of the Florida Greenways and Trails System, administered by the DEP Office of Greenways and Trails.

All waters within the park have been designated as Outstanding Florida Waters, pursuant to Chapter 62-302, Florida Administrative Code. Surface waters in this park are also classified as Class III waters by DEP. The park is not adjacent to an aquatic preserve as designated under the Florida Aquatic Preserve Act of 1975 (Section 258.35, Florida Statutes).

PARK ACCOMPLISHMENTS

- Completed design and engineering for renovation of swimming area.
- Completed prescribed fire planning and fire lines for fire reintroduction.
- Implemented visitor management measures in the swimming area.
- Built a new replica of the Madison.
- Met 100% of invasive species goals.

RESOURCE MANAGEMENT COMPONENT

Troy Spring State Park			
Management Zone	**Zone Acres**	**Managed with Prescribed Fire**	**Contains Known Cultural Resources**
TS-1A	17.07	Y	Y
TS-1B	8.12	Y	Y
TS-1C	30.28	Y	Y
TS-1D	9.41	Y	N
TS-1E	5.02	N	Y
TS-1F	13.67	N	Y

TOPOGRAPHY

Troy Spring is located in the Gulf Coastal Lowlands geomorphologic region, and more specifically in the Suwannee River Lowlands (White 1970). The Gulf Coastal Lowlands are described as gently sloping terraces that originate in the highlands and extend towards the coast. Limestone is typically at or near the surface throughout most of this region, with sand or sandy clay overlying it.

Park elevations range from just under 20 feet to approximately 45 feet above mean sea level (msl). The highest points are in the southern half of the property and the lowest are at the northern end near the Suwannee River. Most of the park lies within the 100-year floodplain as calculated by the Suwannee River Water Management District (SRWMD) for this reach of the Suwannee River.

Some alterations of natural topography have taken place in the park. The most obvious alterations are located in the park's bottomland forest, where a previous owner of the property dredged three or four relatively small ponds. Large spoil piles and a series of ditches are associated with these ponds.

SOILS

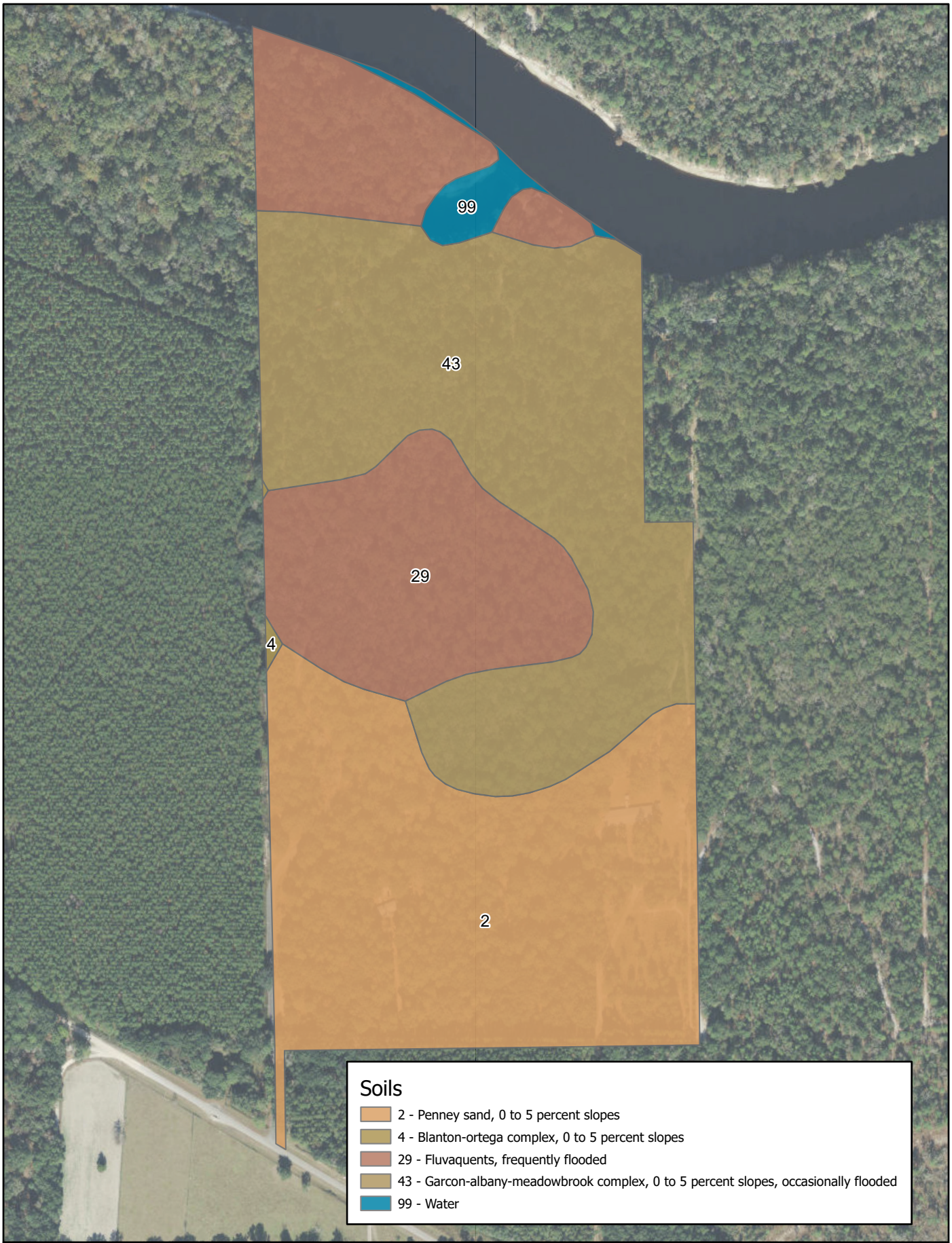
Four soil types occur within Troy Spring State Park according to the Soil Survey for Lafayette County (see Soils Map). Soils include Penney sand, 0 to 5 percent slope; Blanton - Ortega complex, 0 to 5 percent slope; Fluvaquents, frequently flooded; and Garcon - Albany - Meadowbrook complex, 0 to 5 percent slope, occasionally flooded. See Addendum 3 for complete descriptions of these soils (Weatherspoon et al. 1998).

TROY SPRING STATE PARK
Management Zones

N

0 400 800 Feet

This graphical representation is provided for informational purposes and should not be considered authoritative for navigational, engineering, legal, and other uses.



TROY SPRING STATE PARK
Soils

N

0 400 800 Feet

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For much of the park, soils are relatively stable and soil erosion is minimal. However, there are several localized areas where significant erosion has occurred, the most severe of which is on the northern shore of the spring run, where canoes and motorized watercraft once landed or launched. On weekends and holidays prior to 2002, 40-50 motorboats, canoes, and jet-skis would often congregate inside and just outside the spring run at one time. The motorized vessels produced significant wakes, and operators of motorboats and jet-skis typically beached their craft on the shore with considerable force. According to long-term residents of the area, approximately 10-15 feet of shoreline at this location eroded away between about 1980 and 2000. The need to stabilize the shoreline, prevent further erosion, better manage visitor use patterns, and install appropriate facilities was addressed during initial development of the park in 2002.

In 2002, the park closed the spring-run stream to motorized watercraft, establishing a floating buoy system at the mouth of the run to prohibit entry. To provide motorized watercraft patrons with alternative public access, the DRP constructed a floating dock on the Suwannee River just downstream from the spring run, designed to allow patrons to moor their boats without compromising the spring system but still have reasonable access to the park. Reliable functioning of the floating dock has been sporadic, however, due to the extreme fluctuations of water levels on the Suwannee. When the river is at a low stage, the dock rests on the river bottom and boats cannot access it. When the river is at flood stage, boat patrons may not be able negotiate the floating walkway safely because it may be angled very steeply. Maintenance of the mooring facility has also proven to be a major challenge, as it is beginning to show serious signs of weathering and
degradation due to the Suwannee River's dynamic flood events. In addition, the trail leading to the floating dock is now experiencing erosion issues of its own that the park is in the process of addressing.

While exclusion of motorized watercraft from the spring run has helped stabilize the shoreline, continued recreational pressure from swimmers and divers still leads to soil erosion, especially when water levels are low. The greatest impact from recreation occurs when visitors gather at exposed sandy areas along the shoreline of the run, trampling native vegetation and causing significant erosion. Numerous unauthorized foot trails fragment the adjacent forested wetland communities. When the Suwannee River is extremely low, the riverbank and the entire shoreline on either side of the spring run may have relatively uncontrolled numbers of visitors sunbathing and accessing the spring. During these low water periods, visitors accessing the spring from the main access ramp cannot reach the water's edge without walking on uneven limestone and trampling plants.

Another site prone to significant soil erosion is the steep slope below the historic log home, which is located above the southeast shoreline of the spring run. Runoff from heavy rains is eroding the slope and undermining many of the old hardwood trees that grow there and along the shoreline, and the trees are at risk of falling into the spring run. During Tropical Storm Faye in August 2008, a significant amount of sandy soil washed down the slope into the spring run. This sand formed a narrow shelf along the edge of the run and has since persisted as a "beach" that seems to attract visitors seeking shallower water for wading and swimming. Unfortunately, the increased recreational pressure at this site has exacerbated the erosion there.
The park has implemented a number of measures to mitigate impacts from storm water runoff, including improving the gutter system on the log structure to reduce direct runoff from the roof. The park has also installed hay bales, logs, and other materials on the slope for use as water bars to attenuate storm water runoff and divert it from areas that are prone to erosion. These efforts have not succeeded in completely stemming the erosion, so staff will need to consider additional measures.

One factor that may have increased erosion on slopes above the spring run is that the park at one time frequently mowed the entire area between the Log Cabin Visitor Center and the current park office, as well as a broad swath of mesic hammock connecting that area to the main parking lot. Much of the ground surface was devoid of cover. During rain events, water often sheet flows across this gently sloping area to the steep slopes above the spring, where it can then rush downward relatively unimpeded, eroding slopes, undermining trees, and contributing to excessive sediment deposition in the spring run. The simplest solution would be to allow groundcover species to reestablish over much of the area, leaving only a minimum number of traditionally maintained corridors to accommodate vehicular and pedestrian traffic. Supplemental plantings of appropriate native species may be necessary to complete the restoration. Management activities in the park will follow generally accepted best management practices to prevent additional soil erosion and conserve soil and water resources on site.

HYDROLOGY

Troy Spring State Park is located in southwestern Suwannee County, within the third reach of the Middle Suwannee River (MSR) basin (Hornsby et al. 2002). The Suwannee River basin drains approximately 10,000 square miles in Florida and Georgia. Average flow of the Suwannee system is 7,100 million gallons per day, which ultimately discharges into the Gulf of Mexico. The Suwannee River is designated an Outstanding Florida Water and a Class III waterbody. Average annual rainfall for this region approaches 60 inches per year (Fernald and Purdum 1998).

