ICHETUCKNEE SPRINGS STATE PARK
Park Chapter

ICHETUCKNEE TRACE
Park Chapter

SUWANNEE RIVER REGION

ICHETUCKNEE SPRINGS STATE PARK

SUWANNEE/COLUMBIA COUNTY, FLORIDA

0 1,000 2,000 Feet

N W E S

CHINQUAPIN FARM CONSERVATION EASEMENT

PARK FEATURES
- Park Boundary
- Structures
- Paved Roads
- Stabilized Park Roads
- Unstabilized Park Roads
- Parking Lots
- Hiking Trails

NORTH ENTRANCE
Entrance Station
BORROW AREA
Ichetucknee Springs
Restroom
Paddling Launch
Cedar Head Spring
Staff Residence
Concession
BORROW AREAS
238
Blue Hole Spring
SW 260th ST
SUPPORT AREA
Staff Residence
SW ELM CHURCH RD
Mission Springs
UPLAND MIXED WOODLAND
Devils Eye Springs
Grassy Hole
UPLAND HARDWOOD FOREST
SANDHILL
Grassy Hole Spring
Mill Pond Springs
Tube Launch
ALLUVIAL FOREST
WOODLAND
River
UTILITY CORRIDOR
MIXED
UPLAND
Coffee Spring
Ichetucknee
FLOODPLAIN SWAMP
Dampiers Landing
SANDHILL
Bathhouse
Pavilion
Pavilion
Concession
Education Center
UPLAND HARDWOOD FOREST
South Takeout
Pavilion
Restroom
SANDHILL
Entrance Station
Barn
Tram Shelter
Residence
TO BRANFORD
SOUTH ENTRANCE
27
UTILITY CORRIDOR
TO FORT WHITE
ICHETUCKEE CONSERVATION AREA
FORT WHITE WILDLIFE & ENV. AREA

SURROUNDING LAND COVER
- Forests
- Agriculture
- Silviculture
- Wetlands

ICHETUCKNEE SPRINGS STATE PARK

TRACTS

0 2,500 5,000 Feet

N W E S

TO LAKE CITY/I-75

Rose Creek

ROSE TRACT

UPLAND HARDWOOD FOREST

ALLUVIAL FOREST

Rose Sink

Rose Creek Swallet

UPLAND MIXED WOODLAND

SINKHOLE

McCormick Sink

SINKHOLE

PINE PLANTATION

MCCORMICK TRACT

MAULDIN AVE

PINE PLANTATION

PASTURE

MESIC HAMMOCK

BEDROCK ST

MESIC HAMMOCK

ICHETUCKNEE TRACE

Spoil Lakes

SUCCESSIONAL HARDWOOD FOREST

SANDHILL

SPOIL AREA

ICHETUCKNEE AVE

WATSON ST

SANDHILL

MESIC HAMMOCK

Saylor Sink

SAYLOR SINK TRACT

MESIC FLATWOODS

PINE PLANTATION

CHINQUAPIN FARM C.E. (Suwannee R. Water Mgmt. District)

DREW FEAGLE RD

SUCCESSIONAL HARDWOOD FOREST

ICHETUCKNEE SPRINGS STATE PARK

SANDHILL

Ichetucknee River

UPLAND HARDWOOD FOREST

JUNCTION RD

ELIM CHURCH RD

SURROUNDING LAND COVER

- Forests
- Agriculture
- Silviculture
- Wetlands

TO BRANFORD

TO FORT WHITE

247 240 47 238 27 47

INTRODUCTION

LOCATION AND ACQUISITION HISTORY

Ichetucknee Springs State Park is located in Columbia and Suwannee counties (see Vicinity Map). Access to the park is 5 miles northwest of Fort White, Florida, off U.S. Highway 27 and State Road 238. The Vicinity Map also reflects significant land and water resources existing near the park.

The park was initially acquired on Jan. 6, 1970, with funds from the Land Acquisition Trust Fund (LATF). Currently, the park comprises of 2,531.87 acres. The Board of Trustees of the Internal Improvement Trust Fund (Trustees) hold fee simple title to the park and on Sept. 4, 1970, the Trustees leased (Lease No. 2459) the property to the Division of Recreation and Parks (DRP) under a 99-year lease. The current lease will expire on Sept. 3, 2069.

The 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 Appendix. A legal description of the park property can be made available upon request to the Florida Department of Environmental Protection (DEP).

The Ichetucknee Trace Tracts are located in Columbia County (see Vicinity Map) approximately 11 miles southwest of Lake City and 4 miles north of the main park. The Vicinity Map also reflects significant land and water resources existing near the park.

The Ichetucknee Trace Tracts were initially acquired on Sept. 7, 2000, and Oct. 1, 2001, with funds from the Preservation 2000 and Florida Forever programs. Currently, the park comprises 659.87 acres. The Board Trustees hold fee simple title to the park and on January 12,2003 the Trustees leased (Lease No. 4301) the property to DRP under a 50-year lease. The current lease will expire on Jan. 12, 2053.

Ichetucknee Trace 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 Appendix. A legal description of the park property can be made available upon request to 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 timber harvesting as part of the park's natural community restoration and management activities could be accommodated in a manner that would be compatible and 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 timber harvesting for the purpose of natural community restoration and management is appropriate as an additional source of revenue for land management since it is compatible with the park's primary purpose of outdoor recreation and conservation. 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 Ichetucknee Springs State Park is to protect and preserve significant karst elements such as springs, aquatic cave environments, and associated water resources while providing opportunities for resource-based recreation and nature appreciation for the enjoyment of Florida residents and visitors.

The purpose of the Ichetucknee Trace Tracts is to protect the water quality of Ichetucknee Springs by removing the threat of groundwater contamination due to mining within an area determined to be a major conduit to the springs. Ichetucknee Trace is a mix of altered natural communities including mixed hardwoods and open water wetlands.

Park Significance

- The park contains eight major springs, including the headspring and many karst seeps, as well as 3.5 miles of the Ichetucknee River, an iconic spring-run stream.

- The park protects large tracts of upland mixed woodland and sandhill, which are critical aquifer recharge areas within the regional springshed and form a remarkable landscape for hiking, wildlife observation, and interpretation of natural areas in the Suwannee River region of northeast Florida.

- The Ichetucknee Trace tracts of the park protect three distinct hydrogeologic features - Rose, McCormick and Saylor sinks – in a remarkable karst landscape of prominent limestone outcroppings, deep depressions, and swallets with direct connections to underground conduits that supply the Ichetucknee Springs complex.

- Diverse cultural sites indicate human activity that extends from the Paleoindian period through the 20th century, including prehistoric hunting, Spanish missionaries, and an historic grist mill.

Central Park Theme

A colorful underwater forest ripples within one of Florida's healthiest spring-fed rivers, the Ichetucknee, as it meanders through a timeless natural landscape.

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

Ichetucknee Trace is classified as a preserve in the DRP unit classification system. In the management of a preserve, preservation and enhancement of natural conditions is the priority. Resource considerations are given priority over user considerations, and development is restricted to the minimum necessary for ensuring its protection and maintenance, limited access, user safety and convenience, and appropriate interpretation. Permitted uses are primarily of a passive nature, related to the aesthetic, interpretive/educational and recreational use of the preserve, although other compatible uses may be permitted within preservation-oriented limitations. Program emphasis is placed on interpretation of the natural and cultural attributes of the preserve.

OTHER DESIGNATIONS

Neither unit is in an Area of Critical State Concern as defined in section 380.05; Florida Statutes and neither is presently under study for such designation. The parks are components of the Florida Greenways and Trails System, administered by the Department's Office of Greenways and Trails

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

PARK ACCOMPLISHMENTS

Ichetucknee Springs State Park

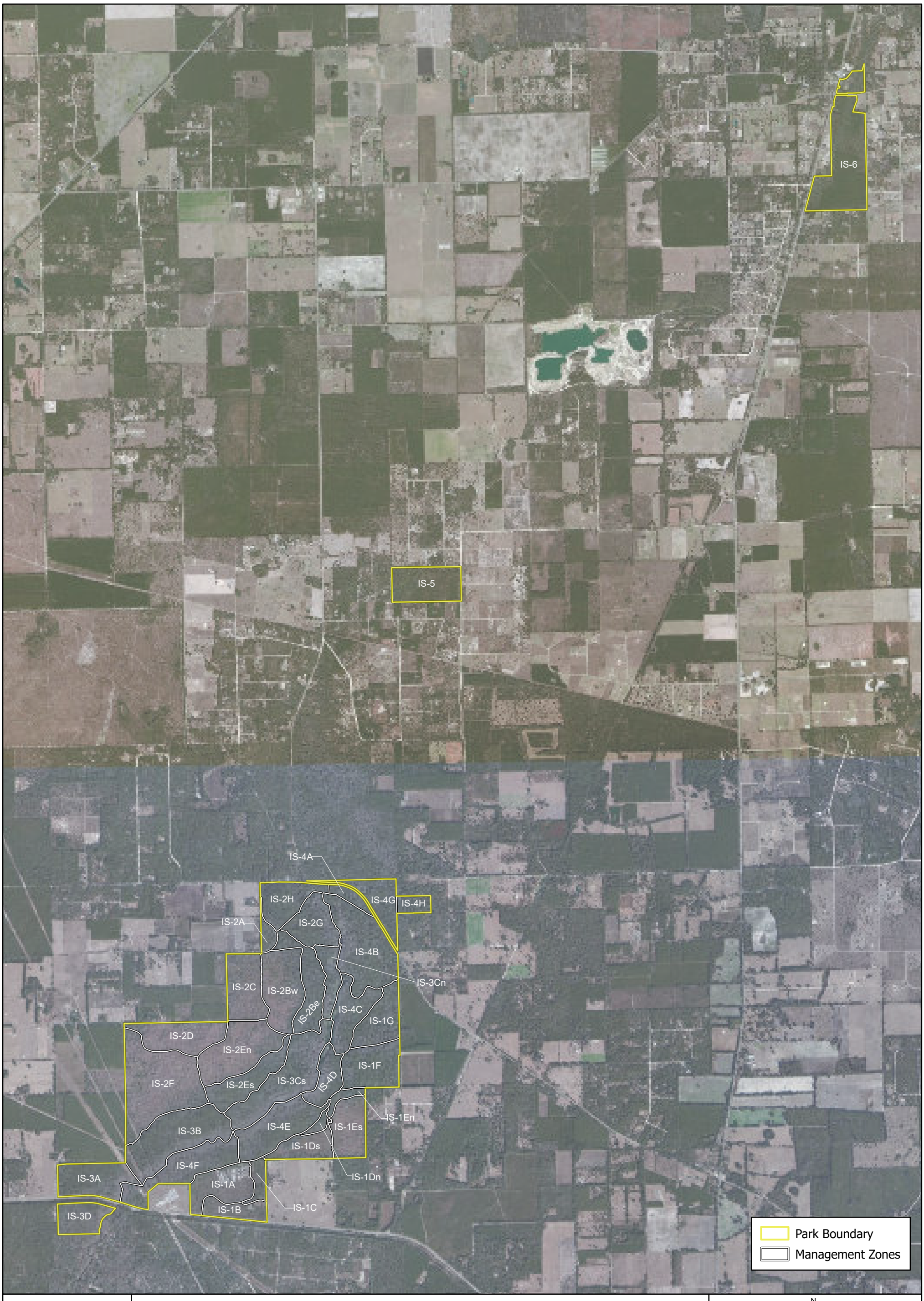
- Continued treatments to remove invasive plant species including water lettuce, cogongrass and Japanese climbing fern, among others.
- Mapped submerged aquatic vegetation profiles at Devil's Eye spring run and Mission spring run.
- Conducted bat population survey in coordination with the Florida Fish and Wildlife Conservation Commission (FWC).
- Completed accessibility improvements in the headspring area.
- Continued to increase opportunities for visitor access to the Environmental Education Center by increasing staffing with dedicated volunteer docents and improved training and reference materials.

Ichetucknee Trace Tracts

- Continued treatments to remove cogongrass and other invasive species.
- Developed plans to introduce prescribed fire into the tract.
- Conducted bat population survey in coordination with FWC.
- Performed feral hog survey.
- Conducted new plant and animal survey to amend species list.

RESOURCE MANAGEMENT COMPONENT

Ichetucknee Springs State Park Management Zones			
Management Zone	**Acreage**	**Managed with Prescribed Fire**	**Contains Known Cultural Resources**
IS-1A	73.83	Y	Y
IS-1B	38.33	Y	Y
IS-1C	20.88	Y	Y
IS-1Dn	9.33	Y	Y
IS-1Ds	49.34	Y	Y
IS-1En	13.14	Y	Y
IS-1Es	67.47	Y	Y
IS-1F	82.04	Y	Y
IS-1G	65.77	Y	Y
IS-2A	15.10	Y	Y
IS-2Be	74.65	Y	Y
IS-2Bw	100.92	Y	Y
IS-2C	81.80	Y	Y
IS-2D	83.23	Y	Y
IS-2En	114.78	Y	Y
IS-2Es	69.75	Y	Y
IS-2F	189.05	Y	Y
IS-2G	66.29	Y	Y
IS-2H	64.20	Y	Y
IS-3A	80.60	Y	Y
IS-3B	142.35	Y	Y
IS-3Cn	39.07	Y	Y
IS-3Cs	137.27	Y	Y
IS-3D	48.70	Y	Y
IS-4A	17.42	Y	Y
IS-4B	144.88	Y	Y
IS-4C	68.34	Y	Y
IS-4D	45.92	Y	Y
IS-4E	100.02	Y	Y
IS-4F	101.73	Y	Y
IS-4G	55.78	Y	Y
IS-4H	19.72	Y	Y
IS-5	80.67	Y	UNK
IS-6	169.59	Y	Y



ICHETUCKNEE SPRINGS STATE PARK
Management Zones

N

0 0.5 Mile 1

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TOPOGRAPHY

Ichetucknee Springs State Park lies in a physiographic region called the Coastal Lowlands, which is described as a low karst plain with elevations typically less than 100 feet above mean sea level (msl) (White 1970). Complete and rapid infiltration of runoff is characteristic of the drainage within this region. Lakes and wetlands are relatively infrequent. Sinkholes are quite numerous but tend to be small in area. Northward of the Coastal Lowlands is the Northern Highlands region, which is an upland area capped by relatively impermeable, clay-rich sediments with elevations typically greater than 150 feet above msl. The Northern Highlands are relatively flat and karst development is minor. Drainage in this region, in contrast with that of the Coastal Lowlands, is characterized by considerable surface water runoff and a more extensive development of lakes and wetlands (Champion and Upchurch 2003).

Between these two physiographic regions, about halfway between the headwaters of the Ichetucknee River and the town of Lake City in Columbia County, is a transitional zone containing an important karst feature known as the Cody Escarpment, familiarly known as the Cody Scarp (Puri and Vernon 1964). This escarpment is one of many analogous geologic features located in the northern half of the state that share similar geological, geomorphic and hydrological characteristics (Upchurch 2002). The Cody Scarp has an abundance of sinkholes, sinkhole lakes and sinking streams (swallets), topographic features that profoundly affect the hydrology of the region. Elevations along the section of scarp that lies northeast of the Ichetucknee River typically range between 100 and 150 feet above msl.

The Ichetucknee Trace is a topographic anomaly of a former stream valley of the Ichetucknee River created as erosion processes shaped the retreat of the Cody Scarp (Champion and Upchurch 2003). The Trace stretches north/northeast from the Ichetucknee River to the Lake City area, which is located in the southern portion of the Northern Highlands. Elevations within the Trace typically range from 50 to 70 feet above msl. Recent acquisition efforts in the Ichetucknee Trace region have resulted in the addition of several important parcels to the park, including the McCormick Sink, Rose Sink, and Saylor Sink properties. Each of these parcels contains portions of the ancient riverbed as well as sinkhole lakes (karst windows) that open into extensive subterranean water conduits running beneath the Trace. These conduits are hydrologically linked with the Ichetucknee Springs system.

Elevations within Ichetucknee Springs State Park range from less than 20 feet (msl) along the river floodplain to over 85 feet (msl) on the McCormick parcel that lies northeast of the main park (see Topographic Map). Slopes are gradual in some areas, abrupt in others. Limestone outcrops are common, particularly along the 16 upper edge of the floodplain and along much of the riverbank. Noticeable alterations of the natural landscape include roads and firebreaks; multiple historic phosphate pits and settling ponds; old tram beds; and a long disused borrow pit in the southwest corner of the park.

The phosphate mining operations at Ichetucknee Springs, which occurred in two phases, had a major effect on the topographic features of the park. In the first phase, during the phosphate boom era of the late 1800s and early 1900s, the Dutton Phosphate Company opened the majority of the phosphate pits on the property and extracted hard rock phosphate. Most of the extraction was accomplished by hand and the ore was transported to Fort White or High Springs via narrow gauge rail cars on the numerous tram roads that were constructed in the region (Doig 1992). Although Loncala Phosphate, Inc. acquired the property in the 1920s, it did not mine additional phosphate until the 1950s, when the company reopened the old pits and scraped them to reclaim colloidal phosphate residues. It was at this time that the settling or “slime” ponds were constructed (Doig 1992).

SOILS

Fifteen soil types are mapped within the Columbia County portion of the park (Howell 1984) and four types are mapped within the Suwannee County portion (Houston 1965). A different soil numbering system was used in each county, so it may appear that the soil type on one side of the county line is different from that just across the line, when in fact they may be the same (see Soils Map). Park soils range from excessively well drained sands in the sandhills to poorly drained mine tailings adjacent to phosphate pits and poorly drained alluvial soils in floodplain areas. Detailed soil descriptions are contained in Appendix.

Historical soil disturbances at the park are primarily restricted to phosphate mining areas and include many deep mine pits and several elevated tram roads. Agricultural fields once covered large areas in the McCormick Sink and Saylor Sink parcels.

More recently, foot traffic from recreational users has had an impact on the park. Many of the park's limestone bluffs, particularly those at the river's edge, have been elaborately sculpted by flowing water and upland runoff. Recreational users of the river have discovered that some of these bluffs, as at Devil's Den, may be attractive resting areas. Unfortunately, the resulting foot traffic causes increased erosion of the bluffs and may damage the delicate limestone formations. Foot traffic also damages vegetation that clings to the calcareous soils of the unstable bluffs. Management activities in the park will follow generally accepted best management practices to prevent further soil erosion and conserve soil and water resources on site.

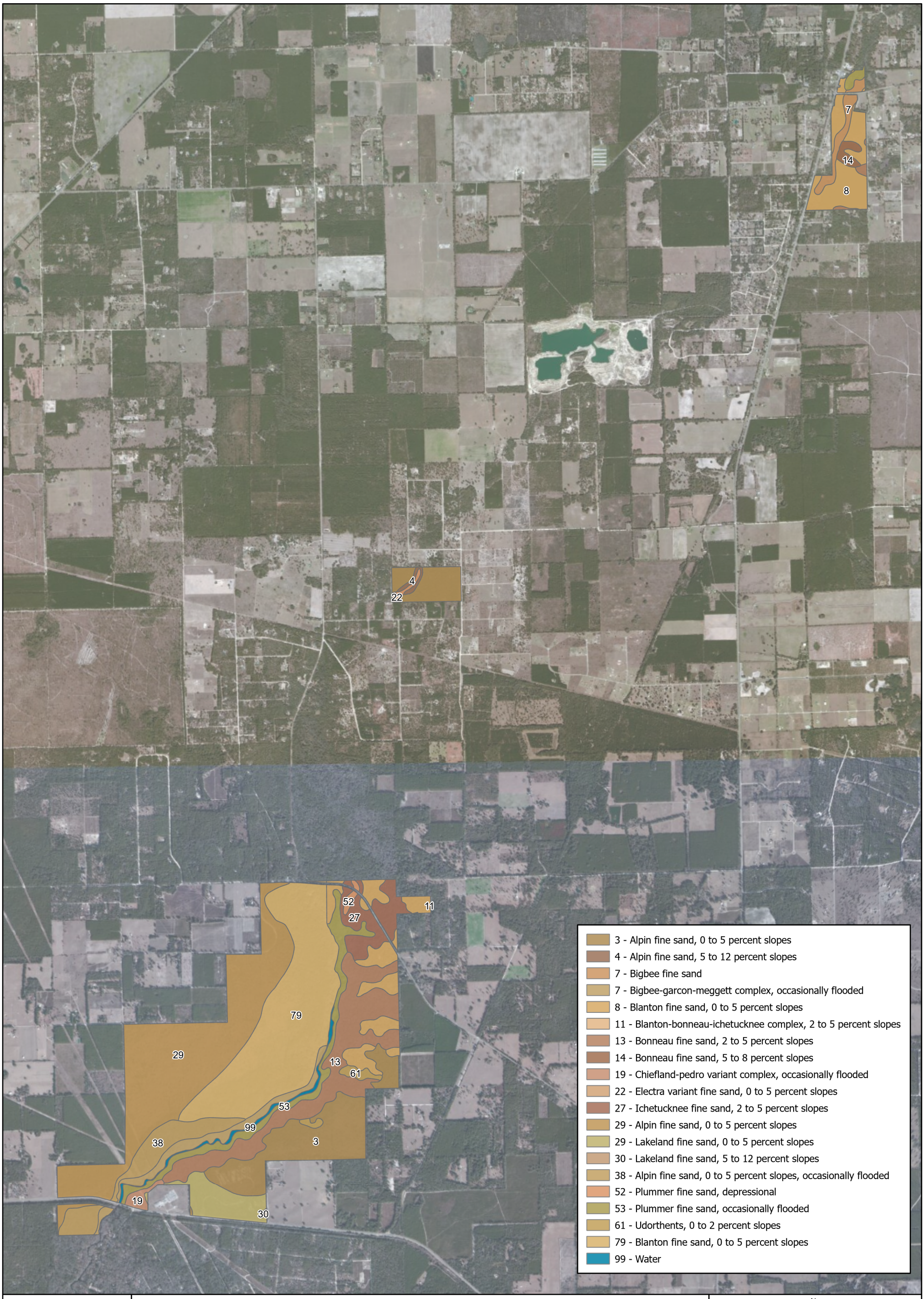
HYDROLOGY

Ichetucknee Springshed and its Major Springs

The Ichetucknee River watershed, measuring approximately 200 square miles, is a hydrologic unit of the Santa Fe River watershed (Champion and Upchurch 2003; Hunn and Slack 1983; Fernald and Purdum 1998). The Ichetucknee Springs groundwater basin is a recently delineated, subsurface hydrologic feature that covers up to 400 square miles (Sepulveda et al., 2006; Wetland Solutions Inc. 2010). Together, the surface watershed and groundwater basin make up the Ichetucknee springshed. Hydrologists have assigned a 900-square mile study area within central and southern Columbia County and eastern Suwannee County as being important for the understanding of the entire Ichetucknee springshed. Smaller portions of the Ichetucknee springshed extend into western Baker County and northwestern Union County.

The regional karst feature that defines surface and groundwater geologic, geomorphic and hydrologic characteristics of this springshed is the Cody Escarpment (Puri and Vernon 1964; Upchurch and Champion 2002; Upchurch 2002; White 1970). The Cody Scarp within the Ichetucknee springshed contains numerous karst-dominated features such as sinkholes, swallets and sinking streams (Means and Scott 2005; Copeland 2003). A large portion of the surface runoff from the Northern Highlands drains across the Cody Scarp and becomes groundwater as it rapidly infiltrates subsurface limestone conduits of the Upper Floridan aquifer.