Regionally within the MSR basin, the Upper Floridan aquifer is unconfined and close to the surface (Scott et al. 1991). The exposed aquifer in this region gives rise to numerous springs that discharge into the Suwannee River and significantly augment its flow. In fact, groundwater is the source of nearly all inflow to the river within the MSR basin (Pittman et al. 1997). Spring flow contributes about half of the river's discharge in this region, and other groundwater sources account for the remaining amount. During flood stage, however, the cycle may reverse, and springs may act as "siphons" or inflow points for river water to enter the upper Floridan aquifer.

Recent research has indicated that substantial nitrate loading, and other related water quality issues are associated with river and groundwater mixing along this reach of the Suwannee River (Katz et al. 1999; Katz and Hornsby 1998; Berndt et al. 1998; Pittman et al. 1997). Currently, silviculture and agriculture are primary land uses in much of the MSR basin, although home site development is increasing within the river corridor. Since the Floridan aquifer is unconfined in this region, there is cause for concern. Contaminated runoff or malfunctioning septic or sewage systems can easily pollute the aquifer.

One watershed level process that seldom receives adequate consideration during studies of river hydrology is flooding. Flood events on the Suwannee River are naturally occurring since the river is unobstructed by artificial dams at present. The stretch of the Suwannee River between river miles 82 and 83, which includes Troy Spring State Park, floods often. The Suwannee River Water Management District (SRWMD) has calculated the following flood elevations for this section of the river during two-year, 10-year and 100-year events.

Flood Elevations				
Event (msl)				
River Mile	**2-year**	**10-year**	**100-year**	**Flood of Record**
82	26	35	40	38
83	27	36	40	40

Natural communities along the river that lie at or below 30 feet mean sea level (MSL) are frequently inundated when the Suwannee River is at flood stage. Within the park, those communities include the spring-run stream, floodplain swamp, alluvial forest and some of the bottomland forest. Additional bottomland forest and some of the mesic hammock also flood during 10-year events, sometimes to the extent that floodwaters may create access problems along the main park drive.

An especially important relationship exists between downstream flooding in a major river and episodic inundation within adjacent floodplain communities (Pringle 1997; Diehl 2000; Light et al. 2002). In Troy Spring State Park, at least three natural communities significantly benefit from this flooding phenomenon: bottomland forest, alluvial forest and floodplain swamp. These floodplain communities are highly dependent on the ephemeral nature of the flooding regime. If intermittent flooding of the Suwannee River did not occur, the adjacent floodplain communities would experience major changes in soil and in species composition. Any alteration of the normal flooding regime of the Suwannee, especially in conjunction with reductions in base flow of springs along the middle reach of the river, could cause significant changes in the character of these wetland communities (Light et al. 2002; Sepulveda 2002).

Troy Spring is the only known spring in the park (Scott et al. 2004). It is classified as a first-magnitude spring. The spring pool measures 138 feet north to south and 118 feet east to west. The main boil, located at the base of exposed limestone along the west side of the pool, is 60 feet deep. The spring discharges to the Suwannee River through a 325-foot spring-run stream. Even though cave divers have not mapped the Troy Spring cave system, they have partially explored the underground conduits. However, cave diving in this system is currently problematic due to the instability of limestone caverns within the conduits. A crumbling limestone ceiling at the conduit entrance has partially buried the old cave guidelines, creating potentially very dangerous conditions for divers trying to map and explore the system (Wes Skiles, personal communication).

Although the groundwater sources for Troy Spring are still being delineated, one recently connected inflow point is located to the northeast at a sinking stream called “Little River” (Greenhalgh et al. 2016). Divers have explored several miles of cave at the Little River swallet, referred to as “Stick Sink Swallet” (Wes Skiles, personal communication). The relationship between Stick Sink, Little River and Troy Spring appears to be very similar to that of Rose Sink and Rose Creek, and their known spring discharge points at the Ichetucknee springs group (Skiles et al. 1997). Further springshed delineation using dye trace studies should be a future priority for DRP. Such studies would enable hydrologists to map additional groundwater connections between other surface water features and Troy Spring, as well as with Little River Spring just downstream along the Suwannee.

Water Quality

State and federal agencies have sporadically collected water quality data for surface water at Troy Spring since 1960 (Scott et al. 2004). In 2002, the SRWMD began to organize and coordinate its data collection activities more efficiently. Over the past 30 years, the SRWMD has increased its involvement in coordinating assessments of water quality and quantity and in supporting springs protection research. The SRWMD is also conducting trend analyses of current water quantity and quality conditions, which it uses in addressing future water supply needs within the district (Suwannee River Hydrologic Observatory 1997; Upchurch et al. 2007). The data collected primarily guides the SRWMD decision-making process in issuing consumptive use permits, approving water supply projects in watershed planning, and in managing district projects. It also aids the SRWMD in the development of state-mandated minimum flows and levels (MFLs) for water bodies throughout the district.

The water monitoring programs have revealed that the quality of water discharging from Troy Spring has declined significantly over the period of record (Upchurch et al. 2007). Stored data from 1960 to 2008 indicate nitrate-nitrogen levels have ranged from 0.85 to 3.05 milligrams per liter. Groundwater throughout this region is highly vulnerable to specific land use activities. A recent DEP well-sampling study in the Troy springshed has indicated that significantly polluted conditions exist, with 10% of the samples showing nitrate levels of more than 10 milligrams per liter (Harrington et al. 2010). According to that DEP study, the highest nitrate level measured in a well sampled within the Troy springshed was a staggering 26 milligrams per liter. Due to the high nitrate levels, the water quality is considered “poor” under both the DEP and SRWMD rating systems and does not meeting Class III water standards (Hand et al. 1996; Hornsby and Mattson 1997). A highly significant overall trend of increased nitrate concentrations through time is characteristic of the Troy Spring system (Upchurch et al. 2007; DEP 2008c).

Anecdotal evidence indicates that the quality and clarity of water discharged from Troy Spring in the past was usually very good. The water was typically so clear that one could easily see from the surface of the spring to the bottom, a depth of nearly 70 feet (Ferguson et al. 1947). At present, however, according to park reports, the spring is often “pea green” in color and visibility is very low. Samples analyzed by the University of Florida in 1997 indicated that most of the total solids were non-volatile. The turbidity may be due to the presence of clay silt particulates in emissions from the spring vents, possibly the result of subterranean collapses in conduits feeding the spring (French 1997). Researchers now cite two significant nutrient sources as contributing to the overall decline in water quality at Troy Spring: animal wastes from the 23 poultry farms and 11 cattle-feeding operations within the Troy springshed, and agricultural fertilizers that have been heavily used in this region since the mid-1970s (Katz et al. 1999; Harrington et al. 2010). The DEP basin status report for this region indicates that the Middle Suwannee River, including Troy Spring, became a potentially impaired waterbody in 2001 because of high mercury concentrations in fish tissues, unbalanced abiotic levels (including low dissolved oxygen), and high nutrient levels (DEP 2001). Currently, Troy Spring is listed as impaired for nutrient loading, low dissolved oxygen, and mercury presence, which means that its surface waters do not meet applicable state water quality standards for these three parameters (Hallas and Magley 2008).

Very little research has addressed how increased contaminant levels have affected benthic macroinvertebrate communities in spring ecosystems (Woodruff 1993; Steigerwalt 2005; Dormsjo 2008; Politano 2008). Some researchers have suggested that the presence of a diverse freshwater gastropod population could function as an indirect indicator of good water quality, and therefore could serve as a reliable indicator of ecosystem health (Thompson 2000). Research at Troy Spring has revealed a very

troubling trend in the decline of a once common and widespread spring crustacean, the white tubercled crayfish (*Procambarus spiculifer*). Anecdotal evidence of *Procambarus spiculifer* populations at Troy Spring between the 1930s and 2002 indicates that numbers have decreased dramatically. In fact, only one individual was observed during a survey in 2002 (Hobbs 1942; District 2 files; Dick Franz, personal communication).

Water quality appears to be declining in many springs along the lower and middle Suwannee River. The DEP Ambient Monitoring Section of the Division of Water Facilities has a 28-square mile Very Intense Study Area (VISA) located upstream of Troy Spring in north-central Lafayette County. Groundwater samples were taken from 19 wells and seven springs. Data analyzed from 1990 through 1997 indicate that nitrate levels in groundwater within the VISA are elevated above background levels measured elsewhere in the state (Maddox et al. 1998). Troy Spring was recently documented as being one of the highest nitrate-polluted springs in the state (Harrington et al. 2010). If groundwater quality in the Troy springshed continues to decline, many of the values for which Troy Spring was acquired will be seriously compromised. The excellent water clarity, the size and depth of the spring boil and the presence of the submerged wreck of a Confederate steamboat (the C.S.S. Madison) once made Troy Spring a very popular diving/snorkeling destination.

Lately, this recreational activity has declined significantly due to reduced water clarity. To improve conditions at Troy Spring, DRP adopted additional protective measures in 2002. Those measures included the exclusion of boat traffic from the spring and spring run for public safety reasons and to reduce water quality impacts, eliminate stream bottom damage from propeller scarring, and preserve the park's most significant historic resource, the Madison shipwreck.

In the majority of Florida's springs, including Troy, increased nitrogen and phosphorus levels are now recognized as a significant driving force behind large-scale blooms of benthic macroalgae (Stevenson et al. 2007). The growth of macroalgae (also known as periphyton) in many Florida springs is now so rampant that submerged macrophytes are smothered, and large-scale macrophyte die-offs have occurred. Widespread increases in periphyton are occurring in nearly all of Florida's springs, which is a recognized symptom of declining spring health (Mirti et al. 2006; Stevenson et al. 2007).

Water Quantity

During the period from 2002-08, the average annual discharge of Troy Spring was approximately 108 cubic feet per second (U.S. Geological Survey (USGS) 2008). The maximum flow ever recorded was 468 cubic feet per second on March 9, 2008. One significant complicating factor in documenting discharge this spring is the flooding that occurs regularly in the Suwannee River basin. Other discharge measurements for Troy Spring have ranged from 148 to 205 cubic feet per second (Rosenau et al. 1977). Flows measured by the SRWMD in 1997 ranged from 93.45 cubic feet per second in June to 141.63 cubic feet per second in September (Hornsby and Mattson 1997).

The SRWMD is responsible for issuing water use permits in the region, and in doing so, must ensure that proposed uses are in the public interest, which includes the conservation of fish and wildlife habitat and the protection of recreational values.

Water scientists who have noticed the recent trend in the Suwannee River basin toward longer drought cycles and increased consumptive use of groundwater resources have begun to express strong concerns about lowered water tables and decreased spring flows. Given the projected water supply needs for the

area, the USGS predicts that spring flows throughout the state, including those at Troy Spring, will continue to decline (Sepulveda 2002).

Water managers have recently begun to address concerns about the quality and quantity of the water that discharges from Troy and other major springs in Florida (Upchurch and Champion 2004). The development of standards for Spring Protection Areas and Springshed Protection Areas for Troy Spring has evolved as a strategy to protect specific areas in the Troy Spring watershed from "significant harm" (Chapter 373.042 F.S.). Currently, there are no known Surface Water Protection Areas for the Troy springshed. Stick Sink Swallet, however, as discussed above, falls within the recommended Troy Spring Springshed Protection Area, and future dye trace work within the region should remain a top priority.

Many of Florida's largest springsheds, including Troy's, have undergone a detailed delineation process (Florida Geological Survey 2007). Springshed boundaries, however, are not static. They can change dramatically over time, depending on the amount of consumptive use of groundwater that takes place in various parts of the springshed. For example, recent research has revealed that a significant region of groundwater supply in the eastern part of the SRWMD, considered a groundwater divide of sorts between the SRWMD and the St. Johns River Water Management District (SJRWMD), has declined to the extent that a westward shift in groundwater potentiometric contours has occurred. The shift appears to be in response to the artificial depletion of groundwater reserves caused by large-scale pumping in Duval and Nassau counties (Grubbs and Crandall 2007). This regional drawdown may be partially responsible for shrinking springsheds and declining spring flows within parts of the SRWMD, including the Ichetucknee River (Mirti 2001; Grubbs and Crandall 2007). Both water management districts are now attempting to coordinate more closely when issuing consumptive use permits and monitoring groundwater withdrawals.

The SRWMD is also responsible for prioritizing and establishing MFLs for water bodies within its boundaries. The SRWMD is currently developing a MFL for the Middle Suwannee River, which extends from the mouth of the Withlacoochee River south to Fanning Springs. There are several first- and second-magnitude springs along this middle reach of the Suwannee that will ultimately be assigned a spring specific MFL.

Once MFLs for the Middle Suwannee River and associated springs are established, implementation of protection areas within those watersheds will be based on projected relative impacts of groundwater withdrawals and on vulnerability of the aquifer (SRWMD 2005). If MFLs developed by water management districts are to succeed in providing water bodies with adequate protection against significant harm, it will be important to have a diverse group of stakeholders available to assist in guiding the MFL review process. Participation by DEP in the review process will be important, especially since significant problems (e.g., declines in spring flows) have already occurred at other springs in DRP District 2 (Madison Blue, Fanning and Manatee springs) despite MFLs recently assigned to them (SRWMD 2004; SRWMD 2005).

The recent documentation of flow reductions at Troy Spring and of shrinking springsheds in the SRWMD highlight the importance of DRP staff continuing to engage with the public and other agencies to maintain high standards of water resource protection in the Troy springshed. Most critical will be to work closely with the SRWMD and other agencies during development of the Middle Suwannee River MFLs to ensure that Troy Spring receives the highest level of spring flow protection possible.

The natural hydroperiod of a section of floodplain in the northeast corner of the park may be somewhat altered due to the presence of a slightly elevated, unpaved roadway that connects the log cabin by the spring with a home on adjacent property. However, an 18-inch culvert placed under the road at the lowest elevation of the floodplain provides some hydrological relief by reducing the extent of impoundment of floodwaters.

Previous landowners altered the natural hydrological regime of wetlands in the center of Troy Spring State Park. Artificial ponds dredged in the bottomland forest by those landowners may now be affecting groundwater levels in the immediate vicinity. Several natural-appearing depressions are located near the ponds. Drainage ditches, presumably excavated when the ponds were dug, connect these depressions to the ponds. The ditches may be altering the hydroperiods of not only the depressions, but also the surrounding bottomland forest.

Objective A: Assess the park's hydrological restoration needs.

- Action 1 - Establish photo points and conduct annual assessments of macrophyte/periphyton populations.
- Action 2 - Form a designated access route for visitors from the floating dock to the Suwannee River to the spring use area.
- Action 3 - Conduct additional dye trace work.
- Action 4 - Conduct hydrological assessments of the artificial ponds and ditches within the bottomland forest.

As a supplement to the routine monitoring provided by other agencies, the park will establish photo points and conduct annual assessments of macrophyte/periphyton populations. The photo points will be useful in documenting natural changes in spring water clarity that are associated with Suwannee River flood events and that may affect recreational use of the spring. The photo points will also enable staff to track artificial changes caused by erosion and the deposition of sediments. Shoreline erosion caused by foot traffic along the edges of the spring run has become a serious management issue. A factor contributing to that is the lack of a formally designated access route for visitors to travel from the floating dock on the Suwannee River to the use area at the spring.

Stick Sink Swallet is an important groundwater source for Troy Spring. Supporting efforts of additional dye trace work to continue Troy springshed delineation will be important for DRP.

Within the next 10 years, staff will evaluate the artificial ponds and ditches within the bottomland forest to determine if they are negatively affecting the local water table by conveying surface waters away. If hydrological assessments indicate that the ditches are causing serious enough impacts to warrant a response, then the ditches may be filled or blocked. Planning for potential restoration of the dredged ponds should await additional research. Re-establishment of the ponds' natural contours may be an option, but any attempted restoration should not cause unacceptable impacts to surrounding natural communities or to park facilities.

Objective B: Restore hydrological conditions to approximately 0.1 acres of spring-run stream natural community.

- Action 1 - Close and rehabilitate unauthorized trails.
- Action 2 - Reduce the mowed footprint between the visitor center and the visitor parking lot at the headspring.
- Action 3 - Pursue outreach opportunities to educate the public about anthropogenic impacts to the Troy Spring system, impacts that are extensive and attributable both to outside sources and to in-park sources.
- Action 4 - Assess the feasibility of conducting experimental plantings of key species of submerged macrophytes within about 0.1 acre of the Troy spring run.

Within the next five years, best management options will be reviewed to improve public access to the spring while limiting the sanctioned swimming and sunbathing areas to less sensitive portions of the spring. This could include a redesign of visitor access locations and/or implementing protective measures for overly intensive recreational use.

Continual coordination will occur with all agencies that are involved in the protection and improvement of hydrological resources, which includes SRWMD, DEP, USGS and the Florida Fish and Wildlife Conservation Commission (FWC). Coordination may consist of regular attendance at meetings that focus on regional or local hydrology and the maintenance of relevant correspondence. Coordination with county governments will also be essential. Park staff will review county land use changes proposed for properties outside the park that may pose potential impacts to the water quality and quantity of Troy Spring. Staff will provide comments to public officials if any threats to surface or groundwater resources at Troy Spring becomes apparent. DRP will continue to work closely with DEP and SRWMD personnel in seeking ways to mitigate increased nutrient levels in Troy Spring. A major part of this process will be implementation of regional TMDL standards issued from the U.S. Environmental Protection Agency (EPA) for area water bodies. DRP will also promptly respond if water quality impacts are attributable to inappropriate location or design of park facilities. Finally, DRP will continue to work closely with the SRWMD to ensure that MFLs developed for the Middle Suwannee River, including Troy Spring, are implemented judiciously and that spring flows do not decrease to the point that the Troy system suffers significant harm.

DRP will need strong public support if it hopes to be effective in reducing the threat level of these impacts.

NATURAL COMMUNITIES

Mesic hammock

Mesic hammock at Troy Spring occurs in the northern part of the park in areas that are generally below the 35-foot contour but are slightly higher than adjacent bottomland or alluvial forest communities. A narrow strip of good quality mesic hammock of the evergreen levee variety occupies the primary levee along the Suwannee River upstream from the spring run. The remainder of the park's mesic hammock, located in zones 1C, 1E and 1F, is in relatively poor to fair condition due to past land use practices such as under-brushing. Water oak is the dominant canopy species, with live oak, southern magnolia, pignut hickory, sweetgum (*Liquidambar styraciflua*) and loblolly pine (*Pinus taeda*) scattered about. Cabbage palm is virtually absent. The understory consists mainly of young growths of the above-named species,

plus American holly, sparkleberry, highbush blueberry, and the occasional saw palmetto. The groundcover includes yellow jessamine (*Gelsemium sempervirens*), which grows profusely in places, greenbrier (*Smilax* spp.), panic grass and patches of turf grass that are remnants of the landscaping efforts of previous landowners.

Maintenance of the quality of the mesic hammock on the river levee will require a long-term commitment to protecting the area from overuse by visitors. In order to protect the lesser quality mesic hammock, the best management scheme includes protecting it from additional disturbance to the extent possible. Allowing the natural process of succession to take place should eventually yield a more typical hammock community with an appropriate mix of plant species. Control and eventual eradication of the exotic turf grass will likely require the application of herbicides.

Sandhill

The higher elevations within the park are largely successional hardwood forest or highly disturbed sandhill. These areas are shown as successional hardwood forest on this plan's Natural Communities Map, within the Existing Conditions. The sandhill areas have been impacted by various disturbances including logging, conversion of native groundcover to bahiagrass pasture and long-term fire exclusion. Nowhere in the sandhill does the groundcover appear to be in fair condition or better. Bahiagrass (*Paspalum notatum*) now covers a significant portion of the former 24-acre sandhill community. The few longleaf pines that survive in the former pasturelands are likely volunteers from longleaf stands on adjacent or nearby private properties. A portion of the southeast corner of the former pasturelands once contained a slash pine plantation. The pines were harvested in 2008.

The sandhill community at Troy Spring State Park is in poor condition. It is mapped as successional hardwood forest, clear-cut pine plantation and abandoned pasture. Although the park will introduce prescribed fire, restoration of this area is a long-term goal due to the limited extent of sandhill in the park. A significant tract of good to excellent quality sandhill is located adjacent to the park's east boundary. This property, the O'Brien tract, is included in the park's optimum boundary. If portions of these sandhills were eventually acquired, the ecological value of the park sandhill would increase greatly, since the O'Brien tract would connect the park with several hundred acres of good to excellent quality sandhill currently managed by the SRWMD in the Troy Springs Conservation Area.

Prescribed fire is the primary tool for maintaining and improving sandhills. The Troy Spring State Park sandhills will need frequent prescribed fires to reverse the invasion of off-site hardwood species and prevent their reintroduction. Although growing season fires are preferred to stimulate groundcover response, dormant season fires may be used to reduce hardwood densities and to increase fire frequency. Restoration of former agricultural lands to sandhill or upland mixed woodland, while technically feasible, would require significant resources to restore the diverse groundcover that defines those community types. Truly successful conversion of the bahiagrass pasture and the former pine plantation to the original sandhill community will require supplementary measures besides fire. The former pine plantation (approximately 4 acres) seems to be the best candidate for restoration within the next 10 years. Among the management measures likely to be employed are mechanical and herbicide treatment of invasive hardwoods, herbicide treatment of bahiagrass and planting of representative sandhill species such as longleaf pine and wiregrass.