ICHETUCKNEE SPRINGS STATE PARK
Soils



N

0 0.5 1 Mile

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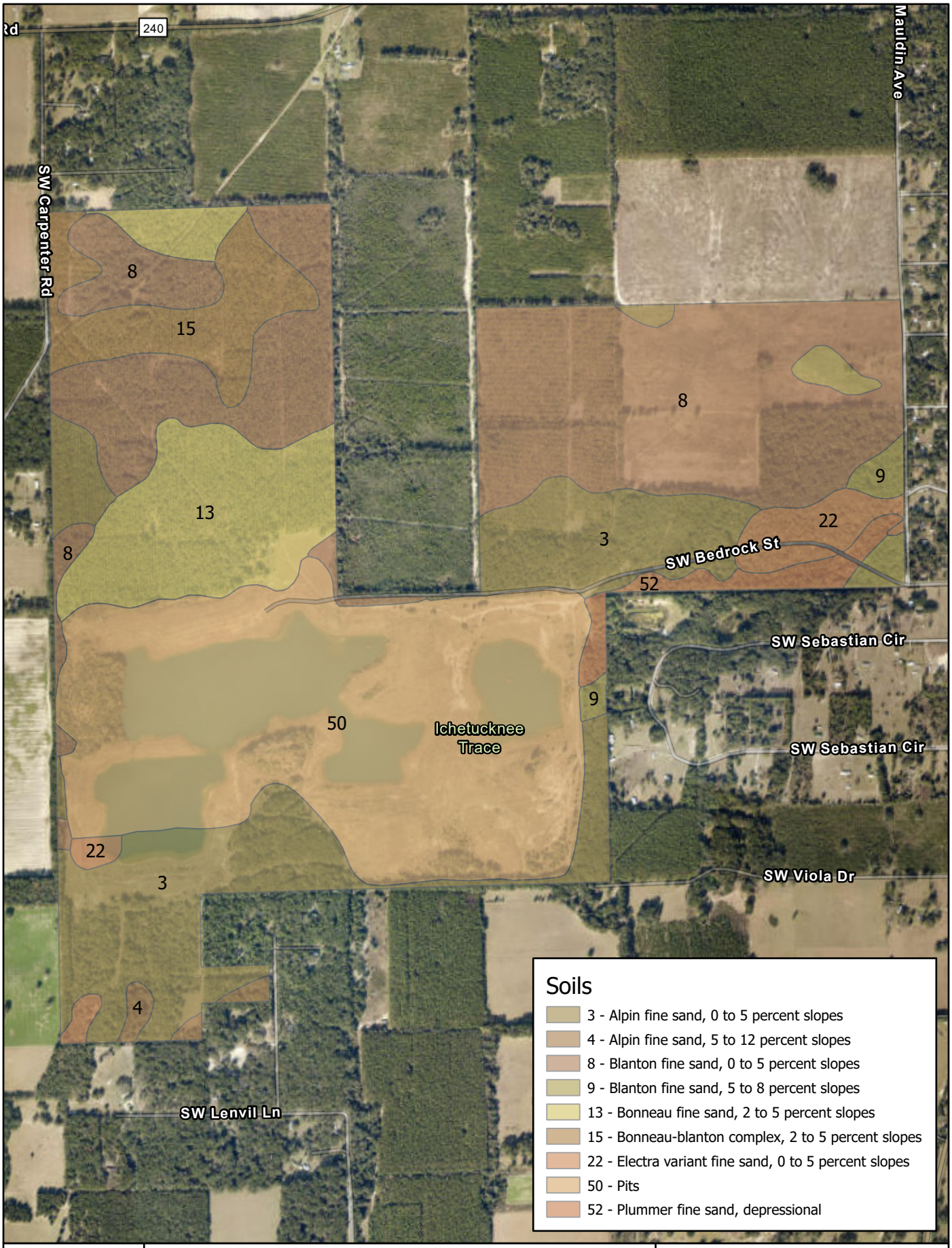

ICHETUCKNEE TRACE
Soils

N

0 1,000 2,000 Feet

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Groundwater within the Ichetucknee springshed moves through a complex matrix of disjointed, and sometimes linked, underground conduits that may return the water to the surface through springs along the Ichetucknee River (Martin and Screaton 2001). Dye trace studies have revealed that surface runoff in the Ichetucknee springshed often moves very rapidly from inputs at these surface karst features to exit points at springs (Karst Environmental Services 1997; Butt and Murphy 2003).

The northern limit of the Ichetucknee springshed is the southwestern portion of Osceola National Forest, while the southernmost extent is the mouth of the Ichetucknee River where it meets the Santa Fe River. In the Osceola Forest region of the springshed, many small cypress and bay-dominated wetlands exist at 98 to 190 feet above mean sea level. These wetlands drain to the west via tributaries of the Suwannee River and to the southwest by sinking streams that disappear in sinkholes or swallets.

The most developed portion of the Ichetucknee springshed, the city of Lake City, is also located in the northern extent. One of the most prominent surface water features in Lake City is Alligator Lake, which is part of a headwaters area that has direct connections to Ichetucknee Springs and therefore plays a crucial role in water quality issues for the springs. Previous studies have documented that eutrophic discharge plumes within the surficial aquifer may extend several miles beyond Alligator Lake. These plumes have the potential to infiltrate underground conduits that eventually connect with Ichetucknee Springs. Dye trace studies have shown that groundwater can travel up to a mile each day in the Ichetucknee basin (Champion and Upchurch 2003). In addition to Alligator Lake, several sinking streams, including Rose Creek, drain upland surface waters as they cross the Cody Scarp.

Ichetucknee Trace

The Ichetucknee Trace is a meandering surface landscape feature that follows lower elevation topographic contours extending between Lake City and the Ichetucknee River. The Ichetucknee Trace encompasses an area of active karst solution and contains multiple, highly intermittent sinking streams whose flow can go underground and mix with the Upper Floridan aquifer (Upchurch and Champion 2004). During extreme flooding events when the volume of water entering the sinking streams exceeds their capacity, the excess water begins to flow overland and may even flood this normally dry surface feature along its entire length (Champion and Upchurch 2003). This type of flood event happened historically in the Ichetucknee Trace, with the most recent occurrence in September 2004 following Hurricane Frances. Hydrological evidence now indicates that the Ichetucknee Trace delineates a former stream valley of a once considerably longer Ichetucknee River, and that it has a complicated underground conduit system with surface and groundwater connections (Martin and Screaton 2001; Champion and Upchurch 2003). Additional evidence, according to Milanich and Hudson (1993), is an 1829 regional map that depicts the Ichetucknee Trace as a former river valley. Underground conduit systems throughout the Ichetucknee Trace may connect directly to various individual springs in the Ichetucknee system (Skiles et al. 1991; Hirth 1995; Karst Environmental Services 1997; Gordon 1998; Butt and Murphy 2003; Butt 2005). The complex mixing of surface water and groundwater of various ages within the Ichetucknee River watershed tends to complicate assessments of spring ecosystem health and vulnerabilities (Katz and Hornsby 1998; Katz et al., 1999).

Since approval of the last unit management plan in 2000, the state has made considerable progress in acquiring key parcels within the Ichetucknee Trace. Four significant parcel purchases include Rose Sink, McCormick Sink and Anderson Kirby Limerock Mine near the Columbia City area, and Saylor Sink about 2 miles north of the Ichetucknee headspring. DRP manages all four as part of Ichetucknee Springs State Park.

The Rose Sink cave system includes two distinct surface water features located at the northeast corner of the intersection of County Roads 47 and 240, Rose Sink and Rose Creek Swallet (Butt and Murphy 2003). Rose Creek Swallet is a sinking point of Rose Creek, which is an intermittent stream that ceases to flow during periods of low rainfall. During normal flows, the swallet captures the entire stream, which generally drains an area southeast of Lake City. During periods of flooding, however, both Rose Creek Swallet and Rose Sink capture the flow of the creek. In essence, Rose Sink receives excess flow that the swallet cannot handle. Overflow swallets such as these are sometimes called midway swallets, and they occur along the entire length of the Ichetucknee Trace. Significant midway swallets in this region include Cannon, Clay Hole, Black, Dyal, Rose Creek, McCormick, Corbitt and Saylor (Wes Skiles, Karst Environmental Services, personal communication).

Rose Creek Swallet, which lies roughly 200 feet northeast of Rose Sink, is currently the furthest upstream point in the Rose Creek cave system. The swallet is a circular cave, about 10 feet in diameter, with a maximum depth of 50 feet. Rose Sink is also circular with a diameter of about 75 feet. It initially deepens to about 20 feet, but later stair-steps down to a maximum depth of 144 feet. Most of the cave is about 140 feet deep. The main entrance to the system, located in a cave wall downstream from Rose Sink, is huge at 26 feet tall and 66 feet wide. About 700 feet downstream, however, the cave passage shrinks dramatically as it becomes a small bedding plane with intersecting joints. Several groundwater vents are in the western wall of Rose Sink. These account for the sink's flow when Rose Creek is dry.

Rose Creek Swallet and Rose Sink are linked via a small passage named Swallet Tunnel, which connects to the main cave system approximately 70 feet southeast of the main cave entrance. Swallet Tunnel is a 10-foot diameter horizontal passage, about 300 feet long and 50 feet deep. It is largely free of sediments due to regular high velocity flows. However, the upstream section nearest the swallet does contain significant amounts of visible bacteria (Butt and Murphy 2003). A number of cave-diving researchers, including Amy Gionnotti of the Cambrian Foundation, are currently investigating this phenomenon (Amy Gionnotti, personal communication). Periodically, organic debris (tree limbs and leaves) and manmade trash appear in the Swallet Tunnel, a result of upstream displacement during heavy rainfall episodes.

The Rose Creek cave system has an abundance of detritus, and organic silt nearly covers the entire cave floor. The abundant supply of organics appears to support a robust troglobite fauna. Voucher specimens of pallid cave crayfish (*Procambarus pallidus*) have been collected from this cave and are contained in the collection of the U.S. National Museum. In September 2002, divers observed a single spider cave crayfish (*Troglocambarus maclanei*) at a depth of 140 feet near the mouth of the downstream feeder to this cave. This represents a significant range extension for the species. Divers have also reported a number of isopods and amphipods from this site (Franz 1994; Kelly Jessop, National Speleological Society Cave Diving Section, personal communication). Notably, water quality conditions in the Rose Creek cave system can vary significantly and temporally. The variations may be directly dependent on weather-driven fluctuations in the intermittent creek that feeds the cave (Morris 2003). Not surprisingly, cave divers have documented small scale, abbreviated die-offs of troglobites following significant storm events (Morris 2003; Kelly Jessop, personal communication). Cave divers began conducting quarterly surveys for troglobites in the Rose Creek system in 2008.

In 2006, DRP coordinated with the Florida Department of Transportation (FDOT) to obtain an easement to install a retention pond upslope of Rose Sink to improve the water quality of local runoff entering the Ichetucknee Trace cave system via the sink. In addition, and subsequent to this action, volunteers from the Ichetucknee Springs Basin Working Group installed a fence/grate across Rose Creek upstream of the

swallet to catch debris before it enters the cave system. Several cleanups involving volunteer cave divers have also occurred in the Rose Creek system (Jerry Murphy, personal communication).

McCormick Sink is the primary hydrogeological feature of interest on the McCormick parcel, a 156-acre partially forested tract immediately south of County Road 240 and the Rose Sink parcel. Besides McCormick Sink (also known as Church Bell Sink or Rose Creek Swallet Overflow Cave), there are three unnamed surface depressions on the property (J. Murphy, personal communication). Of the four features, only two usually hold water to any extent. The northernmost sinkhole on the tract (Sinkhole 1) only has exposed limestone at its bottom (J. Murphy, personal communication). The easternmost sinkhole (Sinkhole 2) has somewhat of a cavernous limestone outcropping at its surface, and it periodically holds water. Sinkhole 3 is a slumped depression southwest of Sinkhole 2 that has no limestone outcrops. McCormick Sink, the westernmost sinkhole, is a karst window and is the only actively researched sink on the property. McCormick Sink is located along the Ichetucknee Trace about 3,000 feet south of Rose Sink. It is a former swallet of Rose Creek, but it now receives creek flow only during extreme flood events when Rose Creek spills over County Road 240. The entrance to the cave is small and silted. The cave passage extends laterally approximately 1,000 feet before stepping down to a maximum depth of 145 feet. In March 2009, divers excitedly confirmed for the first time the connection between the main water source of McCormick and the “downstream section” of the Rose Sink cave system (Murphy 2009). The McCormick cave system has a relatively stronger flow than the Rose system, causing McCormick to have more of a sand floor rather than silt/clay. During the 2003 troglobite survey, cave divers found no evidence of a die-off in this cave system, suggesting that McCormick may have some groundwater sources other than Rose Creek (Morris 2003). Nonetheless, cave fauna in this system resembles that of Rose Sink Cave.

The Anderson Kirby Limerock Mine was primarily brought into state management to protect the Ichetucknee springshed from any further contamination potential. The previously mined site contains four large water-filled pits and some smaller pits resulting from mining operations. The water-filled pits reportedly extend as deep as 80 feet below surface level. The Florida Geological Survey (FGS) conducted a bathymetric survey of the largest (northwestern) pit in July 2003 (FGS, 2003). Average depth was 33 feet, and a depth of 45 feet was recorded for the northwest corner of the pit. The U.S. Geological Survey (USGS) 1:24,000 topographic maps depict the presence of a once-small stream present prior to mining operations. A borrow pit and small pond associated with the stream remain to the east of the mine site.

Because of the potential contamination of the site from previous mining activities, the site underwent several water quality monitoring initiatives that were implemented prior to the state’s final purchase, some of which continue today. DEP conducted a water quality baseline assessment of the open water mine pits (DEP Chemistry Section, 1996). Groundwater monitoring wells and soil contamination assessments were also completed on the property (Murray and Newton, 2003). From multiple assessments, the Anderson Kirby mine site had very few significant soil, ground or surface water contamination issues.

Saylor Sink is the primary hydrologic feature on the Saylor parcel, an 80-acre forested tract located west of County Road 47 and about 1 mile southwest of the Anderson Kirby Limerock Mine. Other names for Saylor Sink include Boy Scout Sink and Troop Sink. Both the Kirby Mine and Saylor Sink are located within the southern part of the Ichetucknee Trace. This area of the Ichetucknee Trace is very distinct, with a well- defined and ravine-like topography, which is especially apparent in the western portion of the Saylor Sink parcel.

Other than a few cave diving reports, very little information is available for Saylor Sink (Morris 2003). Some cave experts suggest that Saylor Sink may be a collapse sink, while others say it may have once functioned as a midway swallet along the Ichetucknee Trace. The entrance to Saylor Sink is a small solution chimney about 15 feet in diameter. Water depth in the sink is about 20 feet, but it fluctuates depending on the amount of regional rainfall. The cave is very short, no more than 100 feet long, and has a maximum depth of 30 feet. Divers entering the cave in March 2004 found abiotic conditions and a water temperature of 60 degrees F, which is atypically cold for groundwater (J. Murphy, personal communication). Other researchers have found similar conditions in the sink, suggesting that there may be little in the way of groundwater exchange between the cave and the surrounding area (Morris 2003). There is a small conduit in the back of the cave, but, in general, divers have observed that water in the cave is green, tannic, and has no significant flow other than the small amount of "blue water" that enters from the ceiling. Some have also suggested that a naturally occurring "sediment plug" may have caused an impermeable layer of organic silt to block water exchange between the surface and the aquifer, which typically occurs in cycles within intermittent sinking stream systems (W. Skiles, personal communication). If that is so, it may indicate that Saylor Sink is directly connected to underground conduit systems and is thereby linked to springs along the Ichetucknee River (Butt and Murphy, 2003).

In 2003, researchers documented an Alachua light-fleeing cave crayfish (*Procambarus lucifugus*) in the Saylor Sink cave system, which represents a large range extension to the north for this species and the first on record for Columbia County (Morris 2003). The Santa Fe cave crayfish (*Procambarus erythrops*) is also known from this location (FWC 2013).

Ichetucknee Springs Group

Water from the many streams, swallets and sinkhole lakes located along the Ichetucknee Trace, and from the associated underground conduit system within the Upper Floridan aquifer, resurfaces just northwest of Fort White to form the Ichetucknee Springs Group. This "springs group" lies wholly within the boundaries of Ichetucknee Springs State Park and provides the base flow for the Ichetucknee River (Scott et al., 2004). The park contains a 3.5-mile stretch of the Ichetucknee River, a bit more than half the total length. Biologists have often divided the park's portion of the river into three distinct regions: Headspring Reach, Rice Marsh Reach and Floodplain Reach (Dutoit 1979). Immediately downstream from the park, the character of the river changes again, with the most significant difference being the addition of numerous shallow-water limestone shoals.

The Ichetucknee Springs Group contains 11 named and numerous unnamed springs and seepages (Hornsby and Ceryak 1998; Scott et al., 2004; Butt and Murphy 2003; Butt 2005). Starting at the head of the river and proceeding downstream, the named springs include Ichetucknee Headspring, Cedar Headspring, Blue Hole Spring, Mission Springs Complex (a total of eight known springs including Roaring, Singing, Fig and Timucua springs), Devil's Eye Spring, Grassy Hole Spring, Mill Pond Spring and Coffee Spring.

Ichetucknee headspring forms a 75-by-105-foot pool. This second-magnitude spring is the first major source of the Ichetucknee River. Prior to the establishment of Ichetucknee Springs State Park, this spring had received very little protection from erosion and overuse. The result was that, over the years, severe sediment deposition had slowly decreased the pool's depth to 14 feet at the main vent.

Historically, the spring had been substantially deeper. A restoration project, started in 1994, has since increased the depth of the main vent to about 30 feet. Materials removed from the spring have included

46 cubic yards of concrete, some rubble, scrap metal, 266 gallons of trash and 3,000 gallons of soil sediments. A small seep discharges to the spring from the west edge of the main pool.

Cedar Head Spring, also called Alligator Hole, is a more isolated spring located approximately 1,000 feet southeast of the Ichetucknee headspring. It forms a pool measuring 30 feet by 60 feet. This second-magnitude spring discharges to a 1,100-foot run that flows south toward Blue Hole Spring. Access to Cedar Head Spring is limited to authorized researchers.

Blue Hole Spring, also known as Blue Jug, discharges to a short run which joins the east side of the main stem of the river about 1,800 feet below Ichetucknee headspring. This spring is one of only two first magnitude springs among the 10 named springs that feed the Ichetucknee. Blue Hole Spring forms a pool about 85 feet by 125 feet in size. About 7 feet below the surface of the pool is a powerfully flowing spring vent. The cavern associated with the vent is 40 feet deep and extends horizontally into a complex cave system. The park has traditionally allowed only divers who possess cave certification to access Blue Hole, but cave divers may also access the main chamber. This is the only spring in the park where recreational cave diving is allowed. Divers call it “The Jug” because of its unique shape. Water that flows out of Blue Hole Spring passes through the narrow neck of the jug. Cave divers have been conducting quarterly troglobite surveys in the Blue Hole Spring cave system since 2004.

Mission Springs Complex is composed of eight separate springs, three of which contribute the majority of the discharge for this group: Roaring, Singing and Fig springs. This spring complex is located on the east side of the Ichetucknee River about 1,500 feet south of Blue Hole Spring. The combined discharges of this spring complex make it a first-magnitude spring group that produces the second-largest outflow along the river. Roaring Spring, which discharges from the north side of Fig Island, is the largest of the complex. Singing Spring is located on the south side of Fig Island. Additional smaller springs and seeps flow from the base of an exposed limestone formation along the east shoreline about 250 feet from the river, where the topography rises dramatically. Another significant vent in this group, Timucua Spring, discharges from the bottom of the Singing spring run near its mouth at the main stem of the river. Timucua Spring was named in 2023. Discharge from the three major springs in this complex has created two separate spring runs that flow on opposite sides of Fig Island. The Mission Springs Complex is the second major spring on the river (see below) where native submerged aquatic vegetation (SAV) has experienced significant die-off stress since 2002. According to staff at Ichetucknee Springs State Park, large areas of SAV at the Mission Springs Complex had suffered significant die-offs by 2005, similar to the Devil’s Eye scenario (Sam Cole, personal communication). The cause of the die-offs is unknown, but experts suspect increased levels of nuisance algae (algae can also be referred to as periphyton) in the springs, water quality issues within the springshed, and reduced groundwater flow (DEP 2006; Hand 2006; Stevenson et al. 2007; Grubbs and Crandall 2007).

Devil’s Eye Spring, also called Boiling Spring, is located about 850 feet south of the Mission Springs Group. This second magnitude spring is comprised of two large vents that discharge within a 60 by 120-foot pool with a short 30 foot run that empties into the main stem of the river. Smaller secondary vents occur in the slough on the north side of the spring pool. This is the first spring on the river to have experienced a major die-off of native SAV, beginning in 2000. As recently as 1997, research had indicated that 80% of the Devil’s Eye spring-run bottom had characteristically high plant diversity with no visible signs of stress. In 2023 by comparison, 23 years after the initial indications of severe vegetation die-off, the percentage of damaged or dead SAV at Devil’s Eye remained significantly high. At the worst stage of the die-off, SAV in the entire Devil’s Eye complex were completely absent (100% die-off), including the slough area to the north of the boil (Sam Cole, personal communication).

Vegetation along the west shoreline of the river for a distance of about 100 feet below the mouth of the Devil's Eye spring run also suffered severe losses. There have been periods of recovery during the past fifteen years, but as of 2023 most of the recovery is restricted to the lower part of the spring run and the adjacent main stem. The exact cause of the die-off is still unknown, but recent research has pointed specifically to water quality issues in the Ichetucknee groundwater basin, reduced redox potential in the sediments, increased periphyton levels in the springs (i.e., decreased light transmittance to plants), and potentially long-term groundwater flow reductions (DEP 2006; Hand 2006; Grubbs and Crandall 2007; Heffernan et al. 2010; Cohen et.al. 2016; McBride and Cohen 2020).

Grassy Hole Spring is a series of several small shallow vents that discharge into a 200-foot spring run which flows into the east side of the Ichetucknee River about 1,350 feet downstream from Devil's Eye Spring. Collectively, the vents at this spring produce a second-magnitude discharge.

Mill Pond, a second magnitude spring, is located about 800 feet downstream from Grassy Hole Spring on the east side of the river. It vents into a 50-by-100-foot shallow pool at the head of a 500-foot spring run that empties into the mainstream. An historic gristmill once existed at the site, harnessing power generated by the spring boil, hence the name given to the spring.

Coffee Spring is the last-named spring to discharge into the Ichetucknee River. This third-magnitude spring is located about 1 mile downstream from Mill Pond Spring, but on the west side of the river. This is the only spring in the Ichetucknee watershed where the critically imperiled and endemic Ichetucknee siltsnail (*Floridobia mica*) occurs. According to Fred Thompson, former invertebrates curator at the Florida Museum of Natural History, there is evidence of a population decline in this species based on early surveys from 1989 to early 2002 (District 2 files; Fred Thompson, personal communication). FWC biologists conducted the first quantitative population assessment in November 2015 (Warren and Bernatis 2015). The siltsnail was moderately abundant but had an extremely clumped distribution within the spring run. A collection of another rare gastropod, *Elimia albanyensis*, was reported from Coffee Springs in 2000, but this report has not been adequately verified and needs further investigation (Florida Natural Areas Inventory (FNAI) element occurrence records).

Groundwater discharge at this spring emerges from the base of an elaborate rock outcropping about 30 to 50 feet from the main stream. To protect the sensitive nature of this seepage community, DRP in 1989 installed a fence along the main stream that prevents human access to the spring from the river. Coffee Spring is the only named spring in the Ichetucknee River that past dye trace studies have failed to define its groundwater source within the springshed.

Additional unknown or unnamed springs and seepages that occur along the riverbank and on the bottom of the Ichetucknee River can contribute up to 19% of the total river flow.

Ichetucknee Springshed

Flooding is a watershed level process that seldom receives adequate consideration during studies of river hydrology. The relationship between downstream flooding in a major river and upstream back flooding in its tributaries is especially important (Pringle 1997; Diehl 2000; Garza and Mirti 2003). In the case of the Ichetucknee River, back-flooding occurs periodically when hydrologic conditions in the Santa Fe River downstream from the Ichetucknee cause a reduction in outflow from the Ichetucknee into the Santa Fe. The back-flooding can occur under at least two different scenarios: 1) when the flow of the

Santa Fe generated within its own watershed is high enough to reach flood stage, and 2) when the Suwannee River is at flood stage, causing its Santa Fe tributary to back-flood. Under both circumstances, a specific resistance of the Santa Fe to flow entering from the Ichetucknee occurs at the confluence of the two rivers. The full flow of the Ichetucknee is unable to penetrate the Santa Fe, and back-flooding of the Ichetucknee results.

Alluvial forest, floodplain marsh, and floodplain swamp benefit from ephemeral back-flooding. These floodplain communities are highly dependent on the ephemeral nature of this flooding regime. If the back-flooding did not occur periodically, major changes in the soils and species compositions of these communities would ensue. Alteration of the back-flooding regime on the Ichetucknee River, especially in conjunction with reductions in base flow of springs along the river, could cause significant changes in the character of these wetland communities (Light et al. 2002; Sepulveda 2002).

Another very prominent ecosystem process occurring in the Ichetucknee springshed is the movement of contaminants and nutrients through surface and ground waters within the basin (Katz and Hornsby 1998; Heffernan et al. 2010). The Ichetucknee springshed is a sub-basin of the Santa Fe River, which ultimately flows into the Suwannee River. The entire Suwannee River watershed drains approximately 10,000 square miles in Florida and Georgia. The Suwannee has an average flow of 7,100 million gallons per day that ultimately discharges into the Gulf of Mexico. Hydrologists have been measuring total nutrient loads dumped into the Gulf of Mexico via the Suwannee River for the past 50 years (Berndt et al. 1998; Hand et al. 1996; Kenner et al. 1991; Ham and Hatzell 1996; Pittman et al. 1997). Nitrogen and phosphorus are the two most common nutrient pollutants that regulate nuisance algae growth in marine and freshwater ecosystems (Stevenson et al. 2007). Excessive nitrogen, specifically in its nitrate form (NO3), is partially responsible for the creation of unhealthy, polluted aquatic ecosystems worldwide (Quinlan 2003; Upchurch et al. 2007). As illustrated in the table below, the Santa Fe River watershed contributes a significant proportion of the yearly nitrate-nitrogen (NO3) input to the Suwannee system.

Total % contribution per year (NO_3)							
	Suwannee River Sections and Tributaries						
Area (mi^2)	**Upper 2873**	**Middle 824**	**Lower 686**	**Alapaha 1801**	**Withlacoochee 2382**	**SantaFe 1184**	**Ichetuckne e 200**
%Coverage Year	**28.80%**	**8.30%**	**6.90%**	**18.10%**	**23.90%**	**11.90%**	**2.01%**
1998	18.1	46.0	2.4	3.0	13.1	16.8	1.9*
1999	10.8	47.0	5.2	4.0	11.9	21.2	1.9*
2000	14.0	36.0	3.0	6.0	11.0	22.6	7.4
2001	2.8	45.5	2.8	12.8	20.2	23.0	4.3
2002	7.2	29.3	31.4	3.6	8.9	19.7	2.5
2003	0.8	34.4	14.4	12.2	23.8	16.2	1.9
2004	3.6	34.7	19.2	9.7	18.6	21.5	2.4
2005	13.5	28.9	16.1	2.4	19.4	19.6	2.5
Mean total	8.9	37.7	20.3	6.7	15.9	20.1	3.5

*low estimate

In fact, the Santa Fe watershed rivals two other upstream Suwannee River sections in terms of total yearly input of nitrogen into the Suwannee system (District 2 files). The middle section is located in the

central region of the Suwannee River, with over 95% of its area situated in Suwannee and Lafayette counties (Mirti et al. 2006). This section is also an area of significant karst topography and, similar to the Ichetucknee, is predominantly influenced by groundwater during times of low flows. The Ichetucknee basin's average contribution of NO3 to the Suwannee appears to be about 3.5% of the total.

Nutrient loading from the Suwannee into the Gulf of Mexico over an eight-year period from 1998 to 2005 totaled nearly 40,000 tons of nitrogen and 11,000 tons of phosphorus (table below). The Ichetucknee basin contributed just less than 3% of the total nitrogen (also 3% of the total phosphorus) dumped into the Gulf of Mexico via the Suwannee watershed every year (Suwannee River Water Management District (SRWMD) data; Hornsby and Ceryak 1998). In the majority of Florida's springs, including Ichetucknee Springs, increased nitrogen and phosphorus levels are now recognized as a significant driving force behind large-scale nuisance algae blooms (Stevenson et al. 2007; Heffernan et al. 2010). Periphyton growth in many Florida springs is now so rampant that SAV are being smothered and large-scale SAV die-offs have occurred (District 2 files; Wetland Solutions Inc. 2010).

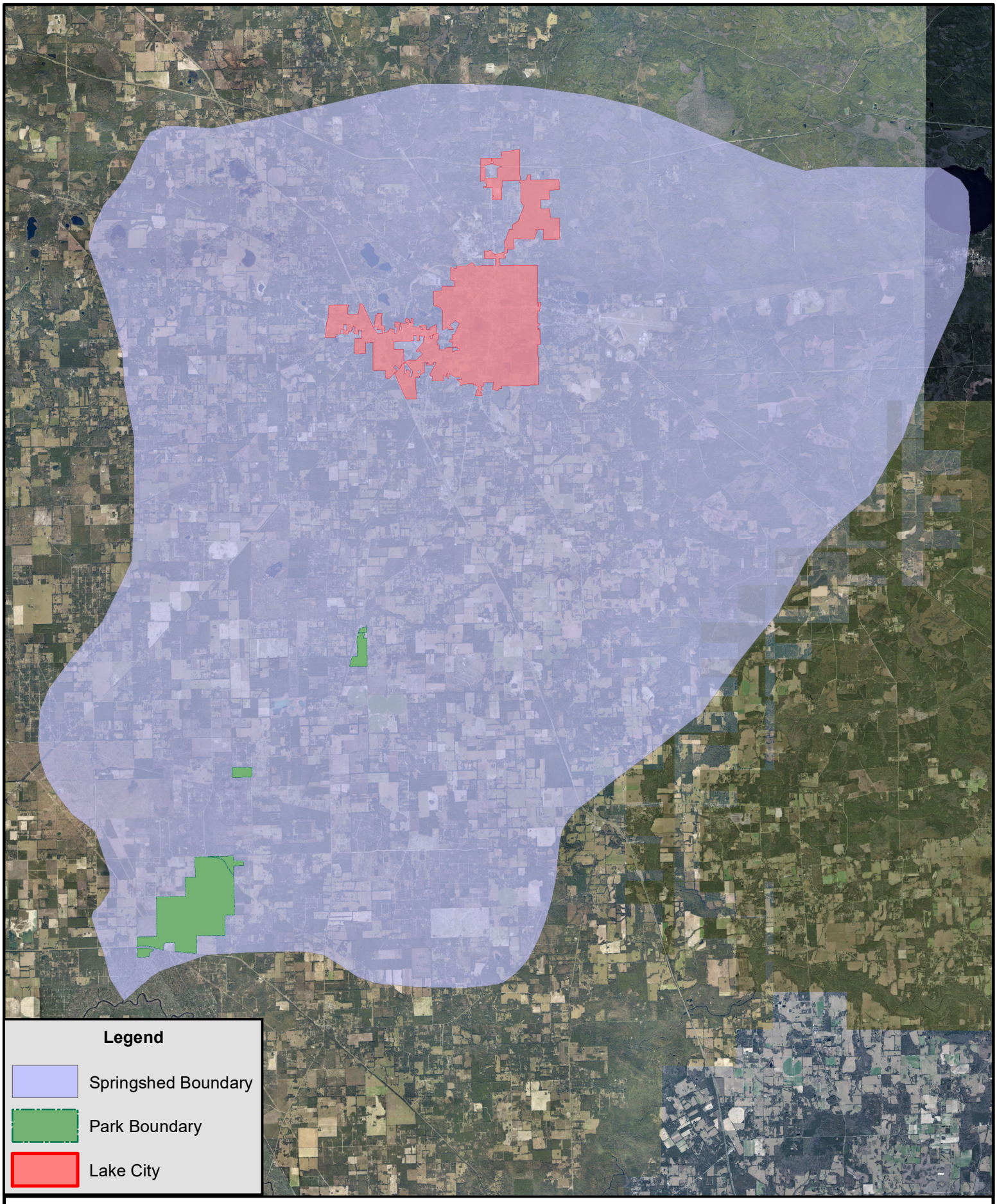
Total Nutrient Loading into Gulf of Mexico (tons/year)

	Suwannee Basin		Santa Fe		Ichetucknee	
	N	**P**	**N**	**P**	**N**	**P**
1998	7113*	1955*	1196	240	85*	60*
1999	4745*	693*	1004	109	85*	60*
2000	2676	493	593	47	193	18
2001	3067	909	689	68	128	14
2002	3012	829	584	68	73	11
2003	4591	1910	726	241	85	60
2004	5507	1309	1143	188	129	36
2005	7040	2939	1358	369	172	59
Total	37751	11037	7293	1330	950	318

* low estimate

One significant outcome of the nutrient loading research conducted in recent years is that numerous government agencies and researchers have finally begun to recognize the need for a greater understanding of water budgets and nutrient cycles as they apply to smaller but equally important watersheds such as the Ichetucknee. During the period from 1990-2016, DRP issued over 110 permits for research/monitoring projects targeting water resources within the Ichetucknee basin (District 2 files). The diverse projects have included exploration of aquatic caves, investigation of aboveground and belowground hydrogeologic connections, evaluation of surface and groundwater quality and quantity, assessment of economic impacts, evaluation of recreational carrying capacity numbers, and assessment of ecosystem health, among others.

Application of the broad spectrum of knowledge gained from these endeavors will be integral to the successful separation of natural and anthropogenic sources when assessing impacts to natural communities within this springshed system.



ICHETUCKNEE SPRINGS
STATE PARK

N

0 0.75 1.5 3 Miles

Florida Department of Environmental Protection
Division of Recreation and Parks
Date of aerial; 2016

ICHETUCKNEE SPRINGS
SPRINGSHED BOUNDARY

Water Monitoring

Concerns about the future water quality of the Ichetucknee River led to the formation of the Ichetucknee Springs Basin Working Group (IWG) in 1995. DEP funding for this and several other springshed stakeholder groups ended in 2011. As of 2016, the Santa Fe River Springs Basin Working Group was the only remaining springs stakeholder group in Florida and is led by the Alachua County Environmental Protection Department (ACEPD 2016).

The IWG was composed of numerous stakeholders, including federal, state, regional and local agencies that have responsibilities in, or knowledge about, the Ichetucknee basin. Other regular members of this group included local citizens, private landowners, educators, businesses and conservation organizations. The IWG gathered information about the Ichetucknee system using past studies, new research and interviews to help to recognize and define water quality and quantity threats. The success of this north central Florida group and of the Wakulla Springs Working Group in north Florida led to their use as models for the establishment of several other working groups in the region.

The IWG played an integral role in coordinating work such as dye trace studies that provided direct evidence of connections between surface and groundwater features in the Ichetucknee Trace and springs along the Ichetucknee River (Skiles et al. 1991; Hirth 1995). The IWG achieved several significant accomplishments during its existence. The group played a very active role in the education of local communities by bringing people together to cooperatively find solutions to water issues as they cropped up. The city of Lake City's efforts to improve Alligator Lake serves as a good example of the type of success attributable to the group's endeavors (Kays 2005).

State and federal agencies have sporadically collected water quality and water level data for surface water and groundwater resources in the Ichetucknee River basin since 1917 (Rosenau et al. 1977; Strong 2004). From 1917 to the 1980s, the USGS was responsible for collecting river stage data at the Highway 27 bridge over the Ichetucknee River. Until the 1990s, hydrological data collection was infrequent and rarely published. In 1989, the Suwannee River Water Management District (SRWMD), with USGS assistance, began to better organize and coordinate specific data collection activities. In the 1990s, DEP embarked on a period of much greater involvement in surface and groundwater assessment by initially accumulating and analyzing all available datasets associated with required water quality assessments in Florida (Hand et al. 1990; FGS 1991).

As a lead agency for water resources, the SRWMD has increased its involvement in coordinating assessments of water quality and quantity and in supporting springs protection research over the past 20 years. It has also implemented an ambitious monitoring network for numerous water bodies within the district (McKinney et al. 2008). This network consists of stations at numerous rivers, lakes and springs, as well as at surface and groundwater wells. The sampling protocol includes measurement of water levels, discharge or flow rates and rainfall amounts, as well as several parameters that assess water quality. The SRWMD is also conducting trend analyses of current water quantity and quality conditions that are used in addressing future water supply needs (Suwannee River Hydrologic Observatory 1997; Upchurch et al. 2007). The data collected by the SRWMD primarily guides its decision-making process in issuing consumptive use permits and approving water supply projects, in watershed planning, and in managing district projects. It also aids in the development of state-mandated minimum flows and levels (MFLs) for water bodies throughout the district.

In 1996, with expanded efforts in 2000, DEP initiated its own statewide water-monitoring program (DEP 1996, DEP 2001, DEP 2005). Referred to as the Integrated Water Resource Monitoring Program, it has evolved from the initial efforts to become a mandate for implementing the requirements of the 1999 Florida Watershed Restoration Act and Section 303(d) of the federal Clean Water Act (Copeland et al. 1999; Maddox et al. 1992; DEP 2005). This program now offers a much broader, more comprehensive way of monitoring Florida's water resources, one that is based on natural hydrologic units and a holistic watershed approach. Accordingly, 52 hydrologic basins have been delineated in Florida, with a five-year rotating schedule that allows water resource issues to be addressed at different geographic scales (Livingston 2003). This watershed approach also provides a framework for implementing the Total Maximum Daily Load (TMDL) requirements necessary for restoring and protecting water quality in specific watersheds (Hallas and Magley 2008). Implementation of a Basin Management Action Plan (BMAP) is DEP's primary resource for addressing specific water issues and reducing the amount of water quality impacts through use of numeric nutrient criteria (DEP 2007; Grubbs 2001). All priorities for TMDL development in Florida follow strict adherence to verified priority waterbody lists reviewed by the U.S. Environmental Protection Agency (EPA 1995).

Important hydrological information collected, stored and managed by these agencies can now be accessed through a variety of web-based databases (FGS 2007; USGS 2016; DEP 2016a, DEP 2016b). A comprehensive assessment of existing hydrological data within the Ichetucknee springshed was summarized in two works: Ichetucknee Work Plan (Wetland Solutions Inc. 2006) and Ichetucknee Springs Ecosystem Study (Wetland Solutions Inc. 2010). The latter work was a two-year, synoptic, ecosystem-level study of Florida springs. The extended appendix in this work includes a summary of all existing physical, chemical and biological data for the Ichetucknee system. In addition, this group issued a science-based environmental health report card based on six parameters including spring discharge, water clarity, nitrate concentration, SAV, nuisance algae cover and visitor allergic reactions (Wetland Solutions Inc. 2008). The Ichetucknee received its lowest grades for persistent water quality issues associated with nitrate increases (the six-spring average in 2008 was 0.63 milligrams per liter) and for nuisance algae impairment (58% average nuisance algae cover at Blue Hole, Mission and Devil's Eye springs). In 2012, the Howard T. Odum Florida Springs Institute (FSI) developed a restoration plan for the Ichetucknee River and its spring ecosystems (FSI 2012a). The report uses best available science to provide a blueprint for ecosystem restoration of the Ichetucknee River and springs.

Water Quality, Quantity, and Spring Protection Areas

The Ichetucknee River is a crown jewel of the Florida State Parks system because of its relatively pristine nature and its classification as one of the 15 largest spring groups in the state (Stevenson and Rupert 2000; Scott et al. 2004). Despite a recent decline, the Ichetucknee remains a unique, highly buffered, alkaline spring ecosystem that owes its clarity to a direct groundwater connection with the Upper Floridan aquifer, which is typical of many other spring-fed streams in Florida (Whitford 1956; Bass and Cox 1985, Canfield and Hoyer 1988). Unfortunately, the health of this spring ecosystem has progressively deteriorated over the past 20 years, and it has begun to show signs of lasting impairment (Stevenson et al. 2007; Hallas and Magley 2008). This impairment is not unique to the Ichetucknee, however. Within the nearby middle Suwannee River, nutrient concentrations, particularly of nitrates, have steadily increased over the past 50 years (Ham and Hatzell 1996). Similarly, nitrates have increased in other springs across the state over the past 30 years (Hornsby and Ceryak 1998; Means et al. 2003). The middle Suwannee basin is similar to the Ichetucknee in that it lacks any major inputs from tributaries. Therefore, most contaminants in the water are attributable to groundwater discharged at the springs (Katz and Hornsby 1998). Both the middle Suwannee and the Ichetucknee rivers contain

nutrient loads that are relatively high for springs because of long-term groundwater nutrient contamination (Katz et al. 1999). Data indicates that specific land-use activities outside the park boundary are playing a significant role in the declining health of this spring ecosystem (Odum 1957a; Cohen et al. 2007).

Two significant anthropogenic factors that may have contributed to a decline in spring ecosystem health are increases in groundwater nutrient pollution and reductions in groundwater flow due to human withdrawals (Wetland Solutions Inc. 2010). Until 2000, these two factors seemed to be of relatively low extent in the Ichetucknee springshed and did not appear to pose a discernable threat to the Ichetucknee ecosystem. Subsequent to 2000, research has demonstrated that a complex relationship exists between increased groundwater nutrient levels and increased presence and abundance of nuisance algae within specific springs along the Ichetucknee (Stevenson et al. 2007). Nuisance algae increases have played a significant role in the declining health of the Ichetucknee River, as evidenced by two ongoing, persistent large-scale SAV die-offs (Sam Cole, personal communication; WSI 2008).

Before 2000, the main impact to the Ichetucknee occurred each summer as recreational users such as swimmers and tubers inadvertently uprooted or trampled significant amounts of SAV along the shallower parts of the river. In 2003, research documented that aquatic plant beds covered 78% of the Ichetucknee River bottom. Remapping in 2004 revealed that this coverage had decreased by 2%. Additional user impacts to the Ichetucknee spring ecosystem are also now apparent. Long-term SAV transect data collected by park staff, and supporting photo documentation, have shown that degradation becomes more severely pronounced during times of drought, especially when water levels in the upper reaches of the river are at their lowest (Sam Cole, unpublished, personal communication; District 2 files; Kurtz et al. 2004; FSI 2012a). The most significant vegetation damage occurs primarily within the Ichetucknee headspring and Rice Marsh reaches (Dutoit 1979; District 2 files; Kurtz et al. 2004). Recreational use is also likely the predominant cause of increased turbidity in the river, which is especially noticeable on busy summer weekends (WSI 2011) (Faraji 2017). Visitor activity in shallow water tends to disturb silt beds, which causes fine silt particles to suspend in the river current and flow downstream. These particles eventually settle and may cover SAV beds. These impacts occur primarily in the shallow sections of the river between the headspring and the midpoint launch (FSI 2012a).

In summary, research indicates that several factors contribute to the declining health of the Ichetucknee ecosystem: higher nutrient levels, reductions in groundwater flow and visitor carrying capacities that may be too high for shallower reaches of the river. While certain impacts are attributable to recreational activities within the park, most originate outside the park within the roughly 576,000-acre Ichetucknee springshed. Park management must continue to monitor hydrological resources closely and remain an active stakeholder in shaping growth management within the Ichetucknee springshed.

Water Quality

In 1996, DEP initiated a baseline monitoring project within the Ichetucknee springshed, beginning a long-term investigation into surface water quality and sources of water body contamination. Initial efforts focused on surface waters and included quantification of levels of nutrients, minerals and coliform bacteria, as well as macroinvertebrate diversity. Additional work included analyses of water columns, sediments and biota for the presence of heavy metals, pesticides, herbicides and other organic pollutants. Results of those studies indicated that the condition of the aquatic environments in the park was “remarkably good” during this period, with the exception of some increased nutrient levels near individual springs (DEP 1996; DEP 1997). Similarly, when macroinvertebrate communities in the

Ichetucknee were compared with those found in other undisturbed streams fed by the Floridan aquifer, indications were that the river had relatively healthy conditions up to the year 1997 (DEP 1997). Data also suggested that human activities within the springshed did not appear to be causing negative impacts to benthic macroinvertebrate communities during that period.

Quarterly water quality monitoring in 18 important springs in Florida began in 2000 (DEP 2008c). Reports from this work, referred to as Ecosummary, contain quarterly ecosystem health assessments of the Ichetucknee River. An overall summary of seven years of work on the Ichetucknee indicates several notable trends that may help explain the declining health of the system despite some assessments that are more positive. For example, stream condition indices have continued to rank the Ichetucknee as one the healthiest of the 18 monitored springs in terms of benthic macroinvertebrate diversity. The river also has the best overall habitat assessment of the 18 springs examined. However, the average concentration of total phosphorus found in the system was quite high (ranging from 0.028 to 0.810 milligrams per liter), and the Ichetucknee ranked as one of the worst in this category. Other researchers have cited this same trend of increased phosphorus levels in the Ichetucknee, even suggesting that it is a "limiting factor" for periphyton abundance in the springs (Kurtz et al. 2003; Stevenson et al. 2007). In a related Ichetucknee study, periphyton abundance was significantly higher than that considered normal under EPA guidance rules (DEP 2006). The EPA has suggested that water bodies with periphyton levels exceeding 150 milligrams per square meter may be impaired.

According to the Ichetucknee study, periphyton levels just below Mission Spring have reached 537 milligrams per square meter, well in excess of EPA guidelines. During the period between the 1996 baseline study and the 2005 follow-up work, a severe imbalance of SAV occurred in surface waters near Mission Spring, per Rule 62-302.500 (48) (b) FAC. The DEP basin status report for this region indicates that the Ichetucknee River became a potentially impaired waterbody in 2001 because of unbalanced abiotic levels, including dissolved oxygen (DEP 2001). A TMDL assessment of the Ichetucknee River and its priority springs was completed in 2008 (Hallas and Magley 2008). Currently, the Ichetucknee is a verified impaired water body listed for nutrients and dissolved oxygen, meaning that its surface waters do not meet applicable state water quality standards for the two parameters. In 2012, DEP developed a BMAP (with final updates in 2018) for the entire Santa Fe basin, including the Ichetucknee (DEP 2012, DEP 2018). In 2016, DEP implemented stronger legislative protections to the Ichetucknee Springs Group by mandating it as one of 30 Outstanding Florida Springs (Florida Springs and Aquifer Protection Act (Part VIII of Chapter 373, F.S.). This legislation requires additional protections specifically designed to assist efforts with the BMAP process, including water quality restoration. Integral to this BMAP process is the designation of important springshed protection zones called Priority Focus Areas (PFAs). PFAs are intended to institute the highest protection level to these 30 important freshwater spring ecosystems within their most vulnerable springshed areas (Scott et al. 2014; Upchurch and Champion 2004). The park lies solidly within the Santa Fe River basin BMAP and Ichetucknee Springs PFA (182,864 acres) regions, both regulated by DEP (DEP 2018).

There is widespread recognition that nuisance algae is increasing in abundance in most Florida springs, which is a recognized symptom of declining spring health (Mirti et al. 2006; Stevenson et al. 2007). In the mid-1900s, a diverse assemblage of macroalgae naturally comprised at least 50% of the aquatic plant growth within the Ichetucknee River and it spring ecosystems (Whitford 1956). In other words, a healthy Ichetucknee ecosystem should include a biologically diverse assemblage of macroalgae and microscopic diatoms, as well as a rich diversity of SAV. However, along the Ichetucknee River, the surge in nuisance periphyton abundance is most predominant in the upper reaches near spring boils and along short

stretches of spring runs associated with those boils, e.g. Devil's Eye. *Lyngbya* spp. and *Vaucheria* spp. appear to be the two most common types of nuisance algae observed (Kurtz et al. 2004; Stevenson et al. 2007). Some periphyton species, such as *Vaucheria* spp., show significant responses to increased levels of phosphorus and nitrogen in the system. These two nutrients apparently play a substantial role in regulating periphyton growth rates. In the past, several groups had been involved in quantifying algae abundance in the Ichetucknee (Canfield and Hoyer 1988; Kurtz et al. 2003, Kurtz et al. 2004, Steigerwalt 2005; Stevenson et al. 2007, DEP 2006, Wetland Solutions Inc. 2010). These groups used at least three different protocols to collect data and monitor changes in periphyton levels. Currently, however, only the DEP Laboratory is conducting periphyton assessments in the Ichetucknee (DEP 2008d). Their most recent guidance recommends use of the rapid periphyton assessment method for monitoring long-term changes within affected water bodies.

Because of the unconfined nature of the aquifer in the Ichetucknee basin, non-point nutrient sources including leached fertilizers, stormwater runoff and malfunctioning septic tanks are causing levels of these specific nutrients in the Ichetucknee springshed to become artificially elevated (Upchurch et al. 2007; Cohen et al. 2007). Research has indicated that the nitrates found at Blue Hole Spring are inorganic in origin, which indicates that the recharge area for Blue Hole Spring must contain an abundance of fertilized agricultural fields and yards (Cohen et al. 2007). Average nitrate-nitrogen levels recorded in the Ichetucknee springs range from 0.34 milligrams per liter at Mill Pond to 0.87 milligrams per liter at Cedar Head (Wetland Solutions Inc. 2006; WSI 2010). Determining nutrient level trends in this system seems to depend on the area of the river being sampled (DEP 2008c). For springs along the upper part of the Ichetucknee, an upward trend in nitrate levels is evident, but for the lower half of the river, the apparent trend is toward decreased levels (DEP 2008c; Upchurch et al. 2007). Phosphorus, on the other hand, shows the opposite trend, with increased levels in the lower portions of the river. These trends correlate with the historic increases in two native SAV throughout the Ichetucknee: springtape (*Sagittaria kurziana*) and American eelgrass (*Vallisneria americana*) (Kurtz et.al. 2003, Kurtz et.al. 2004). With the lack of information concerning the groundwater origin of Coffee Spring, the threat of groundwater contamination to this vulnerable spring and the continued protection of the endemic Ichetucknee siltsnail is extremely problematic.