Upland mixed woodland

Upland mixed woodland in peninsular Florida, also known as southern red oak woods (Duever et al. 1997), is a broad transition zone between sandhill or upland pine (collectively referred to as "high pine")

and non-fire adapted communities such as floodplain communities. This transition zone often occurs on soils that are intermediate in drainage and has fertility characteristics between sandhill and floodplain soils. Fire also exerts a defining influence on the limits of upland mixed woodland. The Florida Natural Areas Inventory (FNAI) previously grouped upland mixed woodland within the upland pine community and only recently assigned formal designation as a distinct community type (FNAI 2009). Typically, upland mixed woodland burns with a frequency similar to that of its neighboring high pine community.

At Troy Spring State Park, a long history of fire suppression and timbering has blurred the distinctions among the three "high pine" communities that are dominated by longleaf pine. Although sorting out the three communities can be difficult, it appears that about 21 acres of the upland portions of the park are best classified as upland mixed woodland. The most significant example of this community type is found in a broad band around the bottomland forest in the center of the park. This area might never have evolved into upland mixed woodland if a "natural" fire regime had been allowed to maintain the landscape. It may exist now mainly because the upland pine forest that was originally there underwent succession due to fire exclusion. This community is in poor condition since much of it is heavily overgrown with invasive off-site hardwoods.

Restoration of a natural fire regime to the upland mixed woodland will be essential to the recovery of this rare and unique community type. Reintroducing fire may require additional hardwood removal efforts to allow prescribed fires to penetrate further into areas currently dominated by offsite species of hardwoods. Some hardwood treatment areas may also need restoration of groundcover species.

Alluvial forest

Alluvial forest occurs in the northern part of the park as a slough-like drainage feature that parallels the Suwannee River. Most of this community is in excellent condition. It supports a high diversity of tree species, most notably cedar elm. It has suffered little disturbance other than logging in the distant past. However, the alluvial forest in the northeast corner of the property is in poor to fair condition. Previous owners had constructed a slightly raised, unpaved roadway in that area, connecting the log cabin by the spring with a home on an adjacent property. The roadway bisects the linear drainageway that runs along that stretch of alluvial forest. One 18-inch culvert placed at the lowest elevation of the drainageway provides some hydrological connection between the two fragments of forest. Turf grasses such as St. Augustine grass (*Stenotaphrum secundatum*) have proliferated throughout the disturbed area, and mowing practices instituted before the state acquired the property continued until recently. Turf grasses have supplanted much of the original groundcover, and nearly the entire understory has been removed.

Maintenance of a natural hydrological regime is critical to the long-term health of alluvial forest. Many of the issues concerning flooding that were described in the *Hydrology* section of this plan also apply to alluvial forest. Staff should monitor the northeast corner of the park to see if the elevated roadbed in the alluvial forest affects the natural hydrological regime in any way. Removal of the road may be necessary to accomplish complete restoration of the natural hydrology. Monitoring of the alluvial forest for possible impacts from invasive plant species or feral hogs will continue.

Bottomland forest

A broad depression near the center of the park is best classified as bottomland forest. It is in generally poor condition due to past land use practices such as logging. At least one small, ephemerally wet natural depression occurs within these bottomlands. A previous owner of the property dredged several small ponds within the bottomland forest. A ditch now connects the ephemeral wetland with one of those ponds. The extent of impact on the natural hydrological regime is unknown.

Maintenance of a natural hydrological regime is critical to the long-term health of bottomland forests. DRP needs to determine whether past dredging has significantly altered the hydrology of the park's bottomland forest. If impacts are deemed significant enough, then DRP must decide if hydrological restoration is feasible. The strategic placement of ditch blocks and the pushing of spoil into adjacent dredged ponds may be the only actions needed to achieve adequate restoration of the bottomland forest. Staff will need to develop a basic restoration plan that considers possible hydrological repairs to the system as well as the recovery of characteristic plant species. It is important to note that a restoration plan featuring the use of spoil piles as fill material for the ponds may reduce the water storage capacity of the bottomland forest. This could increase the frequency of flooding at the lowest point on the park drive where it passes through the edge of the bottomland forest.

Floodplain swamp

A limited area of floodplain swamp occurs within the park. This linear slough-like feature, which drains into the spring run, lies within a broad band of alluvial forest extending westward from the springhead. Some cedar elms occur in the swamp area. The community is in good to excellent condition.

Maintenance of a natural hydrological regime is critical to the long-term health of floodplain communities. Many of the issues concerning flooding that were described previously in the *Hydrology* section also pertain to the floodplain forest. Monitoring of the floodplain swamp for possible impacts from invasive plant species or feral hogs will continue.

Blackwater stream

The Suwannee River forms the north boundary of the park. Additional information about the river is included in the *Hydrology* section. While the condition of the river is still generally good despite declining water quality and quantity, erosion is occurring along portions of the riverbank. Some erosion is attributable to natural flooding, and some is a result of increased visitor use.

Management of a complex aquatic system such as the Suwannee River is a difficult task. Since many impacts to this system have their origins either upstream or from groundwater sources, management considerations must necessarily extend beyond the park boundary. Protection of the Middle Suwannee River basin is a priority. DRP will continue to work with other agencies responsible for monitoring water quality and quantity on the river and will continue to support the basic and applied research that is ongoing within this watershed.

Erosion issues originating within the park are primarily related to visitor access issues through recreational use. The greatest impact from recreation occurs when an excessive number of watercrafts lead to vessels beaching themselves along the riverbank to access Troy Spring. During low river levels, much of the river shoreline both upstream and downstream of the spring run will contain anchored or beached watercraft.

Spring-run stream

Troy Spring consists of multiple spring vents and a spring run about 325 feet in length. The spring pool measures 138 feet north to south and 118 feet east to west. Limestone is exposed in and around the pool, and water flows from a 60-foot-deep boil that discharges to the Suwannee River.

There are currently no aquatic macrophytes found in Troy Spring and its spring run community, and periphyton levels in this system are high. In recent years, water quality issues have increasingly

threatened the spring-run stream. Elevated nutrient levels in the groundwater are causing increases in periphyton growth. Lately, Troy Spring has experienced high turbidity levels and has lacked the clarity normally associated with karst springs. The high turbidity may be due to subterranean collapses or perhaps even to contamination within the springshed. A water quality issue of known concern is its excessively high nutrient level, a condition similar to that found at many springs along the Middle Suwannee River. Additional water quality information is included in the *Hydrology* section.

The spring run also experiences increased turbidity associated with peak periods of recreational use. Troy Spring has long been attractive to outdoor recreation enthusiasts. Activities such as swimming and sunbathing along the shoreline have subjected this aquatic system to highly intensive anthropogenic pressures. Foot traffic on the spring-run bottom causes an increase in suspended sediments and silt in the water column. In addition, human activities along the entire shoreline above the spring and spring-run have caused significant erosion damage to this system.

Management of a complex aquatic system such as Troy Spring is a difficult task. Since many impacts to this spring system originate in groundwater sources, management considerations must necessarily extend outside the park boundary. Protection of the Middle Suwannee River basin and of influences further upstream is a priority. DRP staff will continue to work with state agencies responsible for monitoring water quality and quantity and will support basic and applied research ongoing within this watershed. Staff will also continue to monitor and evaluate the impact of recreation on the park's spring-run stream.

Significant planning must be implemented to guide visitor access and restore the shoreline area of this spring. The restoration objective in the *Resource Management Program* section contains additional information.

<u>Subterranean cave - aquatic</u>

Due to its underground location, the aquatic cave natural community at Troy Spring is not depicted on the Natural Communities Map. There are very few records of exploration of this cave system, therefore its current condition is unknown. As of 2010, the main cave entrance was extremely fragile, crumbling and unsafe for human entrance. However, the conduit system associated with the cave is likely to be very extensive and probably has a significant connection to the Stick Sink Swallet upstream to the northeast. Water quality issues for the aquatic cave system are similar to those previously described for the spring-run stream. At least one troglobite species, the pallid cave crayfish (*Procambarus pallidus*), is known to occur within the aquatic cave. Additional information about water quality issues is contained in the *Hydrology* section above.

DRP staff will continue to support exploration of the cave system following the guidance of cave diving professionals. It is very important that DRP staff begin to understand the upstream conduit connections for the Troy Spring springshed, specifically the conduit system to the northeast of the park in Stick Sink Swallet that divers are currently exploring. Dye trace work in this springshed is lacking, and any research that expands understanding of the Little River/Stick Sink swallet system could fill a large gap in knowledge of groundwater movement in this region.

To prevent silting in of the aquatic caves, staff will have to carefully monitor the erosion of slopes above the spring run and correct problems as they arise. A significant amount of planning will be necessary for restoration efforts along the shoreline of the spring, as well as guiding visitors' access more effectively.

Refer to the hydrological restoration objective in the *Resource Management Program* section of the plan for additional information.

ALTERED LAND COVER

Abandoned field/abandoned pasture

Portions of the former sandhill were converted to pasture in the southeast corner of the park. This area lies to the south of the horse stable. Restoration of this area to sandhill is not a high priority but prescribed fire will be used to initiate restoration and to manage the habitat for the resident gopher tortoises.

Clearcut pine plantation

Slash pines were planted north and south of the pasture area south of the horse stable. These off-site pines were harvested in 2008. Like the adjacent abandoned pasture, this area was once sandhill, and restoration efforts should initially focus on prescribed fire and replanting with longleaf pines.

Developed

Developed areas at the park include a historic log home, a shop building, a ranger residence, a wooden barn, a day-use area including restrooms, parking lot, spring access ramp, picnic area and a park entrance drive.

The developed areas within the park will be managed to minimize the effect of the developed areas on adjacent natural areas. Priority invasive plant species (Florida Invasive Species Council (FISC) Category I and II species) will be removed from all developed areas. Other management measures include proper stormwater management and development guidelines that are compatible with prescribed fire management in adjacent natural areas. Due to the nature of the karst features in the region, DRP will place particular emphasis on proper treatment of sewage originating from the developed areas of the park. Advanced treatment systems may be required to ensure that the effluent from septic systems does not contribute to a decline in groundwater quality.

Artificial pond

Two artificial ponds and associated spoil piles are located within the bottomland forest. Restoration of these ponds to bottomland forest is a low priority since they do provide some freshwater habitat for wildlife.