Research has sparsely addressed how the increase in contaminants in the Ichetucknee may have affected benthic macroinvertebrate communities (Woodruff 1993; Steigerwalt 2005; Dormsjo 2008; Politano 2008). It has been suggested that the presence of a diverse freshwater gastropod population in the river could be used as an indicator of good water quality and therefore could function as a reliable indicator of ecosystem health (Thompson 2000). Surveys of the Ichetucknee siltsnail at Coffee Spring between 1989 and 2004 indicate that the population of this species, which is endemic to the site, had decreased dramatically from hundreds of thousands in early surveys to merely tens of thousands in 2004, a decline never witnessed by the researcher (District 2 files; Fred Thompson, personal communication). A quantitative survey in 2015 (Warren and Bernatis 2015) found the snails to be moderately abundant with significant juvenile recruitment. However, they did point out that the siltsnail is potentially threatened by several impending issues including increasing groundwater nitrate levels.

In 1978 and 1979, researcher Charles DuToit developed detailed maps of SAV populations in the Ichetucknee River (DuToit 1979). At his recommendation, photo points were then established at various locations along the river so staff could document subsequent large-scale changes in SAV beds. In 1989, park staff began to monitor SAV quantitatively through semiannual surveys at multiple permanent transects established along various river reaches within the park. Even though this monitoring effort was originally designed to record changes in aquatic plant abundance relative to varying intensities of

recreational use, it has also revealed that a significant shift in species diversity of SAV occurred between 1989-2008 (WSI 2010). Figure 1 provides a summary of SAV cover and species diversity from 1989 to 2020 and is derived from the data collected on the park's SAV monitoring transects. Interestingly, a comparison of the 1979 assessment of SAV with that of a 2004 study suggests that, over a 24-year period, aquatic vegetation coverage in the Ichetucknee had increased by over 350% (WSI 2010). This increase has been attributed to increased nutrient loads in the springs. To understand the long-term changes in SAV diversity within the Ichetucknee River, implementation of a regular monitoring program, similar to a program in place for the nearby Rainbow River, is recommended (ANAI and DCWI 2012).

In 2005, park staff discovered that the septic system for one of the park facilities had failed. The drain field for the system was located above conduits with direct connections to Mission, Devil's Eye and Grassy springs, such that the potential for nutrient contamination of those springs was considerable. DRP quickly achieved funding for septic system upgrades, including an aerobic digester, which resolved the problem. Since 2000, upgrades to several other wastewater treatment facilities in the park have also taken place. The emphasis has been on relocating septic systems to an adequate distance from the springs and river and on improving system performance and efficiency. Even though park septic system issues have been addressed successfully, this illustrates the importance of a continued active involvement by concerned stakeholders in identifying water quality issues and finding solutions.

Water Quantity

The average total discharge of the Ichetucknee River is approximately 348 cubic feet per second (USGS 2016). Two primary sources of the river are the Ichetucknee Headspring (about 53 cubic feet per second) and Blue Hole Spring (152 cubic feet per second), with the balance of the remaining flow contributed by the six other major springs (Table 3). The minimum flow ever recorded for the entire river was 132 cubic feet per second at the U.S. Highway 27 bridge in 2003, while the maximum was 579 cubic feet per second on April 29, 1948. Flows which have greatly exceeded the average of 364 cubic feet per second (n=400) have been caused by back-flooding from the Suwannee and Santa Fe rivers. This aspect of back-flooding may result in an underestimation of the total discharge of the river (WSI 2006). There is evidence suggesting that over the period of record at the U.S. Highway 27 bridge, the Ichetucknee River discharge has declined approximately 0.8 cubic feet per second per year since 1935 (Grubbs et al. 2009). This reduction in flow constitutes a loss of nearly 60 cubic feet per second or roughly 15% of the river's historic discharge. There is some evidence that this reduction in historic flows is even as high as 25% (FSI 2012b). A complete summary of the long-term flow data for the Ichetucknee is available in a work plan that addresses impairment status in the Ichetucknee springshed (Wetland Solutions Inc. 2006). In addition, a recent springs ecosystem-level study summarizes all flow data for this system (WSI 2010; FSI 2012b).

Ichetucknee Springs Discharge (cfs)							
Location	Max(year)	Min(year)	A	B	C	D	E
Blue Hole	296 (2005)	62 (2003)	59*	106	137	107	122
Mission Group	169 (2005)	34 (2003)	91*	85	111	87	101
Headspring	80 (2006)	13 (2003)	42	42	41	34	51
Devil's Eye	70 (2005)	39 (2002)	40	60	55	47	50
Cedar Head	15 (2005)	2.8 (2002)	10	17	9	6	7
Mill Pond	58 (2005)	6.2 (2005)	20	23	35	25	30
Grassy Hole			3	10		7	
Coffee				3		3	
Other Flows*			61		13		
Springs Subtotal			**266**	**346**	**388**	**316**	**361**
Dampier's	613 (2005)	156 (2003)			401		336
Hwy27 Bridge	579 (1948)	132 (2003)	327	207	394	289	416

* Calculated
[A] Skiles et al 1991 [B] Hornsby/Ceryak 1998 [C] USGS 9/2003 [D] WSI 2006 [E] USGS 4/2008

An oddity of flow rates in the Ichetucknee system is that the sum of all the individually measured spring outputs is often substantially higher than the total river flow measured at the U.S. Highway 27 bridge. This observation is based on a USGS analysis of real time data from Dampier's Landing to the U.S. Highway 27 bridge (USGS 2016). Sam Upchurch, a hydrologist with SDII Global Corporation, has speculated that an unknown river siphon (underwater geologic feature) may be responsible for this loss of water in the system (Upchurch, personal communication; Heffernan et al. 2010).

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 in the Ichetucknee River, will continue to decline (Sepulveda 2002).

The SRWMD is also responsible for prioritizing and establishing MFLs for water bodies within its boundaries. The SRWMD developed an MFL for the lower Santa Fe River and Ichetucknee River in 2013 (SRWMD 2013). Concurrently, the MFL proposed by the SRWMD for the middle Suwannee River, which extends from the mouth of the Withlacoochee River south to Fanning Springs, is under review. The

middle Suwannee River is integral to the establishment of the lower Santa Fe River MFL because of the back-flooding that occurs periodically in the Ichetucknee River.

Water managers are addressing concerns about the quality and quantity of the water that discharges from the Ichetucknee and other major springs in Florida (Upchurch and Champion 2004). The development of standards for Spring Protection Areas, Springshed Protection Areas and Surface Water Protection Areas for the Ichetucknee River has evolved into a strategy to protect specific areas in the Ichetucknee watershed from "significant harm" (Chapter 373.042 F.S.). Many of Florida's largest springsheds, including the Ichetucknee, have undergone a detailed delineation process (FGS 2007). Springshed boundaries, however, are not static. Boundaries can change dramatically over time depending on the amount of consumptive use of groundwater taking place in various parts of the springshed. 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 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 (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 (SRWMD and SJRWMD 2011). Additionally, there is a real need for Florida's water managers to develop a comprehensive, empirically-derived water budget for the Floridan aquifer system, one that will help determine sustainable groundwater extraction limits and protect the state's aquatic resources from harm (Knight and Clarke 2016).

To study trends within springshed protection areas, the SRWMD has developed a high-resolution monitoring program whereby water levels and water quality are measured in a large number of wells scattered throughout the basin (Upchurch et al. 2001). Now that an MFL for the lower Santa Fe and Ichetucknee rivers has been established, implementation of protection areas within those watersheds will likely 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 assist in guiding the MFL process. One responsibility of DEP is to review annual MFL priority lists submitted by water management districts for water bodies within their regions. Participation by DEP in the review process is important, especially since significant problems (e.g., declines in spring flows) have already occurred at other springs in District 2 (Madison Blue, Fanning and Manatee springs) despite having MFLs recently assigned to them (SRWMD 2004; SRWMD 2005). For example, scientists and cave divers have documented, for the first time, a flow reversal at Manatee Spring that lasted over a week (District 2 files). Some experts have also suggested that, due to declining flows, Fanning Spring may no longer rank as a first-magnitude spring (Tom Greenhalgh, FGS, personal communication).

Strong evidence now exists to support the premise that declining spring flow rates correlate with increased nutrient levels in springs and spring runs (Cohen et al. 2007). Given the recent documentation of flow reductions in the Ichetucknee and shrinking springsheds in the SRWMD, it is important that DRP continue to engage other agencies and the public stakeholders in a cooperative effort to maintain high standards of water resource protection in the Ichetucknee springshed (FSI 2012c). Critical efforts will continue to include close partnership with the SRWMD and other agencies to ensure that the adopted

MFLs within the Ichetucknee and lower Santa Fe rivers are protective and will contribute to the restoration of historic groundwater flows.

Submerged Aquatic Vegetation

Historically, all inland freshwater Florida spring ecosystems, like the Ichetucknee River, were characterized by thick beds of five dominant submerged aquatic plants. These included springtape, American eelgrass, southern waternymph (*Najas guadalupensis*), creeping primrosewillow (*Ludwigia repens*) and muskgrass (*Chara* sp.) (Whitford 1956). The presence of these five dominant SAV taxa have long characterized a healthy "underwater forest" within Florida's spring ecosystems (Odum 1957; Wetland Solutions Incorporated 2010; Heffernan et al. 2010). As of 2023, the overall ecological health of aquatic vegetation in the Ichetucknee within the park is in good to excellent condition considering that there are at least 20 native SAV species present, including all five dominants described above. In contrast, the SAV community in several of Florida's first-magnitude springs (e.g., Manatee, Fanning, Volusia Blue or Silver Glen), has nearly collapsed from a multitude of internal and external pressures. The Ichetucknee SAV community has remained primarily intact due to several fundamental reasons, including a continuous strong source of artesian groundwater (extremely important), reasonable recreation limits, strong stakeholder involvement, decades of basic research, and adaptive management. However, as mentioned above, SAV at a few locations in the Ichetucknee continues to show concerning declines.

The SAV of the Ichetucknee can be characterized by three distinct rivers sections, including the upper (Headspring to Millpond Spring), lower (Millpond to Highway 27 bridge) and shoals (Highway 27 Bridge to Santa Fe River). Even though the park only manages 50 acres below the Highway 27 bridge, this shoals section of the river is a critical resting, feeding and access point for imperiled wildlife such as the Florida manatee (District 2 Files, FWC 2020).

The Ichetucknee Shoals section is characterized with at least six major submerged limestone outcrops that nearly completely bisect the river. The shoal closest to the Santa Fe River near the mouth of the Ichetucknee may play a role in exclusion of Florida Manatee's during low water events (Jim Stevenson personal communication). As of 2023, the SAV community of this shoals section was in near complete decline, whereas in just 2012, DRP staff had documented an aquatic plant diversity that closely rivaled the upper and lower Ichetucknee sections within the park. The reason for loss of SAV in this section is unknown and concerning. In recent years, a similar SAV loss and decline in ecological health of lower river segments has occurred in other notable spring ecosystems, namely Rainbow Spring in Marion County (Southwest Florida Water Management District (SFWMD) 2016).

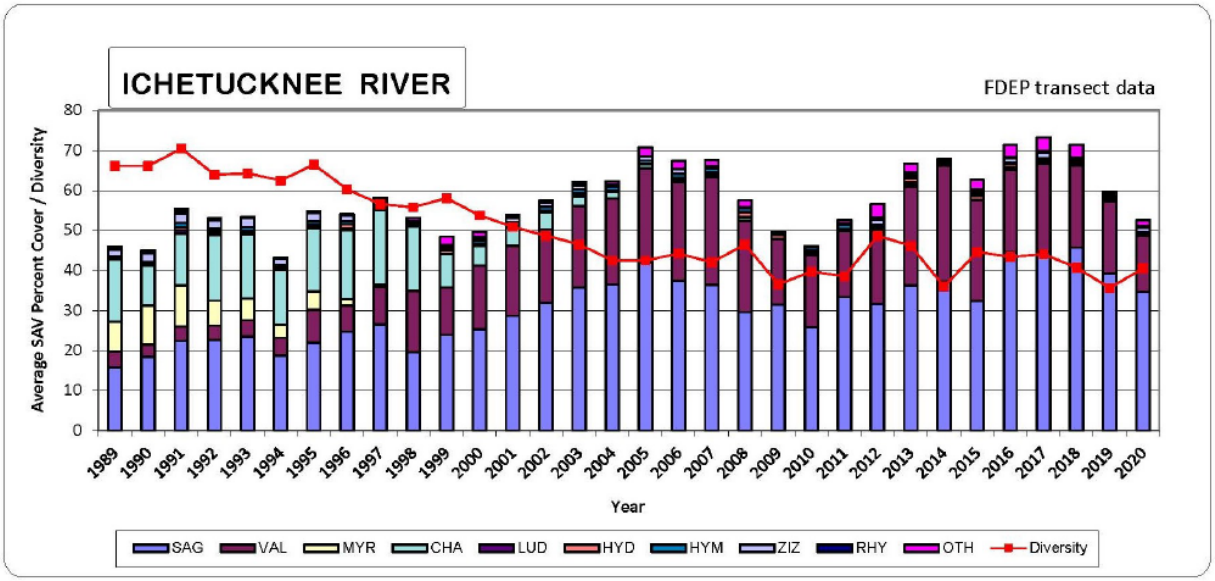
Seven of the eight major springs of the Ichetucknee lie within the upper river section. The shallow/narrow headspring spring-run above Blue Hole has historically undergone some of the highest SAV species diversity losses and damage throughout the upper Ichetucknee. All river areas with shallow depths can be extremely sensitive to direct impacts from foot traffic, but after assessment of 30 years of SAV monitoring it is clear that the species diversity significantly declined throughout the Ichetucknee and especially within the area above Blue Hole (Figure 1). Over the decades in this shallow area above Blue Hole, two sensitive SAV species, *Chara sp.* and twoleaf watermilfoil (*Myriophyllum heterophyllum*), disappeared and a more adaptive native, springtape, became dominant. Fortunately, high SAV diversity areas (including Chara and twoleaf water milfoil) are still present above the north launch (within a protected exclusion area) and throughout the most diverse area of the river, namely Grassy Flats. Springtape is dominant over American eelgrass throughout the upper Ichetucknee.

Coffee Springs is the only major spring located with the lower Ichetucknee. The main stem of the river in this section is characteristically deeper and wider, with a predominance of American eelgrass over springtape due to the river's increased depths. These two species also appear to stratify according to depth with springtape typically found more in shallower locations than eelgrass. SAV transect data from the lower Ichetucknee have illustrated recent declines in SAV coverage that are more likely due to declining water quality and/or hydraulic scouring than recreational impacts because of where the observed losses are occurring, which are at locations with deep water (District 2 Files). Fortunately, Coffee Spring SAV has remained healthy, and the spring run continues to be dominated by springtape.

The current assessment of the overall Ichetucknee SAV health is that even though the system is still dominated by springtape and American eelgrass, there has been a shift away from multi-species with specific declines in species diversity. One notable SAV species that has become more abundant throughout the upper and lower Ichetucknee is Coontail (*Ceratophyllum demersum*). Historically, Coontail presence in the river was minimal and only within the upper Ichetucknee, primarily above Blue Hole. However, this species is now common throughout the river within the park. Coontail is a native aquatic plant that is typically found and able to thrive in high-nutrient waterbodies (Best 1980, Pietro et.al. 2006).

The natural hydrology of most state parks has been impaired prior to acquisition to one degree or another. Florida's native habitats are precisely adapted to natural drainage patterns and seasonal water level fluctuations, and variations in these factors frequently determine the types of natural communities that occur on a particular site. Even minor changes to natural hydrology can result in the loss of plant and animal species from a landscape. Restoring state park lands to original natural conditions often depends on returning natural hydrological processes and conditions to the park. This is done primarily by filling or plugging ditches, removing obstructions to surface water "sheetflow," installing culverts or low-water crossings on roads, and installing water control structures to manage water levels. Below are hydrological management objectives and actions recommended for Ichetucknee Springs State Park.

The following figure identifies the average submerged aquatic vegetation cover and diversity for the Ichetucknee River. This data is from FDEP vegetation transects, analysis and graph courtesy of Howard T. Odum Florida Springs Institute.



SAG = Sagittaria kurziana
VAL = Valisineria americana
MYR = Myriophyllum heterophyllum
CHA = Chara (prob.)zeylonica
LUD = Ludwigia repens
HYD = Hydrocotyle (prob.) verticillata
HYM = Hymenocallis rotata
ZIZ = Zizania aquatica
RHY = Rhynchospora sp. or Carex sp.
OTH = Lobelia cardinalis, Rorippa officinale, Cicuta maculata

Assessment of Needs

Objective: Conduct/obtain an assessment of the park's hydrological restoration needs

Actions:

- Continue to cooperate with other agencies and independent researchers regarding hydrological research and monitoring programs.
- Continue to work with DEP regulatory personnel during implementation of standards for the Ichetucknee system.
- Encourage DEP to resume rapid periphyton assessments in the park, and develop and implement a plan to conduct semiannual periphyton assessments at the park's eight major springs.
- Continue to monitor land-use or zoning changes around the park.
- Continue to cooperate with the SRWMD and other agencies to track adopted MFLs, review annual MFL assessments and ensure MFLs for the Ichetucknee are monitored for compliance to maintain historic river flows.
- Promote the continued monitoring of groundwater levels and spring flows within the Ichetucknee springshed.
- Periodically assess the condition and effectiveness of septic systems associated with park facilities.

A first-magnitude spring-run stream and its associated floodplain natural communities are the most prominent hydrological features of Ichetucknee Springs State Park. Other features include sinkhole lakes and subterranean conduits found in the Saylor, McCormick and Rose sink parcels within the Ichetucknee Trace.

Extensive research and monitoring efforts by the SRWMD, DEP, USGS and FWC, especially since 2000, have already produced an abundance of information documenting the relatively sudden decline in hydrological health of the Ichetucknee system (see details in the *Hydrology* section above). If attempts

by managing agencies to restore the Ichetucknee River to its former pristine condition are to be successful, this exchange of scientific information must continue unabated.

Continued close cooperation between DRP, other agencies and independent researchers engaged in hydrological research and monitoring programs within the springshed of Ichetucknee Springs will encourage and facilitate additional research within the region. Management recommendations derived from research of the Ichetucknee will be essential to the decision-making process that will inevitably precede implementation of plans to restore the health of this regionally important springshed.

Among the specific hydrological assessments needed are water quality monitoring in the Ichetucknee River and the tracking of water quality changes within the Ichetucknee springshed. Based on indications of deteriorating groundwater quality and increased nutrient loading within the Ichetucknee springshed, the Ichetucknee River is currently listed as a verified impaired water body for nutrients and dissolved oxygen (see details in the *Hydrology* section above). The Ichetucknee River (as part of the Santa Fe River watershed) currently has a Basin Management Action Plan (BMAP). DRP will continue to participate in the BMAP process and work with DEP regulatory personnel to seek the best available options for reducing the Total Maximum Daily Load in the Ichetucknee system.

Nuisance periphyton abundance at each of the major springs in the Ichetucknee has increased significantly over the past 10 to 15 years because of elevated nitrogen and phosphorus levels. Semiannual periphyton assessments at each of the park's eight major springs are needed to track this trend. The park has informally monitored periphyton levels in the eight major springs since the onset of aquatic vegetation die-offs in 2000. Currently, standardized formal assessments of periphyton levels in the Ichetucknee are not conducted. DRP will encourage researchers to resume use of the rapid periphyton assessment method at Ichetucknee Springs, which is the preferred method despite its labor-intensive procedures. As a supplement, DRP will develop and implement its own plan for monitoring periphyton semiannually. This plan will include the establishment of photo points at each of the eight major springs along the Ichetucknee River.

In 2005, as mentioned previously in the *Hydrology* section, DRP learned that a septic system within the park was potentially contributing to deteriorating water quality in three major springs along the Ichetucknee. Discovery of this problem would not have occurred without information obtained from a dye trace study funded through the DEP Springs Initiative program. Since these facilities may negatively affect water quality in the Ichetucknee River system, park staff will periodically assess the effectiveness of septic systems associated with visitor restrooms, park residences and other facilities.

Maintenance of an ecologically viable and reliable quantity of groundwater within the Ichetucknee springshed is of critical concern to DRP. Relative to this, among the monitoring efforts that need to continue are water quantity assessments in the Ichetucknee River and the tracking of depletion of groundwater resources in the Ichetucknee springshed. Evidence now exists that groundwater levels have fallen over the period of record in the Ichetucknee River area, as well as in other regions of north Florida, because of increased withdrawals for consumptive use (as was discussed in the *Hydrology* section). It is unclear what harm the Ichetucknee may have already experienced because of reduced spring flows that are attributable to this lowering of groundwater levels in the springshed.

Since the SRWMD is charged with establishing MFLs and conducting follow-up vulnerability assessments for the Ichetucknee River and all priority springs, it will be important for DRP to work with the SRWMD to promote the highest level of spring flow protection for this system. DRP should exercise due diligence

in reviewing annual MFL assessments and should encourage the SRWMD to protect the Ichetucknee River, springs and associated floodplain from harm by restoring historic groundwater flows through the adopted MFL process. In addition, DRP staff will encourage water managers to consider back-flooding from the Santa Fe River as an important contributor to the hydrological function of the Ichetucknee. DRP should encourage all Ichetucknee stakeholders, including DEP water managers, to become actively involved in restoration of historic conditions in the Ichetucknee River and springs.

Monitoring and Restoration

Objective: Restore natural hydrological conditions and functions to approximately 10 acres of spring-run stream natural community

Actions:

- Continue to coordinate with agencies responsible for the protection and improvement of hydrological resources within the Ichetucknee springshed and with local governments responsible for land-use planning in the Ichetucknee area.
- Work closely with state and federal agencies to mitigate the increased nutrient levels at Ichetucknee and assist with implementation of the BMAP developed to meet TMDL requirements.
- Work closely with the SRWMD during implementation of MFLs for the Ichetucknee and provide formal feedback if spring discharges fall below MFL threshold and cause degradation of the river.
- Develop and implement monitoring protocols for semiannual SAV assessments in Devil's Eye and Mission springs and continuous monitoring in all other major springs and their associated spring-run streams.
- Pursue outreach opportunities and develop programming to educate the public about anthropogenic impacts to the Ichetucknee system.
- Seek funding for and consider implementation of a long-term SAV monitoring program on the Ichetucknee River.
- Seek funding for and conduct dye trace studies in the Ichetucknee springshed, specifically to determine groundwater sources for Coffee Spring.
- Examine the feasibility of conducting experimental plantings of SAV at sites affected by post-2000 die-offs.
- Implement erosion control measures to protect water quality in all park surface waters.

As discussed previously in the *Hydrology* section, at least three anthropogenic factors are adversely affecting the 26-acre spring-run stream within Ichetucknee Springs State Park, especially the upper stretch of the river from the headspring down to Mill Pond Spring: 1) Higher nutrient levels are stimulating an increase in nuisance periphyton growth, 2) decreased groundwater discharge is causing a reduction in spring flow, and 3) recreational pressures may now be too great for portions of the spring run and its adjacent floodplain. Three of the largest springs in the Ichetucknee system are experiencing nutrient increases and groundwater flow reductions. At this time, it is unknown if these changes are permanent, but they have been occurring for over 15 years. True restoration of natural hydrological conditions and functions in the Ichetucknee will happen only when there is some mitigation of the three negative factors mentioned above. DRP will consider all management options that hold some promise of reversing the decline in health of the Ichetucknee system. It may be easier to address internal sources of impacts than outside sources. Below is more detail regarding hydrological actions recommended for Ichetucknee Springs State Park.

- Continue to coordinate closely with all agencies, including the SRWMD, DEP, USGS and FWC, that are involved in the protection and improvement of hydrological resources within the Ichetucknee springshed, particularly those at Ichetucknee Springs State Park. Coordination may consist of regular attendance at meetings concerned with regional or local hydrology and the maintenance of relevant correspondence. Coordination with county governments will also be essential. Park staff will continue to review county land-use changes proposed for properties outside the park, particularly in the Ichetucknee Trace area, looking for potential impacts to Ichetucknee water quality and quantity. Staff will provide comments to public officials if any threats to surface or groundwater resources become apparent.

- Continue to work closely with DEP and SRWMD personnel in seeking ways to mitigate increased nutrient levels in the Ichetucknee. A major part in this process will be the implementation of the regional Basin Action Management Plan developed in response to EPA-issued TMDL standards for area water bodies.