Successional hardwood forest

The successional hardwood forest is located in the southern end of the park and was once sandhill. Long-term fire exclusion and removal of the longleaf pines has allowed a hardwood forest to develop on the site. Restoration to sandhill is not a high priority, although the successional hardwood forest should be periodically treated with prescribed fire to initiate restoration.

Objective A: Maintain 32 acres within the optimum fire return interval.

- Action 1 - Develop/update annual prescribed fire plan.
- Action 2 - Conduct prescribed fire on at least 12 acres annually.
- Action 3 - Reduce the density of off-site hardwoods within upland mixed woodland through girdling and herbicide treatments.
- Action 4 - Conduct follow up hardwood treatments with prescribed fire.

Restoration of the most fire-suppressed natural communities at this park will require mechanical and chemical removal of off-site hardwood species before prescribed fires will be truly effective in restoring degraded areas.

Most permanent firebreaks within the park are on service roads or paved roads. Where appropriate, the park utilizes some natural firebreaks as well. One of the main goals of the prescribed fire program at Troy Spring State Park is to restore the sandhill and upland mixed woodland communities. Off-site hardwood species have become very dominant in both these communities.

A small number of adult longleaf pines, as well as a few remnant post oaks, sand post oaks and mockernut hickories, remain scattered throughout the former sandhill and upland mixed woodland communities. As part of the restoration process, it will be important to maintain all the longleaf pines in the park. This includes the isolated pines because they produce highly flammable needle fuel, their genetic stock deserves preservation, and they have the capability of producing future seedlings. Currently, prescribed fire may not be able to penetrate fire zones far enough to reach all pines. To supplement prescribed fire, areas around pines should be some of the first targeted for invasive hardwood removal.

Park staff will contact adjacent residents before conducting prescribed fires in the park. To foster public support and avoid possible future efforts to restrict prescribed fire treatment of natural areas, DRP staff will vigorously promote the benefits of prescribed fire. Staff will monitor any future restrictions on prescribed fire in the region.

In general, fire return intervals should be more frequent than originally suggested by FNAI in the Guide to Florida Natural Communities (FNAI 1990). Rather than two to five years for sandhills, the fire return interval should be closer to the shorter end of the range to be more effective in this pyrogenic community (FNAI 2010). It is recommended that altered landcover types that were once sandhills be treated at least every three years. The upland mixed woodland should be treated every two to five years. Although the growing season, or lightning season, is the preferred time of year to conduct prescribed fires, managers may use dormant season fires effectively during the restoration phases. This should result in an increased number of fires due to lengthening of the prescribed fire season. Additionally, dormant season fires conducted during periods of lower relative humidity are more effective at penetrating overgrown upland mixed woodlands than growing season fires that typically occur at a higher relative humidity.

The table below contains a list of all fire-dependent natural communities in the park, their associated acreages and optimal fire return intervals, and the annual target for acres to burn in the park.

Prescribed Fire Management		
Natural Community	**Acres**	**Optimal Fire Return Interval (Years)**
Successional Hardwood Forest	19.47	2-3
Upland Mixed Woodland	19.33	2-5
Abandoned Field/ Abandoned Pasture	2.20	2-3
Clearcut Pine Plantation	2.06	2-3
Annual Target Acreage	12-25	

Based upon fire return intervals and acreage figures for the park's natural communities, the park will need to treat at least 12 acres with prescribed fire each year to maintain the natural communities within their target fire return intervals. The park may not always reach every zone within its maximum recommended fire return interval, but some zones may be treated with fire more frequently. The number of acres kept within the target fire return interval should not be less than 32 acres, or approximately 75% of the total fire-dependent acres within the park.

Objective B: Conduct natural community improvement activities on 4 acres of sandhill community.

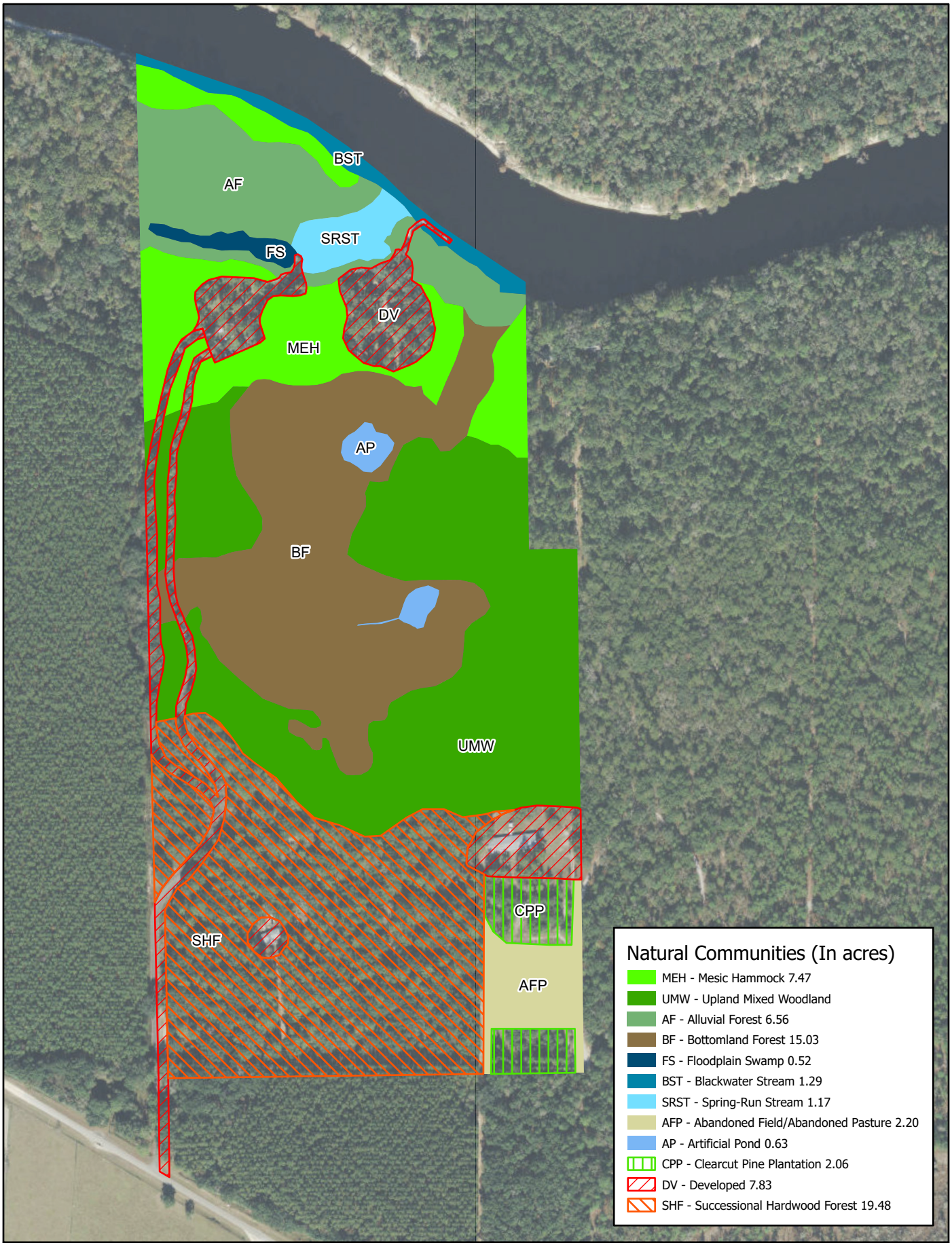
- Action 1 - Plant longleaf pines in the abandoned pasture and clearcut pine plantation located due south of the horse barn.

That area currently maintains a sizeable population of gopher tortoises, and any restoration project there will have to consider their welfare. The area will also be visible to park visitors. Planting of longleaf pines will enhance the park's ability to maintain that area through prescribed fire and will improve gopher tortoise habitat over the long term.

IMPERILED SPECIES

Imperiled animal species at Troy Spring State Park are associated with the former sandhill, upland mixed woodland, blackwater stream and spring run natural communities. The only imperiled animal species formally confirmed in the upland habitats is the gopher tortoise, but imperiled gopher tortoise commensals may also occur in the park. Continued restoration of upland fire-adapted communities will serve to benefit these species. Species that use the spring run or Suwannee River make up a larger component of the imperiled species. The Gulf sturgeon, Suwannee cooter and Florida manatee are denizens of the Suwannee River and may often enter the spring area. Florida manatees seasonally enter the park, most often in winter month, attracted to the warm waters of river springs during colder weather.

The aquatic cave systems within the park harbor several species of sensitive aquatic cave fauna. The pallid cave crayfish is currently the only confirmed imperiled species present at Troy Spring State Park. Two amphipods (*Crangonyx* sp., and *Hyalella* sp.), one isopod (*Caecidotea* sp.) and at least one species of Hydrobiid snail have been observed by researchers but are not yet confirmed to species. Once taxonomists have determined the exact species of these sensitive cave fauna, the park's imperiled species list will likely grow.



Natural Communities (In acres)

- MEH - Mesic Hammock 7.47
- UMW - Upland Mixed Woodland
- AF - Alluvial Forest 6.56
- BF - Bottomland Forest 15.03
- FS - Floodplain Swamp 0.52
- BST - Blackwater Stream 1.29
- SRST - Spring-Run Stream 1.17
- AFP - Abandoned Field/Abandoned Pasture 2.20
- AP - Artificial Pond 0.63
- CPP - Clearcut Pine Plantation 2.06
- DV - Developed 7.83
- SHF - Successional Hardwood Forest 19.48

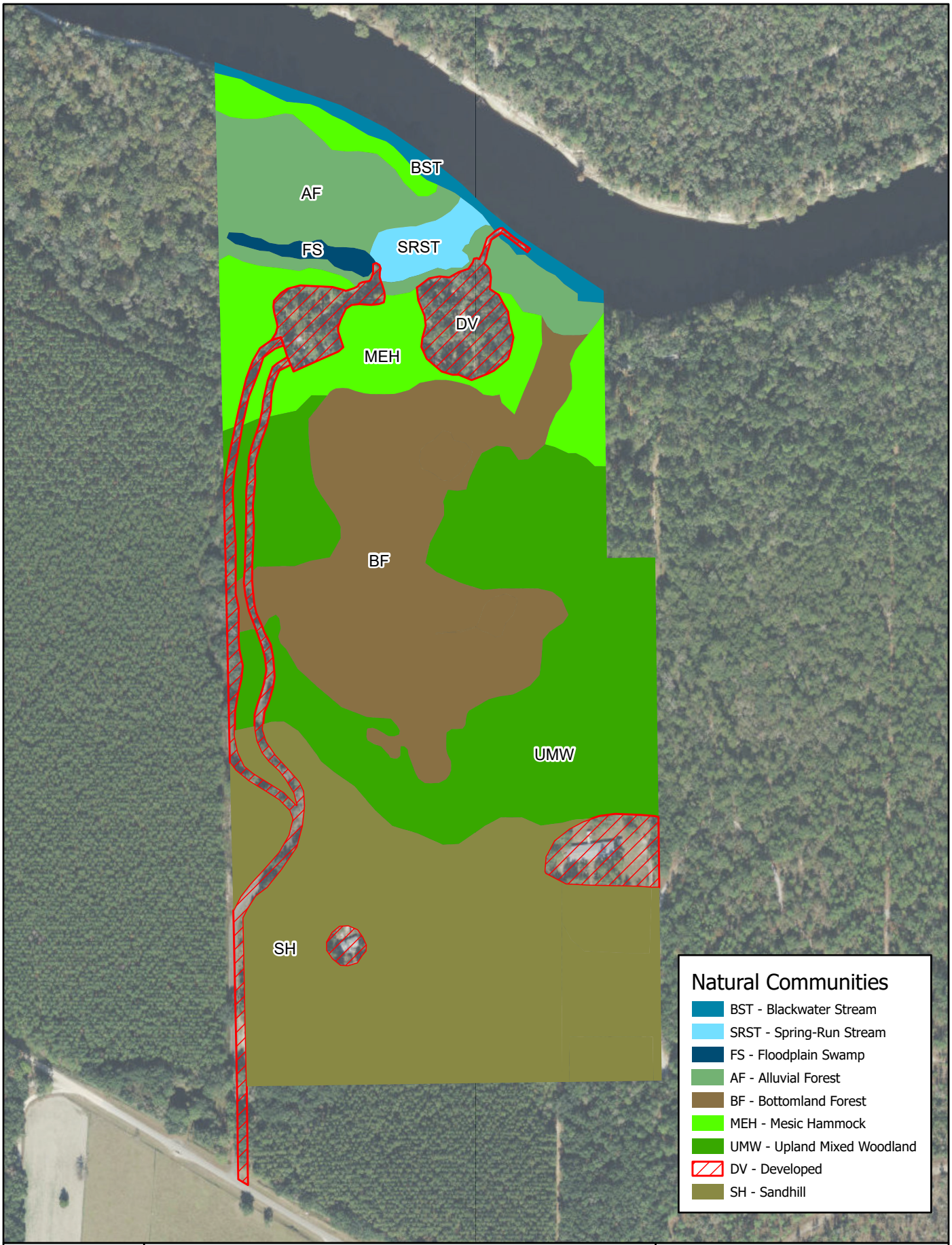
TROY SPRING STATE PARK

Natural Communities - Existing Conditions

N

0 400 800 Feet

This graphical representation is provided for informational purposes and should not be considered authoritative for navigational, engineering, legal, and other uses.



TROY SPRING STATE PARK

Natural Communities - Desired Future Conditions

N

0 400 800 Feet

This graphical representation is provided for informational purposes and should not be considered authoritative for navigational, engineering, legal, and other uses.

Currently, the only imperiled plant species recorded in the park is the rainlily (*Zephyranthes atamasca*). DRP staff will need to conduct thorough surveys during various seasons to determine if additional imperiled plant species are present.

Troy Spring State Park has two imperiled species of turtle, the gopher tortoise and the Suwannee alligator snapping turtle (*Macrochelys suwanniensis*) in the Suwannee River. Turtle species in the region were historically harvested for meat. That included these imperiled species, as well as the recently de-listed Suwannee cooter (*Pseudemys concinna suwanniensis*). Harvest or possession of gopher tortoises was prohibited statewide in 1988. Taking of Suwannee cooters from the wild was prohibited in 2009. In addition, species of similar appearance are also protected from collection from the wild. These include all Florida turtles of the genus *Pseudemys* and the common snapping turtle (*Chelydra serpentina*). Collection of these species, or any other turtle for that matter, is prohibited within the state park. The area under jurisdiction of the park includes the length of the spring run as well as a 400-foot zone from the edge of mean high water along sovereign submerged lands of the Suwannee River adjacent to the park boundary.

The use of prescribed fire in the management of the limited upland areas of the park should benefit sandhill-adapted species such as the gopher tortoise. Without protection and proper management of the adjacent, privately owned sandhill, however, it is less likely that a gopher tortoise population can be sustained within the park for an appreciable length of time.

The table below contains a list of all known imperiled species within the park and identifies their status as defined by various entities. It also identifies the types of management actions that are currently being taken and identifies the current level of monitoring effort. The codes used under the column headings for management actions and monitoring level are defined following the table. Explanations for federal and state status as well as FNAI global and state rank are provided in the Appendix.

Imperiled Species Inventory						
Common and *Scientific* Name	**Imperiled Species Status**				**Management Actions**	**Monitoring Level**
	FWCC	**USFWS**	**FDACS**	**FNAI**		
PLANTS						
Rainlily *Zephyranthes atamasca*			LT		10	1
INVERTEBRATES						
Pallid Cave Crayfish *Procambarus pallidus*		UR		G1G2, S1S2	4,10	2
FISH						
Gulf Sturgeon *Acipenser oxyrinchus desotoi*	FT	LT		G3T2T3, S2?	4,10	1

REPTILES						
Gopher Tortoise *Gopherus polyphemus*	ST			G3,S3	1,6,13	2
Suwannee Alligator Snapping Turtle *Macrochelys suwanniensis*	ST	PT		G2,S2	4,10	1
BIRDS						
Little Blue Heron *Egretta caerulea*	ST			G5,S4	4,10	2
MAMMALS						
West Indian Manatee *Trichechus manatus*	FE	LE		G2G3T2,S2S3	4,10	2

Management Actions:

1. Prescribed Fire
2. Invasive Plant Removal
3. Population Translocation/Augmentation/Restocking
4. Hydrological Maintenance/Restoration
5. Nest Boxes/Artificial Cavities
6. Hardwood Removal
7. Mechanical Treatment
8. Predator Control
9. Erosion Control
10. Protection from visitor impacts (establish buffers)/law enforcement
11. Decoys (shorebirds)
12. Vegetation planting
13. Outreach and Education
14. Other

Monitoring Level:

Tier 1.
Non-Targeted Observation/Documentation: includes documentation of species presence through casual/passive observation during routine park activities (i.e. not conducting species-specific searches). Documentation may be in the form of Wildlife Observation Forms, or other district specific methods used to communicate observations.
Tier 2.
Targeted Presence/Absence: includes monitoring methods/activities that are specifically intended to document presence/absence of a particular species or suite of species.
Tier 3.
Population Estimate/Index: an approximation of the true population size or population index based on a widely accepted method of sampling.
Tier 4.
Population Census: A complete count of an entire population with demographic analysis, including mortality, reproduction, emigration, and immigration.
Tier 5.
Other: may include habitat assessments for a particular species or suite of species or any other specific methods used as indicators to gather information about a particular species

Objective A: Update baseline imperiled species occurrence list

- Action 1 - Conduct periodic floristic surveys to determine if additional species occur within the park.

Only one imperiled plant species has been recorded at Troy Spring State Park.

Objective B: Continue existing monitoring protocols for two imperiled species, the West Indian manatee and pallid cave crayfish.

- Action 1 - Continue to implement existing monitoring protocols.
- Action 2 - Periodically review existing protocols.

Park staff will continue to document the occurrence of manatees in the park's spring run habitat. Data collected will include the location, number and, where possible, the size and distinguishing characteristics of the animals. Any decline in the output of the spring could potentially affect manatee access to this warm water refuge, so tracking spring discharge and water quality will continue to be an important component of the monitoring protocol. Staff will refer to the FWC Manatee Management Plan (FWC 2012) to guide management of this imperiled species.

Qualified researchers have conducted routine censuses of aquatic cave-dwelling crayfish, amphipods, and isopods. Repeated censuses will document fluctuations in arthropod populations that might correlate to flooding events or alterations in water quality. District and park staff will continue to support research that leads to positive identification of currently unidentified cave fauna.

Objective C: Develop new monitoring for one selected imperiled animal species.

- Action 1 - Develop and implement monitoring protocol for the gopher tortoise.

Continued cooperation with FWC will be an important part of the management of this threatened species. District staff will need to develop a monitoring protocol. Park staff will report to the FWC Wildlife Research Laboratory in Gainesville all observations of the incidence of Upper Respiratory Tract Disease (URTD) and of dead tortoises in the park. Providing interpretive information at the park will be an essential tool in curbing the practice of releasing stray tortoises into the park. Public education about the seriousness of the disease will assist in the management of the disease statewide. Staff will continue to refer to the FWC Gopher Tortoise Management Plan (FWC 2012) to guide management of this imperiled species. A full Line Transect Distance Sampling survey (Smith et al 2009) is probably not necessary at Troy Spring State Park unless combined with an FWC survey of Troy Springs Conservation Area which is a Tier 3 Priority for LTDS surveys (FWC 2018).

INVASIVE SPECIES

There are relatively few invasive plant species in the park. Infestations of these invasives are generally small and easily treatable using conventional mechanical and chemical controls. The most widespread problem species is the camphortree, which was originally restricted to spoil piles on the edges of the dredged ponds within the bottomland forest. Now the species occurs individually or in small clumps in other parts of the park as well. Other Florida Invasive Species Council (Category I and II Invasive plants found in the park include Japanese climbing fern, Japanese honeysuckle, and wisteria. The Japanese climbing fern has been treated several times. The park needs to inspect the infestation sites periodically and retreat as necessary.

The park should conduct surveys for invasives annually, covering about half the park each year so that the entire park is surveyed over a two-year period. An advantage in scouting the whole park is that staff will have a better opportunity for early detection and treatment of new invasive plants before they have a chance to become well established. That is the most economical and time-effective way to control invasives. Historically, tung oil trees also occurred in the park.

Since the approval of its last management plan in 2000, the park has treated 11 acres of invasive plants. All invasive plant treatments to date have been in-house efforts by DRP staff. Treatment of Invasives occurs annually.

Invasive Plants			
Species Name **Scientific Name - Common Name**	**FLEPPC Category**	**Distribution**	**Zone ID**
Albizia julibrissin - Mimosa	I	Single Plant or Clump	TS-1F
Cinnamomum camphora - Camphor-tree	I	Scattered Plants or Clumps	TS-1A, TS-1B, TS-1C, TS-1D, TS-1E
Lonicera japonica - Japanese honeysuckle	I	Scattered Plants or Clumps Scattered Dense Patches	TS-1F
Lygodium japonicum - Japanese climbing fern	I	Single Plant or Clump Scattered Plants or Clumps	TS-1F
Nandina domestica - Nandina	I	Single Plant or Clump	TS-1D
Wisteria sinensis - Chinese wisteria	II	Scattered Plants or Clumps	TS-1F

The table above contains a list of the FISC Category I and II invasive plant species found within the park (FISC 2015). The table also identifies relative distribution for each species and the management zones in which they are known to occur. An explanation of the codes is provided following the table. For an inventory of all Invasive species found within the park, see the Appendices.