- Work closely with the SRWMD to ensure that the adopted MFLs developed for the Ichetucknee are conscientiously tracked and that spring flows do not decrease to the point that the Ichetucknee system suffers significant harm. Address any water quantity issues that have caused degradation of the Ichetucknee spring-run community.

- Pursue outreach opportunities to educate the public about anthropogenic impacts to the Ichetucknee system, impacts that are extensive and attributable both to external and internal sources. DRP will need strong public support if it hopes to be effective in reducing the threat level of these impacts.

- Adjust the type and intensity of recreational use on portions of the Ichetucknee River and its springs. DRP will need to continue to consider methods of relieving recreation pressures on all stretches of the river.

- To understand potential changes in spring ecosystem health, DRP should seek funding and consider implementation of a long-term SAV monitoring program on the Ichetucknee River, perhaps similar to the successful five-year recurring project conducted at the Rainbow River.

- Continue to respond aggressively to water quality impacts known to stem from the location or design of park facilities and mitigate those impacts using the best available options for remediation.

- Continue to seek funding for additional dye trace studies, especially for locations where groundwater sources are unknown, such as Coffee Spring. Dye trace studies in the Ichetucknee springshed have provided park management with invaluable

information about the various sources of the springs and the timing of surface to groundwater interactions that potentially affect the Ichetucknee River.

- Within the next 10 years, examine the feasibility of conducting experimental plantings of key species of SAV at sites devastated by the post-2000 die-offs, such as the Devil's Eye spring run.

- Implement effective erosion control measures that will help protect water quality in all the surface waters of the park. Park staff will identify unauthorized trails that breach the floodplain wetlands, riverbanks and spring edges and will eliminate visitor access to those trails. Management will comply with best management practices to maintain the existing water quality onsite and will take appropriate action to prevent soil erosion or other impacts to water resources.

Visitor Management

Objective: Evaluate impacts of visitor use on the Ichetucknee River system and mitigate as needed.

Actions:

- Continue to monitor aquatic vegetation transects each spring and fall to determine long-term impacts of visitor use, including effects on water quality.
- Continue annual photo point monitoring at sensitive locations along the Ichetucknee River to track changes in vegetative cover.
- Continue to evaluate the recreational carrying capacity of the river and its springs to determine the relationship between type and intensity of visitor use and the health of the system. Recreational adjustments may be required including possible reduction or closure of certain recreational activities.
- Continue to provide prompt response to water quality threats to the Ichetucknee that may be attributable to location or design of park facilities.

DRP has largely succeeded in balancing the demands of recreation on the Ichetucknee River and preservation of the river's resources. One of the most effective means of achieving that balance has been the use of research-based carrying capacities for various sections of the river, with the intent of directing most of the intense recreational pressures to the parts of the river that are less sensitive. There is ample evidence however, that swimming and tubing activities continue to cause negative impacts to the springs and spring runs, particularly in the upper reaches of the river. Although much of the SAV that is trampled or uprooted during summer months seems to regenerate reasonably well during the offseason, aquatic plant beds located in shallow water areas do not fare as well.

Their lack of complete recovery during the periods of little or no tubing may lead to a long-term decline in ecosystem health. One result may be a decrease in macrophyte species diversity in portions of the river, with some species disappearing completely. In fact, river monitoring has provided evidence that this has already occurred along the upper Ichetucknee. Another result of intense tubing activity in shallower parts of the river is an increase in turbidity and noticeably impaired water clarity downstream. As mentioned previously, park staff in 1989 initiated a semiannual monitoring program to assess aquatic vegetation at multiple transects established along the Ichetucknee River. That monitoring program has proven invaluable in enabling park management to document fluctuations in water levels, as well as

long-term changes in aquatic plant cover and any correlations between vegetation changes and the amount of visitor use. Information obtained from the monitoring has also served as the basis for establishing specific carrying capacities for various sections of the river. The following bullets expand on the above actions intended to achieve balance of recreational use and resource preservation.

- Continue to closely track human impacts on the entire river by monitoring aquatic vegetation transects each spring and fall to determine long-term impacts of visitor use and to detect any impairment of water quality in the Ichetucknee River.

- Continue to maintain annual photo points at sensitive locations along the Ichetucknee where the intensity of visitor use may be causing undesirable impacts. These photo points may be useful in tracking long- and short-term changes in the percentage cover of aquatic vegetation along the river bottom. They may also provide information about changes in spring-run water clarity caused by erosion and suspension of sediments.

- Maintain carrying capacities on the river, with special emphasis on the protection of the upper section (above Mill Pond Spring). Seek funding for ongoing turbidity measurements at relevant sites on the river to improve our understanding of the relationship between intensity of visitor use, turbidity, and the overall health of the spring run.

NATURAL COMMUNITIES

Mesic Flatwoods

Dominant pines in north Florida will usually be longleaf pine (*Pinus palustris*). Native herbaceous groundcover should be at least over 50% of the area and should be less than 3 feet in height. Saw palmetto (*Serenoa repens*) and shrub component will comprise no more than 50% of total shrub species cover and will also be less than 3 feet in height. Shrub species include saw palmetto, gallberry (*Ilex glabra*), fetterbush (*Lyonia lucida*), running oak (*Quercus pumila*), dwarf live oak (*Quercus minima*), shiny blueberry (*Vaccinium myrsinites*) and dwarf huckleberry (*Gaylussacia dumosa*). Shrubs will generally be knee-high or less, and there will be few if any large trunks of saw palmetto along the ground. Optimum fire return interval for this community is 1-3 years.

A small area of mesic flatwoods occurs at the southwest corner of the Saylor Sink parcel. The mesic flatwoods lie in the transition zone between the mesic hammock that is associated with the Ichetucknee Trace and the surrounding sandhills. The mesic flatwoods fringe is dominated by saw palmetto, sand live oak (*Quercus geminata*), wild olive (*Osmanthus americanus*) and sparkleberry (*Vaccinium arboreum*). Scattered gallberry plants also occur.

Although this area shares some characteristics with xeric hammock, this is most likely due to long-term fire suppression.

Although it is of limited extent, the mesic flatwoods should be treated with prescribed fire along with the adjacent sandhills to restore the natural ecotone between the uplands and the Ichetucknee Trace. An adequate firebreak will need to be maintained along the south and west boundary lines to facilitate frequent prescribed fires.

Mesic Hammock

A well-developed evergreen hardwood and/or palm forest can occur, with variation, through much of peninsular Florida. The typically dense canopy will typically be dominated by live oak (*Quercus virginiana*) with cabbage palm (*Sabal palmetto*) mixed into the understory. Southern magnolia (*Magnolia grandiflora*) and pignut hickory (*Carya glabra*) can be common components in the subcanopy as well. The shrubby understory may be dense or open, tall or short, and will typically be composed of saw palmetto, beautyberry (*Callicarpa americana*), American holly (*Ilex opaca*), gallberry and sparkleberry.

The groundcover may be sparse and patchy but will generally contain panic and switchgrasses (*Panicum sp*.) and sedges (*Carex sp*.), as well as various ferns and forbs. Abundant vines and epiphytes occur on live oaks, cabbage palms and other subcanopy trees. Mesic hammocks will generally contain sandy soils with organic materials and may have a thick layer of leaf litter at the surface. Mesic hammocks are rarely inundated, are not considered to be fire-adapted communities and are typically shielded from fire.

A thin fringe of mesic hammock lies along the slopes and floor of the Ichetucknee Trace where it passes through the Saylor Sink parcel. Characterized by an open understory with a canopy of live oaks, this community forms the ecotone between the open sandhills and the linear karst depression that forms the Ichetucknee Trace.

Mesic hammocks require relatively little management compared to fire-adapted communities. Periodic monitoring for invasive plant species or feral hog damage will be necessary. Prescribed fires should be allowed to burn into the edges of the mesic hammock from the surrounding sandhills to maintain an ecotone, but no attempts should be made to introduce intense fires into this community type.

Sandhill

Dominant pines in north Florida will be longleaf. Herbaceous cover is 80% or more and less than 3 feet in height. In addition to groundcover and pine characteristics, there will be scattered individual trees, clumps or ridges of on-site oak species (usually turkey oak (*Quercus laevis*), sand post oak (*Quercus margaretta*) and blue-jack oak (*Quercus incana*)). In old growth conditions, sand post oaks will commonly be 150-200 years old, and the age of some turkey oaks may even exceed 100 years. Optimum fire return interval for this community is 2-3 years.

The sandhill community occurs on higher elevations in the park on the deepest and most well-drained soils. Like much of the surrounding region, the sandhills were heavily logged during the early 1900s or before. Most of the longleaf pines were removed at that time. Natural regeneration of longleaf pines occurred to varying degrees. Unlike surrounding areas, however, most of the sandhills at Ichetucknee Springs State Park were not converted for intensive agricultural uses, and the native groundcover remained intact. A period of fire suppression followed the removal of the original longleaf pines over much of the area, resulting in an increase in hardwood densities. The park was acquired from the Loncala Phosphate Company in 1970. Park staff began to apply prescribed fire to the sandhills in 1973 and later began replanting understocked areas with longleaf pines.

Sandhills located west of the Ichetucknee River represent the finest examples of sandhill natural communities in the region, if not statewide. These sandhills are relatively rich with groundcover

species diversity. Large expanses of habitat available within the park allow many sandhill animal species that have declined elsewhere to persist on site. Species such as Bachman's sparrow (*Aimophila aestivalis*), southern fox squirrel (*Sciurus niger niger*) and eastern indigo snake (*Drymarchon couperi*), which are often extirpated in isolated sandhill patches, remain relatively common at Ichetucknee Springs State Park. Florida mice (*Podomys floridanus*) are abundant within the park's sandhills (Doonan 2002) and southeastern American kestrel (*Falco sparverius paulus*) thrives. Long-term survival of such wildlife species requires extensive areas of well-maintained sandhill.

The sandhills to the east of the river are not in as pristine a condition as those to the west. Some of these areas may have been more impacted by phosphate mining operations and low intensity agriculture or grazing. At least one area was cleared and planted with watermelons in the 1950s. This area, in the southern portion of the park, was subsequently converted into a slash pine plantation. The site was heavily thinned by park management around 1977 and has since been replanted with longleaf pines. Although disturbed, this area retains scattered clumps of wiregrass (*Aristida stricta* var. *beyrichiana*) and other characteristic sandhill groundcover species. Some areas of sandhill, particularly those closer to the upland pine and upland mixed woodland, and some areas adjacent to the park boundary, have increased numbers of off-site hardwoods due to lack of sufficient fire. In 2008, approximately 125 acres of off-site hardwoods in sandhill, upland pine and upland mixed woodland communities in management zones 2B, 2C, 2E, 2F, 3B and 3C were treated with herbicide to accelerate restoration of those zones.

Other limited areas of sandhill were disturbed to a much greater extent. A tract of approximately 10 acres along the western boundary was converted for agricultural use sometime before 1949. The northern fringe of this tract formerly contained an old residence. The general area is in relatively poor condition due to a lack of native groundcover and canopy species. A second area of about 26 acres, located further south along the western boundary, was not disturbed as severely. This area was cleared of longleaf pines and other canopy species between 1957 and 1963. However, the groundcover was not completely removed. Longleaf pine regeneration is now underway as the result of trees being planted some 20 years ago. Patches of native groundcover occur, as do scattered hardwoods that are typical of the community.

All of the sandhills at the Saylor Sink parcel were cleared of the native longleaf pines by the early 1960s and planted in slash pine. The eastern half of the parcel was cleared and converted for agriculture prior to 1937. According to aerial photography, a thinning cut was conducted between 1994 and 1999. The areas east of the Ichetucknee Trace have an herbaceous groundcover dominated by broomsedge (*Andropogon spp*.) and other weedier types of native groundcover, with an overstory of widely spaced slash pines. The midstory is a mix of scattered hardwood species including laurel oak (*Quercus laurifolia*), bluejack oak and black cherry (*Prunus serotina*). Structurally, the habitat is similar to a natural sandhill.

Pocket gophers (*Geomys pinetis*) and widely scattered gopher tortoises are still found onsite. Sandhills south and west of the Ichetucknee Trace on the Saylor Sink parcel are characterized by relatively few pines, dominated instead by off-site oaks and hardwoods mixed with native sandhill hardwoods.

Prescribed fire is the primary tool for maintaining and improving sandhill vegetation. The Ichetucknee sandhills will need frequent prescribed fires to prevent and reverse the invasion of off-

site hardwood species. 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. Some sections of the sandhills will require additional plantings of longleaf pines to supplement previous planting efforts.

The Saylor Sink parcel will require the application of prescribed fire to initiate restoration of the sandhills. In the eastern portion, the planting of longleaf pines and native groundcover such as wiregrass will be additional steps in the restoration process as the current slash pine overstory is gradually replaced. Prescribed fire should be frequent for the benefit of expediting restoration and improving habitat for resident gopher tortoises. Removal of off-site hardwoods will also be necessary. Western portions of the parcel may require some level of mechanical or chemical hardwood control when implementing the prescribed fire program and before any groundcover restoration efforts. Monitoring, continued treatment of invasive plant species and removal of feral hogs are additional management measures planned for the areas of sandhill.

Sinkhole and Sinkhole Lake

Sinkholes are characterized by cylindrical or conical depressions with limestone or sand walls. Sinkholes do not contain standing water for long periods of time as do sinkhole lakes. Depending on the age of the sinkhole, the vegetation of sandy sinkholes may represent a well-developed forest including magnolia, sweetgum (*Liquidambar styraciflua*), wax myrtle (*Myrica cerifera*), grape vines (*Vitis sp*.), Virginia creeper (*Parthenocissus quinquefolia*), water oak (*Quercus nigra*) and pignut hickory. Sinkholes with vertical limestone walls may be covered by a variety of mosses, liverworts, ferns and small herbs.

Sinkholes will generally have a very moist microclimate due to seepage, buffering by topographic depression and shading by tree canopy. Desired future conditions include limiting unnatural erosion and protecting the microclimate from disturbance.

Sinkhole lakes are relatively permanent and are typically deep lakes characterized by clear water with a high mineral content formed in depressions within a limestone base. Vegetative cover may range from completely absent, a fringe of emergent species, or completely covered with floating plants. Typical plant species may include smartweed (*Polygonum sp*.), duckweed (*Lemna sp*.), bladderwort (*Utricularia sp*.), and rushes (*Juncus sp*.).

Desired conditions include minimizing disturbances that cause unnatural erosion and minimizing pollution to the connected aquifer system.

Due to the karst geology of the region, sinkholes are scattered throughout the park. Solution depressions of differing size and shape are often found in the areas above and around the major springs. Some sinks remain dry the entire year, while others contain water either permanently or seasonally. Most of these sinkholes are too small to map. Two small sinkhole depressions, which often retain water, are mapped in the northeast portion of the park. In most cases, the sinkholes within the park are relatively undisturbed. Vegetation varies from floating or emergent aquatics to herbaceous or woody terrestrial species. At least one sinkhole in the park was used as a trash dump in the past. It is possible that some may have been converted into phosphate pits in the last century, and as such would now be included with the borrow areas.

The Ichetucknee Trace parcels all contain sinkhole lakes, some of which connect directly to underground conduits that feed the Ichetucknee River. These include Rose Sink north of State Road

240, and McCormick Sink south of State Road 240. Rose and McCormick sinks have provided access to the conduits for research dives. Saylor Sink, on the Saylor Sink parcel, and an unnamed sinkhole lake on the McCormick parcel, retain water, but research as of 2020 has not identified direct connection through the underground conduits.
Management of sinkholes and sinkhole lakes must emphasize protection. The edges of sinkholes need to be protected from impacts that could accelerate erosion. This is even more critical with sinkhole lakes since increased levels of erosion can cause a decline in water quality. Access to these areas, particularly the sinkhole lakes, is often restricted except for approved research purposes or other management activities. Monitoring these communities for impacts from invasive plant and animal species will also be necessary.

Upland Hardwood Forest

Mature, closed canopy hardwood forest typically occurs on slopes and rolling hills with generally mesic conditions. Overstory tree species may consist of southern magnolia, sweetgum, live oak, laurel oak, Florida maple (*Acer saccharinum*) and swamp chestnut oak (*Quercus michauxii*). Understory species will include trees and shrubs such as American holly, flowering dogwood (*Cornus florida*), redbud (*Cercis Canadensis*), red bay (*Persea borbonia*), horse sugar (*Symplocos tinctoria*) and beauty berry. Ground cover will consist of shade-tolerant herbaceous species, sedges and vines.

Upland hardwood forest within the park has expanded greatly due to fire suppression in the past century. Historical aerial photographs show a relatively thin band of hardwoods of varying width located upslope of the Ichetucknee River floodplain. A thin band of upland hardwood forest also occurs in association with Rose Sink. In the absence of fire, upland hardwood forest species expanded into adjacent upland mixed woodland areas that had been disturbed during timbering operations in the early 1900s. Invasive woody species such as laurel oaks, water oaks and sweetgums are typical of these upland mixed woodland areas that have “succeeded” to upland hardwood forest. These species are usually precluded from upland mixed woodland by periodic growing season fires.

The boundary between the upland hardwood forest and upland mixed woodland is naturally dynamic and determined by local fire regimes and other disturbances such as windstorms. In the case of Ichetucknee Springs State Park, this natural flux has been overshadowed by extensive logging operations, two periods of phosphate mining, fire suppression and other anthropogenic influences. For the purposes of the natural community map, and to guide restoration of the upland mixed woodland, the boundary of the upland hardwood forest has been located based on interpretation of 1949 aerial photos. In the photos, disturbance from removal of the longleaf pine overstory was still evident in the sandhills and upland mixed woodland. Invasion of these disturbed areas by off-site hardwoods had already begun, but these trees were much smaller than now. Ground truthing of selected areas and mapping of relict longleaf pines and lightered pine stumps (most likely longleaf pine, but possibly slash pine) have also aided in determining the historical limits of the upland hardwood forest along the Ichetucknee River.

Both the upland hardwood forests and upland mixed woodlands have been impacted by phosphate mining operations that constructed multiple pits and tram roads. The topographic disturbances and the soil changes caused by mining residues and tailings have severely affected both communities on a local basis. The upland hardwood forest was undoubtedly subjected to some level of hardwood cutting, but the clearest evidence of timber harvest is the numerous large cedar stumps that occur in the upland hardwood forest along the river.

Management of the upland hardwood forests at Ichetucknee Springs State Park will require periodic monitoring and removal of invasive plant and animal species. Impacts from service roads and trails will also need monitoring. In general, DRP biologists expect the community to gradually recover from previous timber removal with little intervention. Restoration of the phosphate pits, currently considered to consist of borrow and spoil areas, would be difficult and may not be cost effective. In addition, the phosphate pits now represent part of the cultural history of the park.

Upland Mixed Woodland and Upland Pine

Dominant tree species in the upland mixed woodland will include longleaf pine, southern red oak (*Quercus falcata*), post oak and mockernut hickory (*Carya alba*). Hardwood tree species will frequently be dominant or co-dominant with pines. Flowering dogwoods may be present. Longleaf pine replaces shortleaf pine (*Pinus echinata*) outside the panhandle, but shortleaf occur in small numbers at Ichetucknee Springs State Park. The percentage of herbaceous cover will be comparable to sandhill and will be 3-4 feet in height during spring and summer. In some areas, grasses and forbs may reach heights of 6-8 feet or more during the fall (due to blooming of taller grass species such as yellow Indian-grass (S*orghastrum nutans*), silver plumegrass (*Saccharum alopecuroides*) and big bluestem (*Andropogon gerardii*). In old growth conditions, oaks and hickories will commonly be 150-200 years old. The optimum fire return interval for this community is 2-5 years, depending on adjacent natural communities.

Dominant tree species in the upland pine will be longleaf pine. Herbaceous cover will be less than 3 feet in height and comparable to sandhill but may have a higher density of understory shrubs and saplings. In addition to groundcover and pine characteristics noted previously, mature hardwood trees will be scattered throughout (usually southern red oak, post oak, sand post oak, mockernut hickory, flowering dogwood and sassafras (*Sassafras albidum*)). In old growth conditions, oak trees and hickories are commonly 150 to 200 years old. Optimum fire return interval for this community is 2-3 years.

As mentioned above, the boundary between upland mixed woodland and upland hardwood forests is often indistinct under natural conditions. Under disturbed conditions such as logging and fire suppression, the upland hardwood forest species quickly invade the upland mixed woodland, resulting in a blending of the two community types. Such is the case at Ichetucknee Springs State Park.

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 and non-fire adapted communities such as upland hardwood forest and floodplain communities. This transition zone often occurs on soils that are intermediate in drainage and fertility characteristics between sandhill and upland hardwood forest soils. Fire also exerts a defining influence on the limits of the upland mixed woodland. Typically, upland mixed woodland burns with a frequency similar to neighboring sandhills or upland pine, and much more frequently and intensely than adjacent upland hardwood forests.

The long history of fire suppression and timbering at Ichetucknee Springs State Park has blurred the distinctions between the three “high pine” communities that are dominated by longleaf pine. Once lumped within upland pine, the upland mixed woodland has only recently been formally designated by FNAI as a distinct community type. Upland mixed woodland lies closest to the river. It is likely that

upland pine once occurred between the deep well-drained sands of the sandhills and the less well-drained loamy soils of the upland mixed woodland. Fire suppression of the upland pine has led to the loss or suppression of the native groundcover species (particularly wiregrass) and an increase in hardwoods, making it difficult to distinguish between upland mixed woodland and upland pine. For the purposes of this management plan, the upland pine has not been mapped separately from the upland mixed woodland.

Upland mixed woodland and upland pine at Ichetucknee Springs State Park span a broad range of quality. Some limited areas that have suffered less fire suppression are in very good to excellent condition. These areas retain diverse groundcover dominated by grasses, including wiregrass in the case of the upland pine. Beargrass (*Yucca filamentosa*) and longleaf paw paw (*Asimina longifolia*) are also common. Overstory includes adult longleaf pines, mockernut hickories, southern red oaks and scattered sand post oaks. In general, upland pine areas near the sandhills are in better condition, as they were often treated with prescribed fire along with the sandhills when fire was reintroduced to the park in the early 1970s. As more fire is introduced into the upland pine and upland mixed woodlands, responses by remnant groundcover should distinguish these similar community types. Additional research and ground truthing will be needed as these areas improve. Future groundcover restoration goals will need to be based on the correct community designation.

One factor that has influenced the boundary between the sandhills and the upland pine is an old abandoned trail or road that was located along the historic ecotone between these communities on the west side of the river. This old trail was probably cut before the 1920s when the Loncala Phosphate, Company acquired the property (Doig, 1992). The trail has acted as a firebreak, and it appears to have prevented fires from penetrating the upland pine area. Consequently, the invasion of the upland pine by non-fire adapted hardwoods such as laurel oak, water oak and sweetgum seems to have been accelerated. Park personnel have made great strides throughout the park in restoring areas of “overgrown” upland pine to a more natural state. Using prescribed fire, coupled with girdling and herbiciding of off-site hardwoods, the park has been able to reverse many years of fire suppression. By concentrating hardwood removal in the fringes of overgrown upland pine nearest the sandhills and in areas that still have relict longleaf pines, the park has succeeded in encouraging prescribed fires to penetrate formerly overgrown areas, dramatically enhancing the degraded upland pine community. The most recent hardwood removal project at Ichetucknee Springs State Park chemically treated approximately 125 acres of off-site hardwoods in sandhill, upland pine and upland mixed woodland communities in management zones 2B, 2C, 2E, 2F, 3B and 3C.

The McCormick parcel in the Ichetucknee Trace is likely to have originally been upland mixed woodland or upland pine, and, in some areas, there are remnant longleaf pines and scattered clumps of wiregrass. The property was predominantly cleared for agriculture prior to 1937. Most of those agricultural fields were planted in pines in more recent years. These areas are currently mapped as pine plantations.

Restoration of a natural fire regime to the upland pine and upland mixed woodland is essential for recovering these rare and unique community types. Reintroducing fire will require additional hardwood removal efforts to allow prescribed fires to penetrate further into areas currently dominated by off-site hardwoods. Some hardwood treatment areas may also need restoration of groundcover species. Restoration of the upland pine and upland mixed woodland is discussed further in the *Resource Management Program* section of this component. As restoration proceeds, staff will continue to monitor these areas for rare species that are endemic to these communities.

On the McCormick parcel, removal of the planted pines and replanting with longleaf pines and groundcover species will be necessary to initiate restoration of these heavily impacted areas. Some limited prescribed fires may be useful in managing the pine plantations in the meantime. Additional boundary fencing was installed at the McCormick parcel in 2009 along with fencing and boundary line improvements on a new acquisition north of County Road 238 in the main section of the park.