Invasive animal species include non-native wildlife species, free-ranging domesticated pets or livestock, and feral animals. Because of the negative impacts to natural systems attributed to invasive animals, DRP actively removes invasive animals from state parks, prioritizing those species causing the most ecological damage.

In some cases, native wildlife may also pose management problems or nuisances within state parks. A nuisance animal is an individual native animal whose presence or activities create special management problems. Examples of animal species from which nuisance cases may arise include raccoons, gray squirrels, venomous snakes and alligators. Nuisance animals are dealt with on a case-by-case basis.

Feral hogs and armadillos occasionally occur in the park, and staff members remove them whenever possible. No nuisance species are known to occur at Troy Spring State Park.

In 2002, the red bay ambrosia beetle (*Xyloborus glabratus*) was first detected in the United States in southeast Georgia. The beetle carries the fungal pathogen *Raffaelea lauricola*, which it transmits to red bay trees (*Persea borbonia*) and other species in the Lauraceae family, causing laurel wilt disease and death. The beetle and its associated pathogen spread rapidly, and by 2005 it had appeared in Duval County. In 2009, the disease was discovered in Suwannee County. The beetle (and laurel wilt) has now spread throughout most of Florida and into many neighboring states. Although most of the adult red bays are top-killed, the trees continue to re-sprout from their roots. It may be that members of the Lauraceae family will continue to survive in shrub form as the remnant tree root systems continue to resprout. At this point, much remains unknown about the long-term impacts of this disease on red bays

and other Lauraceae. The park should continue to restrict the movement of firewood in and out of the park and educate visitors about the issue.

Objective A: Annually treat 0.25 acres of invasive plant species.

- Action 1 - Annually develop an invasive plant management work plan.
- Action 2 – Implement the annual work plan by treating 0.25 acres in park annually.
- Action 3 - Continue maintenance and follow-up treatments as needed.

Periodic surveys of the park for invasive plants will be necessary. Staff should check about half the park annually, not only to assess the status of known infestations but also to proactively search for any new invasive species that might have appeared since the last survey. Staff will map any Invasives found, treat them immediately and update the invasive plant management annual work plan as needed.

Staff should become familiar with all locations of camphortree within the park and treat each location within one year of discovery. Maintenance treatments after the initial treatment may occur on a biennial basis. The Japanese honeysuckle, infesting approximately 2,000 square feet of the park, will require annual treatments to achieve control. Staff will also need to treat the aggressively spreading Japanese climbing fern at least annually, if not more often. Any other FISC Category I and II species found during park surveys will also need prompt attention.

Objective B: Implement control measures on two nuisance species***.***

- Action 1 - Remove feral hogs and armadillos from the park as needed.

CULTURAL RESOURCES

Prehistoric and Historic Archaeological Sites

Three archaeological sites at Troy Spring State Park are recorded in the Florida Master Site File (FMSF). Two sites are prehistoric (8LF55 and 8LF56), and one is an underwater historic shipwreck (8LF5). Prior to the Conservation and Recreational Lands (CARL) archaeological survey investigations of 1996, which examined a small portion of the park (Wheeler and Newman 1996), the only site recorded at Troy Spring State Park had been the underwater site. A predictive model for the park was completed in 2012 (Collins et al 2012).

Site 8LF5 includes the remains of the Confederate steamship Madison, which was built around 1854 or 1855 for Captain James M. Tucker. The Madison served as a general store on the Suwannee River during the 1850s. Capt. Tucker also operated a mail line between Ellaville and Cedar Key using the vessel. The steamer served as an ad hoc "warship" in the Confederate navy in 1861, when it was used to investigate and eventually take control of four vessels transporting supplies to the Union naval base in Key West. Afterward, the ship was scuttled under the orders of Capt. Tucker (who still owned the ship) when he and his troops (Company H, 8th Florida Infantry) went to fight in Virginia (Barker-Benfield 1995, cited in Wheeler and Newman 1996). Due to salvaging efforts over the years, all that remains of the Madison is the hull (Wheeler and Newman 1996).

The Madison is a highly significant resource requiring particularly sensitive management. The location of the wreck along and across much of the spring run may conflict with the recreational use of the spring. Impacts from recreational use at the site that once occurred with some regularity include scarring by motorboat propellers during low water, use of the wreck as an anchor site for motorboats, and disturbance by divers and snorkelers.

The two prehistoric sites at Troy Spring State Park represent the Indian Pond culture, which was contemporaneous with the Weeden Island period. Artifacts associated with the sites include prehistoric pottery, lithics and some bone. Site 8LF55 could be important in the understanding of the Indian Pond culture.

In addition to the sites already recorded in the FMSF, there is another potential site, a historic homestead. While no physical evidence has yet been found for this site, old records and maps indicate that the Davis homestead was located on the bank of the Suwannee River within the park. DRP should collaborate with the Division of Historical Resources' Public Lands Archaeology to conduct further research to confirm the location of this site prior to submitting it to the FMSF. A predictive model for the park was completed in 2012 (Collins et al 2012).

Currently, all the archaeological sites are in good condition. The Madison site has endured looting in the past, but the remains of the shipwreck are currently quite stable. A buoy line across the spring run now protects the site from boat traffic. One concern is that at low water it is possible for swimmers and snorkelers to stand on the wreck. To protect the site, the park currently prohibits boats from entering the spring run and does not allow swimmers to stand on the remains of the ship. The park should continue these preventative measures. Additional interpretation of the Madison wreck may also help reduce damage to the site. The park needs to continue its periodic photo documentation of the condition of the site. In addition to photo documentation, the park should periodically record the dimensions of the vessel to track changes, erosion and degradation.

The park continually strives to educate visitors about the sensitivity of the site. Feral pigs are not currently a problem in the park, but if they ever become established, they could threaten the archaeological sites.

Historic Structures

There is one historic structure at Troy Spring State Park, the log cabin visitor center, LF00092. This structure was submitted to the FMSF. The cabin was originally built as a private residence in 1956, and it was later transferred to the state. Its construction is 1950s-era cypress split log with extensive brickwork. It overlooks the Troy spring run and the Suwannee River.

The log cabin is currently in fair condition. The main concern with the structure is erosion of the slope on the northwest side of the cabin facing the spring run. This erosion has already damaged the steps leading from the cabin to the spring and has partially undermined the brick terraces on the steep slope above the spring run. The erosion is now approaching the cabin. Some of the cabin roof timbers need replaced and the bricks need re-pointing. DRP needs to evaluate the cabin and develop a plan for its future. If no action is taken, the cabin will likely suffer damage or destruction from continuing erosion.

DRP will stabilize the cabin until a Historic Structures Report is prepared.

Collections

Troy Spring State Park has a small collection. The park is currently the home of the wreckage of the steamship Madison. The Madison remains in the location where it sank in the mid-1800s, near the mouth of the spring run. Some artifacts from the Madison wreckage are housed in the visitor center. One piece of wood that drifted away from the wreckage long ago was recovered and is currently on display in the visitor center. A long piece of metal, believed to be the coal stoker from the Madison, has hung above a window in the log cabin since before the state took ownership and remains there today. The log cabin itself is a historical structure with restrooms and a kitchen depicting popular styles of the 1950s and 1060s. The original stove is still in the kitchen. Other items on display include a ceramic pot used in turpentining that was not found onsite but was acquired for interpretative purposes, gopher tortoise shells, and a porous limestone rock used to demonstrate karst geology. The park also recently accepted a donation of several taxidermy mounts.

There are informal collections of research and documentation housed within the Troy Spring State Park office files. These collections include information about the modern history of the Troy Spring property, the Madison and Capt. Tucker, the historic towns of Old Troy and New Troy, and about the Davis homestead. There is also some documentation obtained from interviews with park visitors during Old Timer's Day.

The collections are in good condition. Erosion that threatens the condition of the log cabin LF00092 may also threaten the collection. However, the documents are kept under climate-controlled conditions.

The most important parts of the collections are the pieces of the Madison that are on display in the log cabin. Other artifacts on display interpret the logging operations of the region and the types of natural areas of the surrounding countryside, but they do not originate from within the park itself.

At this time, the park does not have a Scope of Collections Statement or a management assessment of the collection.

Cultural Sites Listed in the Florida Master Site File

Site Name and FMSF #	Culture/Period	Description	Significance	Condition	Treatment
The Madison LF00005	Historic Confederate, 19th Century	Archaeological	NE	G	P
Troy Spring 1 LF00055	Weeden Island II, Prehistoric	Archaeological	NE	G	P
Troy Spring 2 LF00056	Prehistoric	Archaeological	NE	G	P
Old Log Cabin Visitor Center at Troy Spring LF00092	Historic 20th Century	Historic Structure	NE	F	RH

Objective A: Assess/evaluate four of four recorded cultural resources in the park.

- Action 1 - Complete four assessments/evaluations of archaeological sites. Prioritize sites in need of preservation and stabilization projects.
- Action 2 - Complete one Historic Structures Reports for historic buildings and cultural landscape. Prioritize stabilization, restoration, and rehabilitation projects.
- Action 3 - Photographically document the condition of the Madison every other year.

Conduct multiple assessments/evaluations of all four cultural sites in the park over the course of the next 10 years and prioritize any preservation or stabilization proposals that may derive from the assessment recommendations. Populations of feral hogs are increasing on many public lands, and some of the archaeological sites in the park are in areas infrequently visited by staff. If disturbances such as erosion, looting or feral hog rooting occur at cultural sites and remain undetected for too long a period, damage could become significant. Regular assessments by staff will enable the timely detection of disturbances and a quick response. Periodic assessment and evaluation of the Madison shipwreck and the log cabin will likewise be necessary. For all sites, staff should compare current evaluations with previous ones to determine whether management actions have been successful.

Determine if a Historic Structures Report is necessary for the log cabin visitor center. As discussed previously in the *Hydrology* and *Soils* sections, the stream bank below the cabin is eroding and threatening to undermine its structural integrity. DRP needs to determine whether it should rehabilitate the cabin in situ, move it, deconstruct and reconstruct it, or document it and demolish it. In the meantime, staff will evaluate the condition of the cabin annually.

Photo documentation will provide valuable information about the changing condition of the resource and will serve as a backup reference should floods or other damage occur.

Objective B: Compile reliable documentation for all recorded historic and archaeological resources.

- Action 1 - Ensure all known sites are recorded/updated in the Florida Master Site File.
- Action 2 - Develop and adopt a Scope of Collections Statement for Troy Spring State Park.
- Action 3 - Document the historical context of the log cabin structure.