Dome Swamp

Dome swamp is an isolated, forested, depression wetland occurring within a fire-maintained matrix such as mesic flatwoods. The characteristic dome appearance is created by smaller trees that grow on the outer edge (shallower water and less peat) and the larger trees that grow in the interior. Pond cypress (*Taxodium ascendens*) will typically dominate, but swamp tupelo (*Nyssa sylvatica* var. *biflora*) may also form a pure stand or occur as a co-dominant. Other subcanopy species can include red maple, dahoon holly (*Ilex cassine*), swamp bay (*Persea palustris*), sweetbay (*Magnolia virginiana*) and loblolly bay (*Gordonia lasianthus*). Shrubs can be absent to moderate (a function of fire frequency) and can include Virginia willow (*Itea virginica*), fetterbush, buttonbush (*Cephalanthus occidentalis*), wax myrtle and titi (*Cyrilla racemiflora*). An herbaceous component can range from absent to dense and include ferns, maidencane (*Panicum hemitomom*), sawgrass (*Cladium jamaicense*), sedges, lizard's tail (*Saururus cernuus*) and sphagnum moss (*Sphagnum sp*.). Vines and epiphytes will be commonly found. Maintaining the appropriate hydrology and fire frequency is critical for preserving the structure and species composition of the community.

Dome swamps should be allowed to burn on the same frequency as adjacent fire type communities, allowing fires to naturally burn across ecotones. Fires should be appropriately planned to avoid severe fuel consumption within the dome swamp.

A single dome is found in the northeast corner of the park adjacent to County Road 238. This dome is dominated by hardwoods including swamp tupelo, red maple (*Acer rubrum*) and overcup oak (*Quercus lyrata*) (Herring 1994). This dome appears to have been impacted by the construction of County Road 238 that passes through the park. The southern tip of the dome was cut off from the main part of this depressional wetland by the fill brought in to construct the roadway. During high water events, overflow from the dome is channeled into the roadside swale and then under County Road 238 through a culvert. The portion of the depression that lies to the south of the road is classified as an impoundment or artificial pond since it appears to have been significantly altered during or after construction of the road. The dome that lies north of the road is in relatively good condition although it receives some direct runoff from County Road 238.

Fire may be allowed to creep into eastern edges of the dome from adjacent upland mixed woodland, but that is likely to be infrequent. Maintenance of a natural hydrological regime is a more important factor in management of this dome swamp. Although affected by runoff from County Road 238, the hydrological regime appears adequate for maintenance of this community. As in all areas, monitoring for invasive species impacts will continue.

Alluvial Forest

Alluvial forest is a seasonally flooded, closed canopy, hardwood forest that occurs on ridges or slight elevations within the floodplain of alluvial rivers. Typical overstory trees may include overcup oak, water hickory (*Carya aquatica*), American elm (*Ulmus americana*), laurel oak and red maple.

Understory species may include swamp dogwood (*Cornus foemina*), willow species (*Salix sp*.), and American hornbeam (*Carpinus caroliniana*). Presence of groundcover will be variable. Species such as netted chain fern (*Woodwardia areolata*) and other shade-tolerant herbaceous species may be present.

Alluvial forest is found along much of the Ichetucknee River downslope of the upland hardwood forest and upland mixed woodland. In some cases, a floodplain swamp or marsh separates the alluvial forest from the spring-run stream. The most extensive floodplain development is in the lower half of the river, although a significant area of alluvial forest occurs near the Ichetucknee headspring and along the Cedar Head spring run. Although the larger cypress trees (*Taxodium distichum*) were removed from the floodplain, the floodplain is recovering and with time will regain its former grandeur.
The low area associated with the Rose Creek drainage is classified as alluvial forest since it floods frequently and is associated with a blackwater stream system. However, near Rose Creek Sink, the area is dominated by grasses and other herbaceous plant species rather than by hardwood species normally associated with floodplains. This may be attributable to repeated natural flooding events that may have prevented the establishment of hardwoods or to some anthropogenic disturbance in the past that cleared the area around the sink. It is possible that the area could have been used to water livestock in the past, which might explain the current open conditions.

Maintenance of a natural hydrological regime is critical to the long-term health of floodplain communities. Many of the efforts designed to protect the spring-run stream also apply to the alluvial forest. Monitoring for impacts from invasive plant species and feral hogs will also continue.

<u>Floodplain Marsh</u>
Emergent herbaceous and low shrub species will be dominant over most of the floodplain marsh, and there will be an open vista. Trees are few, and, if present, will occur primarily in the deeper portions of the community. Due to the relatively stable spring-run stream, the community will be ordinarily inundated.

Dominant vegetation in floodplain marsh includes wild rice (*Zizania aquatica*), maidencane, panicum, cutgrass (*Leersia sp*.), common reed (*Phragmites australis*), pickerel weed (*Pontederia cordata*), arrowheads (*Sagittaria sp*.), buttonbush, St. John's wort (*Hypericum sp*.) and coastal plain willow (*Salix caroliniana*). Floodplain marsh dominants will also typically include sand cordgrass (*Spartina bakeri*) and sawgrass. Optimum fire return interval for this community is 2-10 years depending on fire frequency of adjacent communities.

The middle reach of the Ichetucknee River is dominated by floodplain marsh in the area known as Grassy Flats. The marsh is best developed between Mission and Mill Pond springs where the main channel passes through a broad shallow area. Dominated by wild rice, the marsh is comprised of many emergent aquatic plants rooted within the spring-run stream. High water during the winter of 1998 suppressed or killed back most of the emergent aquatic plants within the floodplain marsh. As water levels returned to normal during the spring and summer of 1998, however, recreational use of the Ichetucknee River, primarily tubing, impeded regrowth of the emergent aquatic vegetation due to trampling. Lack of vegetation left the main channel of the river unmarked, and many recreational users ran aground in the shallows of Grassy Flats. Fortunately, the floodplain marsh community is very resilient, and the emergent vegetation has made an almost complete recovery. Invasive water lettuce

(*Pistia stratiodes*) has been a chronic problem in the spring-run and floodplain marsh communities. A systematic and dedicated program of manual removal has dramatically reduced the occurrence of this species.

Maintenance of a natural hydrological regime is critical to the long-term health of floodplain communities. Many efforts designed to protect the spring-run stream also apply to floodplain marsh. Since the Ichetucknee River is relatively stable and non-fire adapted communities border its floodplain marsh, fire plays a lesser role in the maintenance of this community. Monitoring for impacts from invasive plant and animal species will continue.

Floodplain Swamp

Floodplain swamp is a frequently or permanently flooded community in low lying areas along streams and rivers. Soils will consist of a mixture of sand, organics and alluvial materials. In north Florida, the closed canopy will typically be dominated by bald cypress but commonly includes tupelo species as well as water hickory, red maple and overcup oak. Trees bases are typically buttressed. Understory and groundcover will be typically sparse.

Floodplain swamp straddles the lower reaches of the Ichetucknee River within the park. Cypress dominates this community, which typically occurs down slope of the alluvial forest and the various upland community types. In many cases, floodplain swamp and alluvial forest are difficult to distinguish from each other and form a complex mosaic based on local topography. Like alluvial forest, floodplain swamp was historically logged for large cypress trees but is now making a steady but gradual return to previous conditions.

Maintenance of a natural hydrological regime is critical to the long-term health of floodplain communities. Many of the efforts designed to protect the spring-run stream also apply to the floodplain swamp. Monitoring for impacts from invasive plant species and feral hogs will also continue.

Blackwater Stream

Blackwater streams are characterized as perennial or intermittent watercourses originating in lowlands where extensive wetlands with organic soils collect rainfall and runoff and slowly discharge it to the stream. The brown-stained waters will be laden with tannins, particulates and dissolved organic matter derived from drainage through adjacent swamps, producing streams that have sandy bottoms overlain by organic matter. Emergent and floating vegetation including golden club (*Orontium aquaticum*), smartweeds (*Polygonum spp*.), grasses and sedges will sometimes occur, but they are often limited by steep banks and dramatic seasonal fluctuations in water levels. Minimizing disturbances and alterations and preserving adjacent natural communities will be important considerations during management.

Rose Creek is a blackwater stream that forms a portion of the headwaters of the Ichetucknee River. It flows within the park for a short distance before sinking into Rose Creek Swallet and flowing underground. The stream is in good condition within the park. Additional information on the Rose Creek system may be found in the *Hydrology* section above.

The blackwater stream should be protected from erosion impacts within the park and, wherever possible, upstream of the park as well. Any decline in water quality of Rose Creek can have impacts on the Ichetucknee River downstream.

Spring-Run Stream

Spring-run streams are perennial water courses which derive most if not all of their water from limestone artesian openings to the underground aquifer carry waters that are cool, clear and circumneutral to slightly alkaline. These factors allow for optimal sunlight penetration and minimal environmental fluctuations which promote plant and algae growth. Such characteristics of the water can change significantly downstream as surface water runoff becomes a greater factor. Areas of high flow typically have sandy bottoms, while organic materials concentrate around fallen trees and limbs and slow-moving pools. Typical vegetation includes springtape, eelgrass, water milfoil (*Myriophyllum heterophyllum*), muskgrass (*Chara spp*.), creeping primrosewillow (*Ludwigia repens*), arrowheads, southern naiads (*Najas guadalupensis*) and pondweeds (*Potamogeton sp*.).

Because of its striking clarity and beauty, the Ichetucknee River is perhaps the premier example of a spring-run stream in Florida. Protected from development and most sources of water quality damage, the river was the primary focus of the park's designation as a National Natural Landmark and a State Natural Feature Site. Flowing for about 3.5 miles through the park, the river eventually joins with the Santa Fe River about 1.5 miles downstream of the park boundary. Two major springs (Ichetucknee headspring and Blue Hole) and a lesser spring (Cedar Head Spring) feed the upper reach of the Ichetucknee River. The run from Cedar Head actually flows into Blue Hole, where it merges with that spring's flow to form a short but voluminous run to the main river channel.

Numerous smaller spring-run streams and seepages along the edges of the river and within the adjacent floodplain contribute to the flow of the river. Additional descriptions of the springs may be found in the *Hydrology* section above.

The river has long been attractive to outdoor recreation enthusiasts. However, beginning in the 1960s, the river became increasingly popular for tubing and scuba diving. These activities, in addition to swimming, subjected this aquatic system to highly intensive, and potentially destructive, pressures. Extensive damage occurred to both the stream vegetation and stream bottom, particularly in the narrow, shallow, upper reaches of the river.

Monitoring of the visitor impacts on the spring-run stream began with a study by Charles DuToit in the late 1970s (DuToit 1979). Between 1979 and 1989, the river was monitored using photo points at key locations along the river. In 1989, formal line-intercept transects were installed on the river to monitor seasonal and annual vegetation changes. Additional information on the monitoring methods and results may be found in the *Hydrology* section above.

After the implementation of successively lowered carrying capacities on the river in 1978, 1983 and 1989, the Ichetucknee began to show a remarkable degree of recovery. Fencing of the runs below the headspring and Blue Hole also helped to limit the destruction that was taking place in the highly vulnerable upper reach of the river. When it appeared that sediments were accumulating on the downstream side of the existing barrier, staff replaced the fence below the headspring with a buoy line. Signage was used to discourage tubers from wading upstream and disturbing the submerged vegetation. Barriers still remain at Blue Hole Spring. The downstream fence may ultimately be replaced with a buoy line.

In recent years, water quality issues have increasingly threatened the spring-run stream. Elevated nutrient levels in the groundwater are causing increased periphyton growth on submerged aquatic vegetation in the river. The river is also experiencing higher turbidity associated with peak periods of recreational use. Foot traffic on the river bottom and the uprooting of aquatic vegetation tend to cause an increase in suspended sediments and silt in the water column and a corresponding decrease in sunlight penetration, particularly in the upper reaches of the river (WSI 2011). Turbidity, coupled with increased periphyton growth, appears to be having a harmful effect on submerged aquatic vegetation and, by extension, the species that depend on them. Formerly exacerbating this problem was a large and widespread infestation of water lettuce, a floating invasive plant which once extended the length of the river and at times covered the Grassy Flats section from bank to bank. Although mainly occurring along shorelines and backwaters of the river and other areas with low flow rates, the water lettuce had a large impact on submerged aquatic vegetation by blocking sunlight. In response to the threat, park staff organized a large-scale, volunteer-based effort, directed by a part-time employee who also conducted supplementary lettuce removal. The project has been very successful in manually removing water lettuce from the majority of the river over the past decade. This program reduced the water lettuce infestation to maintenance levels without the use of herbicides and enabled the removal of excess biomass from the river rather than allowing it to decompose in place. Additional information on the condition of the spring-run stream is detailed in the *Hydrology* section above.

Management of complex aquatic systems is a difficult task. Since many factors affecting the spring-run stream originate outside the park within the Ichetucknee springshed, management considerations must necessarily extend beyond the park boundary. Protection of groundwater sources within the Ichetucknee springshed will be a priority. DRP will continue to work with the Santa Fe River Springs Basin Working Group and to coordinate the numerous research projects associated with the river and its springshed. Staff will continue the vegetation transect monitoring that tracks changes in aquatic plant coverage and diversity.

Water quality issues that originate within the park are mostly related to recreational use. The greatest impacts from foot traffic are in the shallower reaches of the river, primarily in the upper portions. Sediments disrupted in shallow areas cause increased turbidity far downstream from the original point of disturbance. Efforts to educate visitors to refrain from touching the bottom or damaging aquatic plants are underway. The reallocation of the carrying capacity will help restore and preserve the upper portion of the river. Shifting all of the tubing use to the midpoint launch and increasing access to the upper river for canoes and kayaks achieves a higher level of protection for the upper river while still allowing recreational access.

The park will continue to manually remove water lettuce to keep the infestation at maintenance levels. The restriction on motorized craft will be continued to help prevent the introduction of the invasive aquatic plant hydrilla (*Hydrilla verticillata*) from the Santa Fe River.

Subterranean Cave—Aquatic

These natural communities are characterized as cavities below the ground surface in karst areas. A cave system may contain portions classified as terrestrial caves and portions classified as aquatic caves. The latter vary from shallow pools highly susceptible to disturbance to more stable, totally submerged systems. Cave systems are extremely fragile. Desired future conditions include protecting against alterations that may increase pollution in aquatic systems.

Aquatic caves are associated with all the springs within the park to varying extents and lie beneath much of the main park as well as the Ichetucknee Trace. Aquatic caves that are accessible to scuba divers require careful management to protect them from misuse. Springs and sinks that can provide access for divers include Blue Hole Spring, Rose Sink and McCormick Sink. The only public cave diving access is at Blue Hole Spring. All other cave entrances are restricted to permitted research dives only. At Blue Hole Spring, the cavern through which divers pass before entering the cave was defaced with graffiti in the past. Volunteers with the North Florida Springs Alliance removed the graffiti in 2013, although some scarring remains. As part of the Ichetucknee Hydrology Study, the accessible portions of the Blue Hole Cave were mapped and filmed by a team of cave divers (Skiles et al 1991).

Periodic monitoring of the aquatic caves by cave divers will allow staff to monitor impacts on the aquatic caves, particularly Blue Hole Spring. Research dives at Rose Sink and McCormick Sink provide details on the condition of those caves. Current research projects include mapping of the cave system between Rose Sink and McCormick Sink. Erosion of the slopes above the sinkhole lakes must also be monitored and corrected to prevent siltation of the aquatic caves.

Altered Landcover Types

Where altered landcover types occur, desired future conditions will typically be the historical natural community types described above.

Borrow Area

A borrow pit and dump were located in the southwest portion of the park adjacent to the park boundary. The desired future condition is upland mixed woodland.

Restoration of this site may not be a high priority and would require filling, contouring and replanting of upland mixed woodland species.

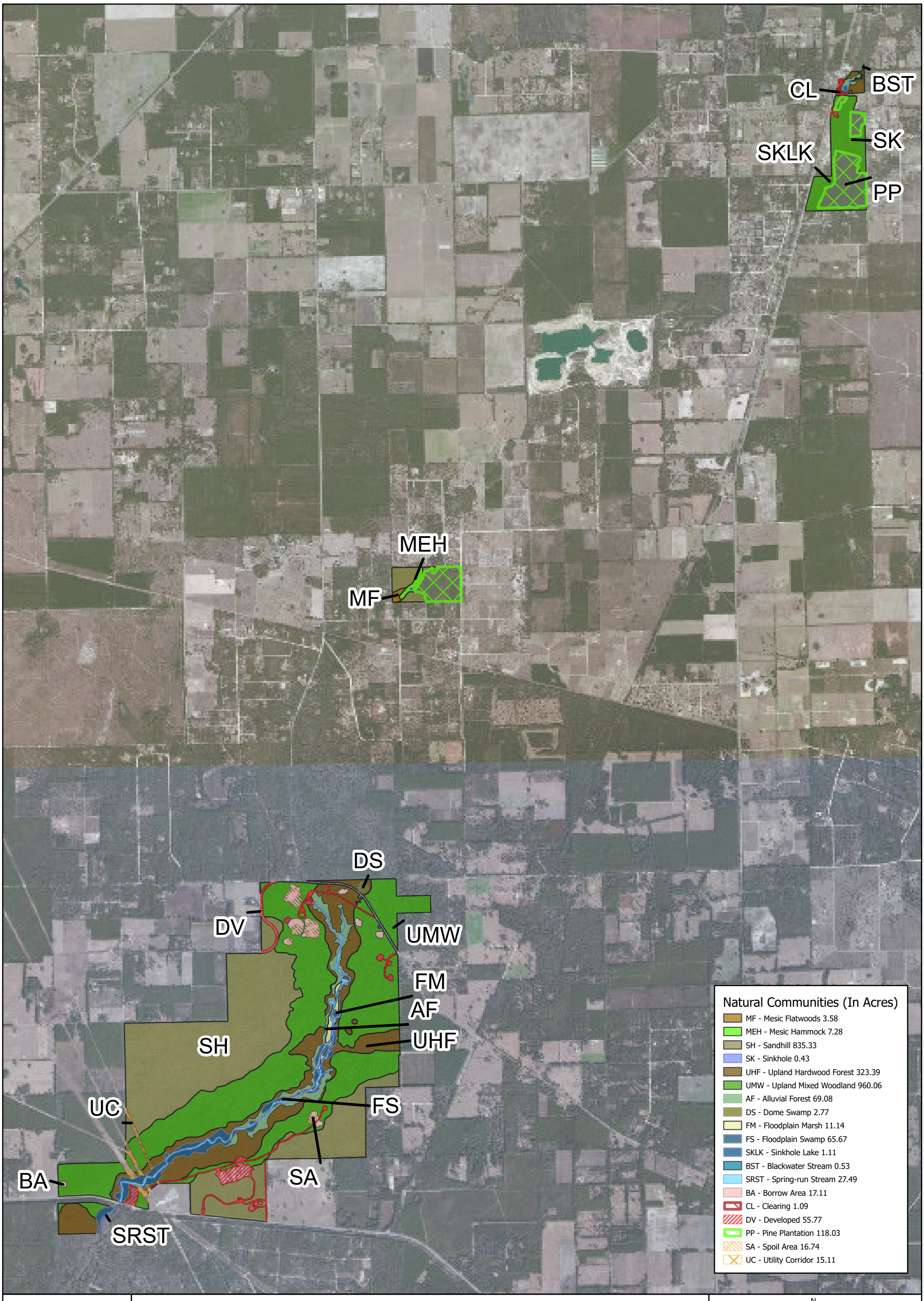
Other borrow areas are associated with phosphate mining pits in the north end of the park. The topographic and soil changes associated with the phosphate pits prevent typical restoration efforts. Since these would require significant expense to restore and they have some historical significance, the desired future condition for these mine pits will be borrow areas. Management measures for these areas include control of priority invasive plant species.

Clearing/Regeneration

The only clearings in the park are associated with the public road rights-of-way at the western edge of the Rose Sink parcel. The desired future condition for this area is upland mixed woodland. Replanting with canopy tree species and groundcover will be necessary, along with removal of non-native grasses and weeds.

Developed

Developed areas at the park include two shop complexes, park residences, parking lots, picnic areas, several bathhouses and restrooms and other support structures. The stormwater basin constructed at Rose Sink to prevent runoff from entering the cave system is classified as developed. The former private residence on the McCormick parcel and associated out buildings are included as developed. 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

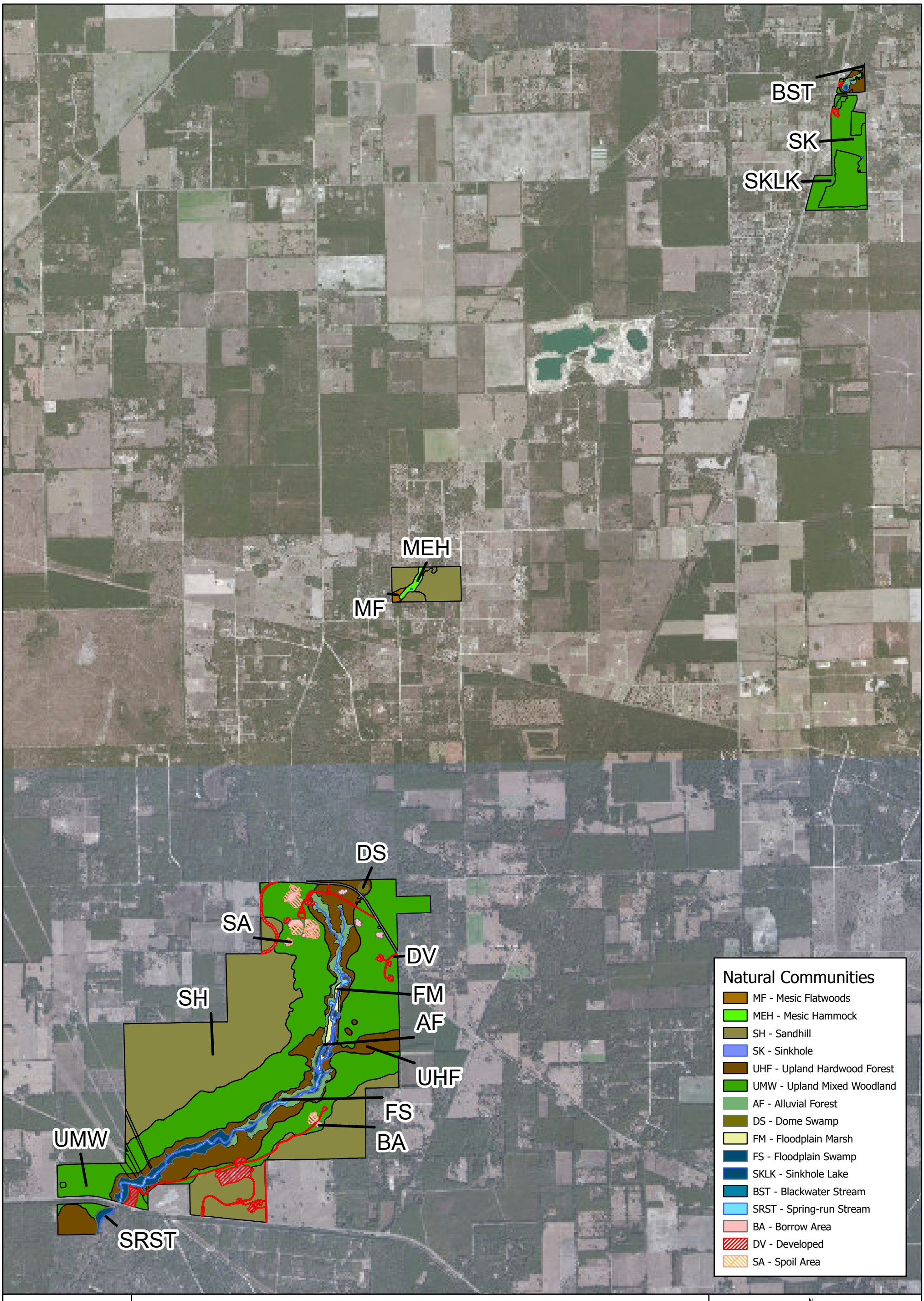


ICHETUCKNEE SPRINGS STATE PARK
Existing Conditions

N

0 0.5 1 Mile

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



ICHETUCKNEE SPRINGS STATE PARK
Desired Future Conditions

N

0 0.5 1 Miles

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, particular emphasis will be placed on proper treatment of sewage originating from the developed areas of the park. Advanced treatment systems may be required to ensure that septic system effluent does not contribute to a decline in groundwater quality.

Impoundment/Artificial Pond

A depressional wetland located south of County Road 238 was probably at one time part of the dome community north of the road but was cut off by construction of the road. This area appears to have been modified, perhaps to increase storage of runoff from the roadway. At this time, no restoration is planned for this impoundment and the desired future condition is impoundment/artificial pond.

Ichetucknee Trace property contains four large water-filled pits and some smaller pits that are the result of mining operations (Map 3). The water-filled pits reportedly extend as deep as 80 feet below surface level. The Florida Geological Survey conducted a bathymetric survey of the largest (northwestern) pit in July 2003 (FGS, 2003). The average depth was 33 feet, and a depth of 45 feet was recorded for the northwest corner of the pit. Bathymetric surveys of the other pits are planned. The USGS 1:24,000 topographic quad shows that a small stream was present in the area. The stream is no longer present and has been replaced by the pits and spoil. A borrow pit and small pond related to the stream remain to the east of the project.

Pine Plantation

Pine plantations are located on the McCormick and Saylor parcels. The pine plantations on the McCormick parcel have a desired future condition of upland mixed woodland or possibly upland pine. Most of the planted pines on the McCormick parcel were planted on abandoned pastures or fields that were cleared for agricultural uses prior to 1937 (the earliest available aerial photography). These agricultural fields were then converted to planted pines at some point after 1956. It is likely that most of these pines were harvested at least once and replanted. The large pine plantation in the southern end of the McCormick parcel was harvested and replanted in the early 1990s. Restoration of agricultural fields planted with pines to upland mixed woodland, while technically feasible, would require significant resources to restore the diverse groundcover that defines this community type. Thinning or removal of the slash pines and replanting with longleaf pines is an interim measure that would allow restoration of a fire regime. The pine plantations on the McCormick parcel were thinned in 2017 to initiate restoration. Control of priority invasive plant species is particularly important in these areas since many invasive species take advantage of disturbed areas.

The Saylor Sink parcel was cleared for agriculture and subsequently planted with slash pines. Some native grasses and herbaceous species were retained on site. This area will be restored to sandhill through thinning or removal of the slash pines and replanting with longleaf pines. Removal of off-site hardwoods and groundcover restoration may also be required.

Road

Roads within the park include the paved north and south entrance roads and the tram road. Management measures include proper stormwater treatment and prevention of erosion along the roads. Speed limits are posted and should be enforced to minimize the impact of the internal roadways on wildlife species by reducing road kills.

Spoil Area

Most of the spoil areas that are located within the main park are associated with the previous phosphate mining operations. The spoil piles are adjacent to the borrow areas. In most cases, restoration of these disturbed areas to their former natural communities is not likely due to the extent of the damage. Although the planted slash pines in the phosphate settling ponds could be removed, the extensive changes to the soil profile would preclude restoration to a moderately well-drained upland pine or upland mixed woodland.

Since the phosphate pits have some historical significance, the desired future condition for these spoil piles will be spoil areas. Management measures for these areas include control of priority invasive plant species.

Utility Corridor

Significant electric utility line corridors are maintained by Duke Energy at the southern end of the park. The lines run north-northwest across the park from the power substation located on U.S. Highway 27. Removal of the tree canopy occurred many years prior to state acquisition, and these areas are kept open by routine maintenance. Should these utility corridors ever be abandoned, the desired future conditions would include upland mixed woodland, upland hardwood forest and floodplain swamp. General management measures include control of priority invasive plant species and prescribed fire in the upland mixed woodland. The park coordinates with Duke Energy to try to minimize the impacts of the utility corridors on adjacent natural communities.

As discussed above, DRP practices natural systems management. In most cases, this entails returning fire to its natural role in fire-dependent natural communities. Other methods to implement this goal include large-scale restoration projects as well as smaller-scale natural community improvements. Below are the natural community management objectives and actions recommended for the park.

Prescribed Fire Management

Prescribed fire is used to mimic natural lightning-set fires, which are among the primary natural forces that shaped Florida's ecosystem. Prescribed fire increases the abundance and health of many wildlife species. A large number of Florida's imperiled species of plants and animals are dependent on periodic fire for their continued existence. Fire-dependent natural communities gradually accumulate flammable vegetation. Therefore, prescribed fire reduces wildfire hazards by reducing these wild land fuels.

All prescribed fires in the Florida State Parks system are conducted with authorization from the Florida Department of Agriculture and Consumer Services, Florida Forest Service (FFS). Wildfire suppression activities in the park are coordinated with the FFS.

Prescribed Fire

Objective: Maintain 1,460 acres within the optimum fire-return interval within 10 years.

Actions:

- Prescribe burn all fire type acreage according to FNAI fire-return intervals

The prescribed fire program at Ichetucknee Springs began in 1973, shortly after state acquisition of the property. Before that time, the previous owners had suppressed all fires for over 50 years. An aggressive prescribed fire program has reversed much of the damage to the sandhills. Restoration of the upland pine and upland mixed woodland will require mechanical and chemical removal of off-site hardwood species before prescribed fires will be effective in restoring degraded areas.

The park is divided into multiple prescribed fire zones or management zones (see Management Zones Map). However, some of these zones are further subdivided, with higher quality areas receiving maintenance fires in the growing season and lower quality areas receiving restoration fires during the early growing season or late winter. Soft firebreaks that minimize or eliminate soil disturbance are used to subdivide zones in most cases. Additional resource management zones will be designated in the McCormick and Saylor Sink parcels within the Ichetucknee Trace when perimeter and internal firebreaks are constructed to subdivide the existing management zones into smaller units.

Most permanent firebreaks within the sandhills are service roads or paved roads. Closer to the river in the upland mixed woodland, some natural firebreaks are used and prescribed fires are allowed to naturally penetrate overgrown areas. As upland mixed woodland areas are restored, these fires will penetrate further and further toward the floodplain and river as they once did. There is clear evidence from living relict longleaf pines and lightered pine stumps that the upland mixed woodland once stretched to the edge of the Ichetucknee River in some locations, and at least to the floodplain in others. One of the primary goals of the prescribed fire program at Ichetucknee Springs State Park is the restoration of the upland mixed woodland. Previous restoration efforts included girdling and herbiciding of off-site hardwood species in the upland pine and upland mixed woodland. It is critical that hardwood treatments be followed by prescribed fires. Isolated stands of remnant longleaf pines within the upland mixed woodland and upland pine will be targeted for off-site hardwood removal and prescribed fire. During or just after prescribed fires, efforts will be made to introduce fire into remote longleaf stands where perimeter ignitions did not penetrate far enough into the management zone to burn isolated longleaf stands. Having sufficient soil and duff moisture is an important consideration when introducing fire into long-unburned longleaf pine stands.

Burning under conditions with low soil moisture and a high drought index can lead to significant mortality of adult pines. Prescribed fires should be used to gradually remove accumulated duff layers over a period of several years rather than during a single fire event.

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 2-5 years for sandhill, the fire return intervals should be closer to the shorter end of the range to more effectively maintain this pyrogenic community as suggested in the most recent FNAI natural community description for sandhill (FNAI 2010). It is recommended that the sandhills be treated with prescribed fire at least every three years. The upland mixed woodland should be treated every 2-5 years along with the upland pine that separates it from the sandhills. Although the growing season or lightning season is the preferred time to conduct prescribed fires, dormant season fires may be used effectively during the restoration phases and allow an increase in the number of fires by lengthening the prescribed fire season. Dormant season fires conducted during periods of lower relative humidity are more effective at penetrating overgrown upland mixed woodlands than growing season fires at higher relative humidity.

Some of the more disrupted areas of upland pine and sandhill on the Ichetucknee Trace parcels may require significant mechanical or chemical control of hardwoods before an effective fire program can be initiated. Some of the more overgrown areas of upland pine and upland mixed woodland in the main park will also require additional management efforts before prescribed fires will be effective.

DRP will also monitor any future restrictions on prescribed fire in the region. Residences along the park boundary will be contacted before conducting adjacent prescribed fires. Public education about the benefits of prescribed fire will be promoted at the park to avoid future efforts to restrict prescribed fire in natural areas.

Many of the wildlife and plant species that occur within the park are adapted to and dependent upon a natural fire cycle. Without periodic low-intensity fires, the sandhills, upland pine, upland mixed woodland and other fire-adapted communities begin to lose plant and animal diversity. Prescribed fire is an essential tool in managing plant and animal species. Species such as the gopher tortoise, indigo snake, southeastern American kestrel and southern fox squirrel depend upon the open fire-maintained grasslands of the longleaf pine sandhills. Likewise, many rare plant species are associated with fire-maintained natural communities and depend on periodic fires for their survival and reproduction.

The prescribed fire management table contains a list of all fire-dependent natural communities found within the park, associated acreages, optimum fire return intervals and annual average targets for acres to be treated with prescribed fire.

Prescribed Fire Management		
Natural Community	**Acres**	**Optimal Fire Return Interval (Years)**
Sandhill	873	2-3
Mesic Flatwoods	4	2-3
Upland Mixed Woodland	980	2-5
Upland Pine		2-3
Floodplain Marsh	11	2-10
Dome Swamp	3	20
Pine Plantation	365	5
Annual Target Acreage	560 - 1000	

The park is partitioned into burn zones, and fire prescriptions are implemented on the prescribed fire cycle for each zone. The park's prescribed fire plan is updated annually because fire management is a dynamic process. To provide adaptive responses to changing conditions, fire management requires careful planning based on annual and very specific objectives. Each annual prescribed fire plan is developed to support and implement the broader objectives and actions outlined in this 10-year management plan.

Based upon the fire return intervals and acreage figures for the natural communities within the park, between 490 and 975 acres will need to be treated with prescribed fire each year to maintain the natural communities within their target fire return intervals. Not all zones may always be treated within the maximum recommended fire return intervals, while others may receive fire more frequently.

To track fire management activities, DRP maintains a statewide prescribed fire database. The database allows staff to track various aspects of each park's fire management program including

individual zone histories and fire return intervals, staff training/experience, backlog, if objectives have been met, and more. The database is also used for annual prescribed fire planning, which allows DRP to document fire management goals and objectives on an annual basis. The database is updated quarterly, and reports are produced that track progress towards meeting annual prescribed fire objectives.

Restoration

Objective: Conduct habitat/natural community restoration activities on 225 acres of upland pine and upland mixed woodland natural communities.

Actions:

- Conduct off-site hardwood removal on an average of 10 acres per year and conduct necessary follow-up management activities.
- Assess the 125-acre restoration area and implement groundcover restoration where necessary.
- Map the remnant longleaf pines within the fire-suppressed upland pine and upland mixed woodland communities at Ichetucknee Springs State Park.

Restoration of the upland pine and upland mixed woodland communities that border the Ichetucknee River will require a combination of management methods. The park contains nearly 1,000 acres of upland pine and upland mixed woodland. In many parts of these communities, suppression of natural fires over many decades has allowed off-site hardwood species to shade out the native species. These areas have been the focus of hardwood removal efforts since the early 1990s. Effective control of off-site hardwoods will be essential to the reintroduction of fire in the more overgrown areas. Hardwood treatments will be chemical or mechanical in nature.

Top priority treatment sites will be those that are adjacent to areas still in good enough condition to carry prescribed fire. The park's hardwood removal program should target a minimum of 10 acres per year, on average, for a total of 100 acres over 10 years. If dedicated funding becomes available for larger restoration efforts using outside contractors, then the park may treat additional acreage.

Ongoing maintenance after removal of off-site hardwoods will focus on prescribed fire. The park has installed permanent photo points within the hardwood removal areas, similar to those typically used in management zones, to monitor prescribed fire effects. As fires begin to stimulate suppressed groundcover species and further reduce off-site hardwood species, it should become easier to distinguish the upland pine from the upland mixed woodland community at Ichetucknee Springs State Park. Refinement of the natural communities map will probably be necessary as restoration proceeds.

Due to the relative rarity of high-quality upland pine, upland mixed woodland and the imperiled species associated with them, restoration of these communities is a very high priority at Ichetucknee Springs State Park.

DRP staff needs to assess the remnant groundcover in the 125-acre upland pine/upland mixed woodland restoration area where off-site hardwoods were previously treated. Wherever an appropriate density and diversity of groundcover is lacking, the park will initiate restoration measures using a combination of planting and direct seeding of wiregrass and other native groundcover species. The initial focus will be to provide sufficient groundcover to support prescribed fires. Wiregrass

plantings will be concentrated in those areas determined to be upland pine since wiregrass is typically not a dominant plant in upland mixed woodland.

A more accurate mapping of the upland pine and upland mixed woodland habitats, as well as their subsequent restorations, will require additional information about the original extent of these communities. As off-site hardwoods have invaded these habitats, fire is no longer reaching many of the remaining longleaf pines. These remnant trees are valuable indicators of the original extent of these habitats.

Knowledge of their locations could also influence prescribed fire plans. Introduction of fire around individual remnant longleaf pines, red oaks and mockernut hickories would expand the burnable area within the broader fire-suppressed habitat.

Improvement

Objective: Conduct habitat/natural community improvement activities on 85 acres of sandhill community.

Actions:

- Chemically treat and remove off-site hardwoods from zone 2D or 2F.
- Plant longleaf pine seedlings in zone 2D or 2F.
- Map remnant longleaf pines and native groundcover in successional hardwood forest at McCormick Sink and on the approximately 60 acres of newly acquired successional hardwood forest at the Ichetucknee Trace tract.
- Based on the results of Action 3, develop a restoration action plan.

Due to logging activities prior to state acquisition, some sandhill areas at Ichetucknee Springs State Park still lack sufficient regeneration of longleaf pines. In an effort to address that situation, longleaf pine seedlings will be planted on at least 25 acres of sandhill community on the west side of the park. Chemical treatment of off-site hardwoods will be an integral part of that habitat improvement effort. Another aspect of the improvement effort will be a reduction in density of some young turkey oak and sand post oak stands that have come to dominate certain areas due to the reduced frequency and intensity of prescribed fires there recently. Removing a percentage of the younger on-site hardwoods, along with off-site hardwood species, will improve longleaf pine survivorship and recruitment and will stimulate recovery of the native groundcover.

Sixty acres of successional hardwood forest that contain remnant longleaf pines, fire-suppressed wiregrass and other groundcover species were recently added to the Ichetucknee Trace tract. Prior to conducting restoration on the acres, staff should conduct a biological evaluation to determine how best to proceed. This will include mapping locations of remaining longleaf pines and remnant native groundcover species. Limited prescribed fires may be possible in the vicinity of remnant longleaf pines. The potential for additional prescribed fire will be addressed in the evaluation.

The McCormick Sink tract also has areas of successional hardwood forest that contain remnant longleaf pines and some groundcover.

IMPERILED SPECIES

Imperiled species are those that are 1) tracked by FNAI as critically imperiled (G1, S1) or imperiled (G2, S2) or 2) listed by the U.S. Fish and Wildlife Service (USFWS), Florida Fish and Wildlife Conservation Commission (FWC) or the Florida Department of Agriculture and Consumer Services (FDACS) as endangered, threatened or of special concern.

Ichetucknee Springs State Park has a rich diversity of plant and animal life, including a variety of imperiled species. Botanical studies (Herring and Judd 1995; P.M. Brown personal communication) have documented many of the rare plant species within the park. Staff observations and past monitoring efforts have also documented rare vertebrate species within the park.

Many of the imperiled animal species are associated with the sandhill and upland pine natural communities. These include the gopher tortoise (*Gopherus polyphemus*), short-tailed snake (*Lampropeltis extenuata*), southeastern American kestrel and eastern indigo snake. Continued restoration of fire-adapted upland communities will only serve to benefit these species.

The park has been recording observations of imperiled animal species since acquisition in the 1970s, although most observations date from the 1990s to the present. Numerous observations are summarized in spreadsheets, supplemented by hard copies of the original data forms showing specific map locations.

The Florida manatee (*Trichechus manatus latirostris*) is a visitor to the park, particularly in the winter months. It is likely that manatees are attracted to the warm waters of the river during cold weather. It is not known if the lower numbers of manatees observed in the warmer months are due to increased recreational use of the river. Since 1992, all manatee sightings by staff or park visitors have been recorded in a database along with date, location, and river stage data. Manatee access to the Ichetucknee from the Santa Fe River may be affected by water levels. The Ichetucknee River is classified as a Secondary Warm-Water Refuge in the Florida Manatee Warm-Water Action Plan (Valade et al. 2020). The river is considered to have medium or low thermal quality.

Park staff made a considerable commitment to monitoring the gopher tortoise population closely and to mapping burrow locations within prescribed fire zones. Staff have marked several hundred individual tortoises since 1997 and recorded recaptures. A long-term marking system has been adopted using a standard numbering system based on drilling small holes in the marginal scutes. Basic data were collected on each marked and released tortoise, including a visual inspection for signs of Upper Respiratory Tract Disease (URTD). This disease, caused by the bacterium *Mycoplasma agassizii*, was confirmed at Ichetucknee Springs State Park in the early 1990s. All tortoises within the park are considered potential carriers of the disease. While handling gopher tortoises, staff should take care not to allow tortoises to contact each other. All surfaces that the animals touch should be sprayed with a weak chlorine bleach solution (1-to-30 ratio of bleach to water) to kill the bacterium. Staff should also wash their hands between handling tortoises to reduce the risk of disease transmission. Gopher tortoises should not be subjected to unnecessary stress.

Stress has been linked to the onset of URTD symptoms. Staff have continued to cooperate with researchers from the University of Florida College of Veterinary Medicine and with FWC.

One source of transmission of this potentially fatal disease between tortoise populations is the practice of capturing tortoises in developed areas or on roadways and releasing them into protected areas such as state parks. These misguided attempts to aid tortoises may endanger many more tortoises. There are many anecdotal accounts of tortoises being released by visitors into state parks, including Ichetucknee Springs State Park.

In 2014, the park was included in an FWC-funded gopher tortoise population study using Line Transect Distance Sampling (LTDS) techniques conducted by staff of the Jones Ecological Center (Smith et al 2009). The LTDS technique provides more accurate and statistically valid estimates of gopher tortoise populations. Over 13.5 kilometers of transects were walked in the park. The estimated density of 3.97 tortoises per hectare was the third-highest recorded in the study, which included 26 state-managed public lands. The park is estimated to have 1,269 gopher tortoises with lower and upper confidence limits of 962 and 1,675 tortoises. The burrows had an occupancy rate of 44%. The study also included vegetation monitoring as part of a habitat suitability ranking. Ichetucknee Springs State Park was ranked as a high-quality site with a viable tortoise population in suitable habitat (Smith and Howze 2016). The park has a Tier 1 ranking in the Survey Prioritization Blueprint (FWC 2018) and is a high priority for future surveys.

Several species have historically been harvested for food in the region. These include the gopher tortoise, Suwannee (river) cooter (*Pseudemys concinna suwanniensis*) and Suwannee alligator snapping turtle (*Macrochelys suwanniensis*). Harvest or possession of gopher tortoises was prohibited statewide in 1988. Taking Suwannee cooters and alligator snappers from the wild was prohibited in 2009. In addition, species of similar appearance are 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, is prohibited within state park boundaries. The area under park jurisdiction includes the length of the Ichetucknee River within the park boundary as well as a 400-foot zone from the edge of mean high water along sovereign submerged lands of the Ichetucknee River below U.S. Highway 27.

In 2007, Dr. Peter Meylan was contracted for a population survey of turtles in the Ichetucknee River. Suwannee cooter was one of the most abundant species within the park (Chapin and Meylan 2011). Additional yearly surveys in 2014-19 and 2021 were conducted by Dr. Gerald Johnston of Santa Fe College in cooperation with the North American Freshwater Turtle Working Group. These surveys included captures of Suwannee alligator snapping turtles and showed an increase in the number of adult Suwannee cooters compared to the 2007 study. It is thought that the increase was related to extended dark water conditions in the Santa Fe River causing the Suwannee cooters to seek food in clear water systems (Johnston 2016). Johnston's research is expected to continue and will be expanded to include additional surveys for Suwannee alligator snapping turtles.

A southeastern American kestrel nest box program supplements natural cavities that may be scarce within the park. Staff and volunteers run the program each breeding season. In addition to monitoring nest boxes, the park cooperates with a USFWS-permitted bird bander to band and patagial-tag the young kestrel chicks for future identification. In 2008, the park joined with FWC in their Southeastern American Kestrel Conservation Partnership to increase monitoring and improve habitat management for southeastern American kestrels (Miller 2008).

In 2009, transects were placed in the sandhills to monitor Bachman's sparrows and other bird species listed as Species of Greatest Conservation Need (FWC 2005), including redheaded woodpecker

(*Melanerpes erythrocephalus*), common ground dove (*Columbina passerina*), northern bobwhite (*Colinus virginianus*), brown-headed nuthatch (*Sitta pusilla*) and swallow-tailed kite (*Elanoides forficatus*).

Everglades snail kites (*Rostrhamus sociabilis plumbeus*) have been rarely sighted in the park in the past. With the large breeding population currently established in nearby Alachua County on Paynes Prairie, sightings may become more frequent.

The tricolored bat (*Perimyotis subflavus*) has been documented within the park as part of FWC's Long-Term Bat Monitoring Program (LTBMP). DRP staff assist FWC with quarterly deployment of ultrasonic bat detectors at three sites within the park. The status of the tricolored bat is of particular concern due to the drastic population reduction of this species due to the fungal disease known as white nose syndrome in caves in the United States and Canada. The tricolored bat was proposed for listing as endangered by the USFWS in September of 2022. Use of bat detectors over time will provide insight into population trends of the tricolored bat within the park.

Road kills are a persistent problem for imperiled species at the park. Numerous road-killed gopher tortoises and indigo snakes have been documented over the years on park roads and on U.S. Highway 27 along the park's southern boundary. Recording road kills is part of the park's wildlife monitoring program. The park will continue to work with FDOT to investigate ways to reduce road kills.

The park also shelters the only known locality of Ichetucknee siltsnail (*Floridobia mica*), discovered in 1962 by Fred Thompson of the Florida Museum of Natural History. This species of snail only occurs at Coffee Spring on the western edge of the Ichetucknee River. Additional surveys in 1989 failed to find any other populations but documented that the snail was still as abundant as it was in 1962 (Thompson 1989). Staff erected a fence across the mouth of the Coffee Spring run to exclude recreational tubing from the spring and prevent damage to the microhabitat where the snail occurs. Qualitative surveys prior to 2004 indicated the siltsnail population may have declined compared to earlier surveys. In 2015, FWC researchers conducted the first quantitative monitoring assessment for Ichetucknee siltsnail at Coffee Spring (Warren and Bernatis 2015). The siltsnail was moderately abundant and showed high juvenile recruitment, indicating a healthy population.

Several threats to the siltsnail have been identified, including declining spring flows in the Ichetucknee River basin and water quality, specifically elevated nitrate levels and the potential for point source contamination within the springshed. The unknown source of the Coffee Spring groundwater supply is problematic. An additional threat to the siltsnail is the recent appearance of the exotic quilted melania snail (*Tarebia granifera*) and red-rimmed melania (*Melanoides tuberculata*). Both species are known to displace native snail species. FWC will conduct additional quantitative surveys to monitor population changes. A second imperiled snail species, the black-crested elimia (*Elimia albanyensis*), was documented by Thompson at Coffee Spring in 2000 during a survey of the Ichetucknee siltsnail. The black-crested elimia also occurs at several locations in the Apalachicola River drainage.

Aquatic cave systems within the park and the Ichetucknee Trace harbor several species of troglobitic cave crayfish. Of note is the state-listed Santa Fe cave crayfish (*Procambarus erythrops*), documented at Saylor Sink (T. Morris personal communication). FWC has developed a Species Action Plan for this species (FWC 2013). Additional species may be recorded as cave exploration continues within the Ichetucknee Trace.

Many rare plant species occur at Ichetucknee Springs State Park, and several of these, particularly the orchids, are relatively cryptic and difficult to find except when in bloom. It is possible that park development or recreational use could inadvertently damage or extirpate some populations of cryptic species. Florida willow (*Salix floridana*) is another rare species that may be overlooked. Although previously documented, Florida willow has not been observed since the flooding event of winter 1998. A 2003 survey of former locations failed to find any specimens remaining in the park.