One possible site that may have been inadvertently overlooked is the Davis homestead. Historic maps indicate that the Davis homestead in the mid-1800s was either in or close to what is now Troy Spring State Park. The park needs to gather additional evidence that might pinpoint the exact location of the Davis site. If that location happens to fall within the current boundaries of the park, then staff will submit this site to the Florida Master Site File. A predictive model for the park was completed in 2012 (Collins et al 2012).

Develop and adopt a Scope of Collections for Troy Spring. While the park has a very small collection, a brief Scope of Collections Statement will give park staff guidance as to what, if any, additional items should be accepted into the collection.

Document the historical context of the log cabin structure as part of the process of determining its eligibility for listing in the National Register of Historic Places.

Objective C: Bring one of four recorded cultural resources into good condition.

- Action 1 - Design and implement regular monitoring programs for all cultural sites.
- Action 2 - Create and implement a cyclical maintenance program for each cultural resource.
- Action 3 - Implement recommendations for preservation and stabilization of the log cabin as determined by a Historic Structures Report.

Design and implement a monitoring program that includes a provision for the visual inspection of each cultural site in the park at least once per year. An integral part of this monitoring program will be an annual assessment of the old log cabin visitor center. Erosion along the spring run and riverbank are threatening the structural integrity of the log cabin. It is important that staff routinely track changes in the cabin to aid in evaluating the structure and in determining what DRP needs to do to manage the structure properly.

Create and implement a cyclical maintenance program for each of the park's cultural resource sites. This will be especially important for sites subject to chronic and significant disturbances such as erosion.

To the extent feasible, implement recommendations for preservation and stabilization of the Log Cabin as determined by a Historic Structures Report or other in-depth evaluations.

LAND USE COMPONENT

VISITATION

Visitation at Troy Spring State Park centers primarily on swimming, especially during the warm summer months. Diving and hiking are both possible at the park, while a paddle craft launch allows direct access to the Middle Suwannee River. A paved and formalized parking area, complete with improved bathrooms and a notable winding walkway leading downslope to the springhead, allows visitors easy access to the swimming area.

Visitation Trends

As swimming is by far the most popular form of resource-based recreation at Troy Spring State Park, the unit experiences the highest rate of visitation during warm-weather months between May and October.

EXISTING FACILITIES AND INFRASTRUCTURE

Facilities at Troy Spring State Park are concentrated in and around the springhead day-use area. A paved park entrance road splits traffic into a one-way loop about 600 feet into the park. The park road funnels visitors to a paved parking area at the springhead day-use area.

The day-use area includes a bathroom facility and a paved walkway with several switchbacks that connect the parking area and restroom to a swimming pier along the springhead swimming area. A maintenance shop, a boat ramp, a floating dock on the Suwannee River, and an architecturally intriguing cabin are all situated to the east of the springhead. The southern stretches of the park include a staff residence and a large horse stable structure that is currently used on occasion as a group camping facility.

Facilities Inventory

Springhead Day Use Area	
Paved Parking Lot	1
Parking Spaces	25
Restroom	1
Springhead walkway	1
Pier	1
Floating dock	1
Boat ramp	1
Cabin	1
Shop	1
Boardwalk length in feet	50
Hiking trail mileage	0.29
Paved Road Mileage	0.89
Stabilized Road Mileage	0.20
Un-stabilized Road Mileage	1.67
South End of Park	
Staff Residence	1
Stables	1

CONCEPTUAL LAND USE PLAN

Detailed Conceptual Land Use Plan Objectives

The use areas at Troy Spring State Park listed below detail specific objectives and action items to be implemented within the 10-year planning cycle.

Springhead Day-Use Area

Objective: Update park facilities through infrastructure additions and improvements.

Actions:

- *Convert cabin into staff residence, gift shop or park office.*
- *Add changing facility.*
- *Add an ADA-accessible covered picnic pavilion.*
- *Add pervious large vehicle/trailer parking.*
- *Update swim platform with waterproof materials.*

The current bulkheaded switchback walkway that connects the springhead to the picnic area channels stormwater directly into the spring. A redesign of this use area should include more environmentally and structurally sustainable access, as well as replacement of the swimming platform.

An unoccupied but attractive and architecturally unique cabin is situated at the springhead day-use area. Insulation and sewer/septic improvements are needed at the cabin to alleviate long-term climate control and plumbing issues. Alternative uses should consider staff residence or conversion to park offices or a gift and snack shop. If the retail option is pursued, concessionaire opportunities should be explored.

Park visitors are currently relegated to changing into swim attire in the park bathroom. DRP should consider a dedicated changing facility, comparable to the wooden structures at Peacock Springs State Park. Visitors would also benefit from a covered picnic pavilion with a grill. Finally, additional parking should be considered for larger vehicles with trailers. Pervious surfaces are preferred within the springshed. Additional paved parking is not recommended.

Riverfront

Objective: Update infrastructure to remove unused structures while maintaining fishing access.

Actions:

- *Remove damaged floating dock.*
- *Maintain fishing access.*

The damaged boat dock should be removed and not replaced. Due to the popularity of fishing in this area of the Middle Suwannee River, the dedicated fishing platform at the end of the boardwalk should be retained, or clearly delineated access points along the shoreline should be established to allow for continued fishing access. With removal of the floating dock, the buoy line within the spring run can be repositioned to permit ingress and egress for paddlers at the boat ramp.

South End Stables
Objective: Convert park facilities into support structure(s)

A large horse stable structure is located in the southern reaches of the park. This structure is equipped with electricity and plumbing and is currently used by scout groups. Due to the relatively small size of the park and a lack of access to equestrian trails in the area, the building receives very little usage from equestrian groups.

OPTIMUM BOUNDARY

The park is situated within a patchwork of conservation lands along the Suwanee River. The two parcels identified for the optimum boundary expansion would connect to the Suwanee River Water Management District's Troy Springs Conservation Area. The rest of the parcels outlined as non-DRP conservation coupled with the park's optimum boundary parcels would create an extensive greenway corridor between the spring's conservation area and the park. These acquisitions would further protect the floodplain areas along the Suwanee River and bolster protections for the springshed.

Suwannee River

Proposal
Structures
Spring-Run Stream
Walkway
Service Road
Park Road

1

2

3

NE Jeff Walker Rd

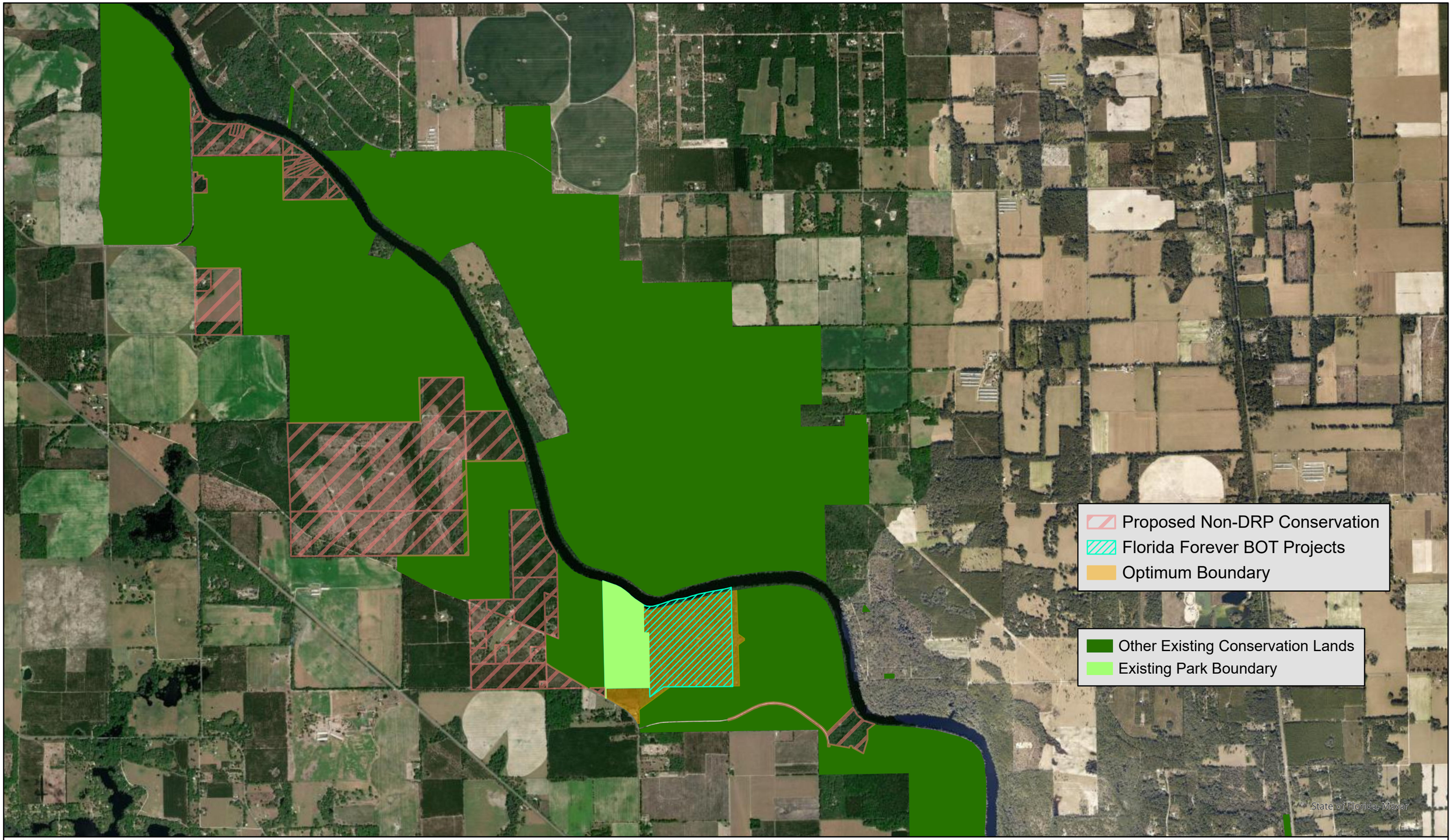
1. Springhead Day Use Area - Convert cabin into staff residence, gift shop, or park office. Add a changing facility, ADA-accessible covered picnic pavilion, and a pervious parking area for large vehicles/trailers. Update swim platform with waterproof materials.
2. Riverfront - Remove the damaged floating dock. Maintain the boat ramp as a service road for park staff to access the buoy line. Allow continued fishing access in this area with a clearly delineated access point or fishing platform.
3. South End Stables - Convert stables into park support structure.

Troy Spring State Park

Conceptual Land Use Plan

0 300 600 Feet

N



Troy Spring State Park

Optimum Boundary