Table 5 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 currently being taken by DRP staff 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**
	FWC	**USFWS**	**FDACS**	**FNAI**		
PLANTS						
Harvest-lice *Agrimonia incisa*			LT	G3, S2	1,6	Tier 1
Eastern sweetshrub *Calycanthus floridus*			LE	G5, S2		Tier 1
Spiked crested coralroot *Hexalectris spicata*			LE			Tier 1
Cardinalflower *Lobelia cardinalis*			LT		4	Tier 1
Florida milkvine *Matelea floridana*			LE	G2, S2	1,6	Tier 1
Angle pod *Matelea gonocarpos*			LT			Tier 1
Trailing milkvine *Matelea pubiflora*			LE		1,6	Tier 1
Giant orchid *Pteroglossaspis ecristata*			LT	G2G3, S2	1,6	Tier 1
Florida willow *Salix floridana*			LE	G2G3, S2S3	4	Tier 2
Lacelip ladiestresses *Spiranthes laciniata*			LT		1	Tier 1
Lesser ladiestresses *Spiranthes ovalis*			LE			Tier 1
Crane-fly Orchid *Tipularia discolor*			LT			Tier 1

Imperiled Species Inventory						
Common and *Scientific* Name	**Imperiled Species Status**				**Management Actions**	**Monitoring Level**
	FWC	**USFWS**	**FDACS**	**FNAI**		
Threebirds orchid *Triphora trianthophoros*			LT			Tier 1
Rainlily *Zephyranthes atamasca*			LT			Tier 1
INVERTEBRATES						
Black-crested Elimia *Elimia albanyensis*				G3Q, S1	4,10	Tier 2
Ichetucknee siltsnail *Floridobia mica*				G1, S1	4,9,10	Tier 3
Hobbs' cave amphipod *Crangonyx hobbsi*				G2G3, S2S3	4,10	Tier 2
Santa Fe cave crayfish *Procambarus erythrops*	ST			G1, S1	4,10	Tier 2
Alachua Light-Fleeing Cave Crayfish *Procambarus lucifugus*				G1G2, S1S2	4,10	Tier 2
Pallid cave crayfish *Procambarus pallidus*				G2G3, S2S3	4,10	Tier 2
North Florida spider cave crayfish *Troglocambarus maclanei*				G1G2, S1S2	4,10	Tier 2
Gopher Tortoise Noctuid Moth *Idia gopheri*				G2G3, S2S3	1,6	Tier 1
REPTILES						
American alligator *Alligator mississippiensis*	FT (S/A)	SAT		G5, S4	10	Tier 1
Eastern indigo snake *Drymarchon couperi*	FT	LT		G3, S2?	1,6,13	Tier 3
Gopher tortoise *Gopherus polyphemus*	ST			G3, S3	1,6,13	Tier 3
Short-tailed snake *Lampropeltis extenuata*	ST			G3, S3	1,6	Tier 1
Suwannee alligator snapping turtle *Macrochelys suwanniensis*	ST	PT		G2, S2	2,4	Tier 2
Florida pine snake *Pituophis melanoleucus mugitus*	ST			G4, S3	1,6	Tier 1

Imperiled Species Inventory						
Common and *Scientific* Name	**Imperiled Species Status**				**Management Actions**	**Monitoring Level**
	FWC	**USFWS**	**FDACS**	**FNAI**		
BIRDS						
Little Blue Heron *Egretta caerulea*	ST			G5, S4	2,4	Tier 2
Tricolored Heron *Egretta tricolor*	ST			G5, S4	2,4	Tier 2
Swallow-tailed Kite *Elanoides forficatus*				G5, S2		Tier 2
Southeastern American Kestrel *Falco sparverius paulus*	ST			G5T4, S3	1,5,6	Tier 5
Wood Stork *Mycteria americana*	FT	LT		G4, S2	2,4	Tier 2
Everglades Snail Kite *Rostrhamus sociabilis plumbeus*	FE	LE		G4G5, S2	4	Tier 1
MAMMALS						
Tricolored bat *Perimyotis subflavus*		PE			10,13	Tier 2
West Indian manatee *Trichechus manatus*	FT	LT		G2G3T2S2S3	4,10	Tier 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
11. Decoys (shorebirds)
12. Vegetation Planting
13. Outreach/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: 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.

Inventory

Objective: Update baseline imperiled species occurrence list.

Actions:

- Continue species identification through incidental observations and targeted surveys.
- Compile and convert imperiled species distribution and abundance data into electronic format in a geospatial database.

Baseline surveys by park biologists dating back to the late 1980s have documented numerous imperiled plant and animal species. Additional surveys by academic and university-based researchers have provided valuable supplements to park species lists. Staff will document species occurrences whenever possible and will work with outside researchers and institutions to document additional species occurrences.

Tracking of imperiled species within Ichetucknee Springs State Park has been consistent since at least the 1980s and large datasets of species occurrences are compiled. These data exist as hard copy maps or electronic spreadsheets.

Conversion to geographical information systems (GIS) coverage will allow more effective and efficient analysis of long-term trends and distribution patterns. DRP staff will digitize imperiled species locations and compile ancillary data. The resulting data will be incorporated into the DRPs GIS program, and any records not already transmitted to the Florida Natural Areas Inventory will be shared.

Animal Species Monitoring

Objective: Continue existing monitoring protocols for eight selected imperiled animal species.

Actions:

- Continue to implement existing monitoring protocols.
- Periodically review existing protocols.

Imperiled species management at Ichetucknee Springs State Park is built on a strong monitoring program. Park staff were instrumental in initiating a new National Audubon Society-sponsored Christmas Bird Count in December 2009 that included Ichetucknee Springs State Park. This annual bird census provides monitoring information on imperiled bird species. Park staff will also continue to record road kills of all imperiled and rare species within the park and on adjacent roadways, particularly gopher tortoises, indigo snakes, and southern fox squirrels.

Imperiled or rare species that are part of ongoing monitoring projects include the gopher tortoise, eastern indigo snake, southeastern American kestrel, tricolored bat, West Indian manatee, Suwannee alligator snapping turtle, Ichetucknee siltsnail and several troglobitic arthropods.

Gopher Tortoise

In 2014, the park was systematically surveyed using Line Transect Distance Sampling (LTDS) techniques to develop a statistically valid estimate of the gopher tortoise population. The mark/recapture study of gopher tortoises at Ichetucknee Springs State Park has been ongoing since 1997 and has resulted in over 300 tortoises being individually identified. This project is particularly relevant since it provides long-term survivorship data on a population that has been documented to have a high incidence of Upper Respiratory Tract Disease. The park staff will continue monitoring the

gopher tortoise population for URTD. Continued cooperation with FWC will be an important part of the management of this threatened species. Any increase in the incidence of the disease or any abnormally frequent observations of dead tortoises should be reported to the FWC Wildlife Research Laboratory in Gainesville. Interpretation 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.

Eastern Indigo Snake

Opportunistic observations of eastern indigo snakes have been documented by staff at Ichetucknee Springs State Park for many years. In 2022, FWC initiated an occupancy survey to further document eastern indigo snakes in the sandhills of the main park as well as the Ichetucknee Trace tract. This two-year study is proposed as the initial phase of a longer-term monitoring effort at multiple sites to address components of the USFWS recovery plan.

Southeastern American Kestrel

DRP staff and volunteers will continue monitoring the kestrel nest boxes. DRP staff will also continue to assist FWC with the Southeastern American Kestrel Conservation Partnership (Miller 2008).

Tricolored Bat

DRP staff will continue to assist FWC with implementation of the Long-Term Bat Monitoring Program deploying ultrasonic detectors on a quarterly basis at three locations within the park.

West Indian Manatee

DRP staff and outside researchers will continue to document the occurrence of manatees in the Ichetucknee River. Data collected include the location, number and, where possible, the sizes and distinguishing characteristics of the animals. Staff gauge readings on the river are also included in the database to look at the relationship between river stage and manatee use of the river within and below the park boundary. At certain river stages, access to the park may be more difficult for manatees. Any decline in the output of the springs that feed the Ichetucknee River could potentially affect manatee access to these warm water refugia, so monitoring of river stage readings will continue to be an important component of this project. Staff will continue to refer to the FWC Manatee Management Plan (FWC 2007a) to guide management of this imperiled species. Staff will also coordinate with FWC and the USFWS to implement the Florida Manatee Warm-Water Habitat Action Plan (Valade et al. 2020). Water temperatures are measured on a monthly basis at seven locations along the river and in three spring locations as part of ongoing water quality monitoring by the SRWMD and other agencies.

Suwannee Alligator Snapping Turtle

DRP will continue to cooperate with and assist Dr. Gerald Johnston of Santa Fe College, the North American Freshwater Turtle Research Group and the Turtle Conservancy in their surveys of freshwater turtles in the Ichetucknee River.

This long-term study provides valuable information on the status of all freshwater turtle species in the park, including the state threatened Suwannee alligator snapping turtle. Although the Suwannee cooter is no longer listed as an imperiled species in Florida, it is a primary focus of this study, which

provides data on long-term population trends of multiple turtle species.

Ichetucknee Siltsnail

Due to its small size and the difficulty in identifying the Ichetucknee siltsnail, the park will depend on specialists with FWC to conduct periodic sampling to estimate population levels within Coffee Spring. Coffee Spring should remain closed to visitor access to protect the Ichetucknee siltsnail. The 2004 survey noted a slight decline, perhaps due to a decline in water quality. The formal survey in 2015 found the siltsnail to be moderately abundant. Monitoring of water quality at Coffee Spring will continue as part of the larger ongoing monitoring of the Ichetucknee River and its springs. An investigation into the groundwater sources of Coffee Spring is also recommended.

Troglobitic Arthropods

Routine censuses of aquatic cave-dwelling crayfish, amphipods and isopods are currently being conducted as part of a series of cave faunal abundance surveys by researchers at Blue Hole and Rose Creek Sink. Park staff also cooperate with other researchers monitoring or sampling aquatic cave-dwelling arthropods.

Repeated censuses will document fluctuations in arthropod populations that might be correlated to flooding events or alterations in water quality.

DRP staff will periodically review protocols for monitoring imperiled animal species within the park in cooperation with FWC, the USFWS and other partners.

Plant Species Monitoring

Objective: Continue existing monitoring protocols for two selected imperiled plant species.

Actions:

- Continue to implement existing monitoring protocols.
- Periodically review existing protocols.

Ichetucknee Springs State Park has a well-documented flora and a number of imperiled plant species. Staff will need to map all locations of imperiled plant species recorded by Herring (1994) and other researchers near visitor-use areas or where future development may occur.

Florida Willow

The Florida willow was last observed in the park prior to 1998. Surveys since 2003 have not rediscovered this species. Staff will continue to conduct surveys for Florida willow at previously known sites to determine its status in the park.

Harvest Lice

A second imperiled species, harvest lice, is of note since it is a component of the upland pine and upland mixed woodland communities and responds favorably to periodic fires. Tracking of this species may serve as a form of bio-indicator for the restoration efforts in the upland pine and upland mixed woodland. As the park reintroduces fire to restoration sites and shading from invasive hardwoods decreases, harvest lice populations may increase. Staff should conduct surveys for blooming harvest lice in late summer and early fall.

DRP staff will periodically review protocols in cooperation with FNAI, FDACS and other partners.

INVASIVE SPECIES

Ichetucknee Springs State Park contains a variety of invasive plants located in areas of previous disturbance such as former phosphate pits, old house sites, road rights-of-way and firebreaks. Water lettuce is also present in the Ichetucknee River. Invasive plant infestations also occur at the Ichetucknee Trace, Saylor Sink, McCormick Sink and Rose Sink properties. Additional surveying and mapping of invasives is needed on those properties, as well as in the main park. Even areas that historically have been free of invasive plants need to be included in a periodic survey schedule so that any new infestations that appear may be detected early and treated quickly. All invasive plant populations need prioritization for removal based on their potential to spread aggressively through the park. Staff should seek funding for invasive removal annually, not only from DRP and DEP sources, but also through FWC grants.

Species of particular concern in the uplands are cogongrass (Imperata cylindrica), sweet tanglehead (*Heteropogon melanocarpus*) and Japanese climbing fern (*Lygodium japonicum*). Much of the climbing fern infestation occurs in old phosphate pits. The Rose Sink and Saylor Sink properties also have some Japanese climbing fern. Both the McCormick and Rose Sink properties have old house sites containing a diversity of invasives, including ardisia (*Ardisia crenata*), heavenly bamboo (*Nandina domestica*) and silverthorn (*Eleagnus pungens*). The McCormick parcel also has a pine plantation in which mimosa (*Albizia julibrissin*) is scattered throughout. A small infestation of cogongrass occurs in the McCormick Tract and on the roadside edge of zone 2H. Ichetucknee Trace also has cogongrass.

DRP staff will continue the program of water lettuce removal. This volunteer-based, manual removal program has successfully controlled water lettuce in the majority of the spring-run stream and floodplain marsh in the park without the use of herbicides. The water lettuce control is now in maintenance phase.

Invasives have been treated in-house at Ichetucknee Springs State Park and Rose and Saylor sinks. Ichetucknee Springs State Park and the McCormick property have each received contract treatments as well. Because of the diversity and widespread distribution of the invasives at the McCormick property, staff will need to develop a control plan specifically for this site.

The invasive grass sweet tanglehead (*Heteropogon melanocarpus*) is an increasing problem, particularly at the southern end along U.S. Highway 27 and the west side of the park. This grass, which mowers have apparently spread for miles along U.S. Highway 27, is gradually moving into the sandhills from the road shoulder. It is also spread along firebreaks within the park. Staff need to develop and implement a plan to control this species and prevent it from encroaching further into the sandhill.

Another invasive species not listed by FISC is showy rattlebox (*Crotalaria spectabilis*), which occurs sporadically in disturbed areas in the park and could become problematic in the sandhills. Staff should regularly monitor for this species as a preventative measure to ensure it does not begin to proliferate in the future.

To prevent mowers from inadvertently introducing invasive plants, staff should develop and implement a protocol for inspecting and cleaning equipment prior to entry into the park. This is critically important since cogongrass now occurs on the road shoulder in one area of the park. A well-designed protocol could help ensure that the equipment is free of contamination from seeds or other propagules.

Ichetucknee Trace

Species Name Scientific Name - Common Name	FLEPPC Category	Distribution	Zone ID
Albizia julibrissin - Mimosa	I	Scattered Plants or Clumps	IT-3
Dioscorea bulbifera - Air-potato	I	Single Plant or Clump	IT-3
Imperata cylindrica - Cogon grass	I	Scattered Dense Patches	IT-3
Pteris vittata - Chinese brake fern	II	Scattered Plants or Clumps	IT-3

Ichetucknee Springs State Park

Species Name *Scientific Name* - Common Name	FLEPPC Category	Distribution	Zone ID
Albizia julibrissin - Mimosa	I	Single Plant or Clump, Scattered Plants or Clumps	IS-1Es, IS-1B, IS-3A, IS-4F, IS-5, IS-6
Aleurites fordii - Tung oil tree	II	Scattered Plants or Clumps	IS-2C, IS-3A
Ardisia crenata - Coral ardisia	I	Scattered Plants or Clumps	IS-6
Cinnamomum camphora - Camphor-tree	I	Single Plant or Clump, Scattered Plants or Clumps	IS-4E, IS-6
Colocasia esculenta - Wild taro	I	Single Plant or Clump	IS-6
Dioscorea alata - Winged yam	I	Scattered Dense Patches	IS-6
Imperata cylindrica - Cogon grass	I	Single Plant or Clump, Scattered Plants or Clumps	IS-6, IS-2H
Lygodium japonicum - Japanese climbing fern	I	Single Plant or Clump, Scattered Plant s or Clumps	IS-2G, IS-2H, IS-4A, IS-4B, IS-4E, IS-5, IS-6
Melia azedarach - Chinaberry	II	Scattered Plants or Clumps	IS-6
Nandina domestica - Nandina	I	Single Plant or Clump	IS-6
Pistia stratiotes - Water-lettuce	I	Scattered Dense Patches	IS-2G, IS-3A, IS-3B, IS-3Cn, IS-3Cs, IS-3D, IS-4B, IS-4C, IS-4D, IS-4E, IS-4F

Species Name *Scientific Name* - Common Name	FLEPPC Category	Distribution	Zone ID
Sapium sebiferum - Chinese tallow tree	I	Single Plant or Clump, Scattered Plants or Clumps	IS-2C, IS-2F, IS-6, IS-2D, IS-3B
Wisteria sinensis - Chinese wisteria	II	Scattered Plants or Clumps, Scattered Dense Patches	IS-2C, IS-3A, IS-6

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, with priority being given to 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 (*Sus scrofa*) have become problematic in the park, primarily by rooting in areas near the river. DRP will continue to aggressively pursue removal of the hogs to protect the numerous cultural sites in the park as well as the river floodplain, other wetlands, and upland natural communities, particularly the sandhills. Other non-native animal species, including stray dogs, cats, and armadillos (*Dasypus novemcinctus*), will be removed using appropriate techniques.

Detailed management goals, objectives, and actions for management of invasive plants and invasive and nuisance animals are discussed in the *Resource Management Program* section of this plan.

DRP actively removes invasive species from state parks, with priority being given to those causing the most ecological damage. Removal techniques may include mechanical treatment, herbicides, or biocontrol agents.

Invasive Plant Treatment
Objective: Annually treat 20 infested acres of invasive plant species which are dispersed over approximately 453 gross acres.

DRP will develop an invasive plant removal plan that prioritizes zones and invasive species based on the ecological importance of the habitat and the aggressiveness of the invasive species. The plan will include maps of infested areas by management zone and will determine priorities for treatment. The plan will provide guidance for subsequent annual work plans. The acreage of invasive plants treated per year will vary depending on the status of current infestations or of any new infestations that might arise during the life of this management plan.

A top priority for annual fall treatment is cogongrass. Given that cogongrass thrives under a fire regime and will aggressively invade sandhill and other fire-type communities, replacing the native groundcover, the species should be eliminated from the park. Loss of native groundcover in these communities will deprive gopher tortoises and other species of their food source.

Another high priority sandhill invader species is the grass sweet tanglehead, (*Heteropogon melanocarpus*). Treatment of this species also occurs in the late summer and fall when the grass has grown enough to be visible. It is an annual that requires multiple treatments several weeks apart because plants grow and become visible from August to October.

Treatment of Japanese climbing fern will continue annually. Hand removal of water lettuce along the Ichetucknee River and floodplain will continue so that control of this species remains in maintenance state. Treatment should be focused on FISC Category I and II species, with the exception of sweet tanglehead. This species is not currently listed with FISC but is rapidly invading natural areas in north Florida and needs multiple annual treatments.

The park will plan to treat an average of about 20 infested acres of invasive plants every year, with the treatments roughly apportioned as follows: 363 gross acres in park uplands and 90 gross acres in the Ichetucknee River and associated wetlands.

Removal of non-invasive plants will be promptly completed within the park as feasible. However, ornamentals that are known to be non-invasive and that occur in landscaping around residences may remain. Staff will monitor treated areas and implement follow-up treatments as needed.

Invasive Plant Preventative Measures
Objective: Develop and implement measures to prevent the accidental introduction or further spread of invasive plants in the park.

DRP needs to schedule and conduct surveys and mapping of invasives in every zone within the park at least twice within the next 10 years. It is important to know what invasive species are present within the park, where they are located and how severe their infestation is. It is also very important to know what zones or communities are currently free of invasives, and to keep those areas invasive-free. This is particularly important for high-quality or ecologically important habitats. By regularly surveying these invasive-free zones, staff can find new infestations early and eliminate them before they increase significantly. Areas that serve as sources of particularly aggressive species, or of species that can dramatically change ecosystem function, may need to be scouted more frequently. Finding new populations of invasive plants before they become established will help prevent larger infestations. The focus should be on FISC Category I and II species, while at the same time watching for new species that exhibit aggressive tendencies.

Preventative measures should be designed to avoid the accidental introduction or spread of invasives. To prevent the introduction of invasive plants by mowers, tractors, logging skidders and other equipment, park staff will need to develop and implement a protocol for equipment inspection and decontamination. The park may be able to prevent some new infestations of invasives by ensuring that contractors clean their equipment before operating in the park.

The further spread of invasives already established in the park may be avoided by making sure that staff and contractors do not move equipment from a contaminated area to an invasive-free area without cleaning their equipment first. This may be especially important for the invasive grass sweet tanglehead, which currently is growing at the edge of the sandhills along the south and west boundaries of the park, since mowing and the disking of fire lines can cause it to spread.

To help prevent properties that are adjacent to the park from becoming sources of invasives, staff may need to educate neighbors about threats to the park posed by the cultivation of invasives.

Invasive and Nuisance Animal Control
Objective: Implement control measures on a minimum of three nuisance and invasive animal species.

Feral hogs are a recurring problem at Ichetucknee Springs State Park. Feral hog control activities will focus on areas where hogs are causing the most damage, including the Ichetucknee spring run, associated floodplain and any threatened cultural resources. The park must also occasionally remove feral or stray cats and dogs from the park, which should be turned over to the county animal control facility. Adjacent homeowners will be contacted, if necessary, to discourage free-roaming pets from entering the park.

CULTURAL RESOURCES

Prehistoric and Historic Archaeological Sites

Ichetucknee Springs State Park contains 51 archaeological sites and three resource groups, including two designated as a district (8CO49 and 8SU345) and one designated as a linear resource (8CO57). These sites represent diverse cultural resources that range from the Paleoindian era to the Spanish Colonial Aboriginal contact era and to the 19th- and 20th-century mill and phosphate mine era. In fact, the entire park has been recorded in the Florida Master Site File (FMSF) as the Ichetucknee River Archaeological Zone (8CO49 and 8SU345). A predictive model for the park was completed in 2012 (Collins et al 2012). The Ichetucknee Trace tract does not have any known cultural resources at this time.

The park has several types of prehistoric sites. There are three confirmed burial sites, with at least three additional mounds that may contain burials. Additionally, two sites are prehistoric campsites, two are prehistoric habitations and two are classified as quarries. Numerous sites are classified as artifact scatters including lithics, ceramics or both. Several of these sites occur underwater. Very little information is available for other sites.

Based on artifacts found within the park, Aboriginal occupation of the area spans the entire length of Florida's Indian ethnohistory as defined by Milanich (1990). A few Paleoindian artifacts have been recovered from the park (11,500-9500 B.C.). Archaic period (9500-1500 B.C.) tools have also been recovered from the park, as has late Archaic pottery. Scattered artifacts from the Deptford period (500 B.C.-200 A.D.) have been found in the river and along the riverbanks.

Archaeological remains from the Weeden Island culture (200-1000 A.D.) include scattered ceramics, a habitation and two burial mounds, one of which has been looted and may not be presently recorded with the Florida Master Site File (possibly formerly 8SU29, Weisman 1990). The transition period between the Weeden Island and Leon-Jefferson periods is the Suwannee Valley period (750 A.D. to currently unknown). The period of European contact, or Spanish Mission period, which is characterized by Leon-Jefferson series ceramics, covers the time span of circa 1585-1700 A.D.

Important paleontological resources have been recovered from the riverbed and associated springs within the park. In 2003, a portion of a Pleistocene mastodon (*Mastodon americaneus*) skull was discovered in the Ichetucknee, and in 2022 another mastodon bone was found in the riverbed. Other

Pleistocene mammal remains found in the park include mammoth (*Mammuthus*), horse (*Equus*), tapir (*Tapirus*), giant jaguar (*Felis atrox*), saber-tooth cat (*Smilodon fatalis*), bison (Bison *antiquus*) and other extinct and living species. The Ichetucknee River lies in an area where the Ocala Group limestones reach at least mean sea level and very often extend above the ground surface. The stratigraphy of the limestone deposits, combined with periodic flooding, is responsible for its continual erosion and redeposition of fossil-bearing Pleistocene soils along the watercourse. Fossils have been recovered at several archaeological sites.

The best-documented site at Ichetucknee Springs State Park is the Fig Springs site (8CO1). Refuse dating to the Spanish period was discovered in Fig Spring in the late 1940s by John Goggin of the University of Florida (Deagan 1972), who surmised the artifacts in the spring were refuse from a nearby Spanish mission. Artifacts collected at Fig Springs by Goggin have been extensively studied and dated (Deagan 1972). The actual mission site was not located until a field crew led by Ken Johnson (1990) discovered mission artifacts, human burials, and a possible clay floor on a nearby bluff in 1986. Until the most recent work at Fig Springs from 1988 to 1990, it was assumed that the Fig Springs Mission was the Santa Catalina de Afuerica, based on written mission locations. However, as a result of the recent work that involved excavations and intensive study of many facets of the site by a team of researchers, the current thought is that the Fig Springs Mission is the mission San Martín de Timucua (also called San Martín de Ayaocuto) (Weisman 1991 and 1992).

Since 1972, 14 surveys have occurred within the park or along its perimeter. One survey took place in a disjoint park parcel. All surveys were performed prior to construction activities (Weisman 1989a). In 2001, a pre-construction survey of the park's new administration, education and exhibit center was conducted. No cultural resources were found at that location. In 2006, a Phase 1 survey of the Rose Creek Sink coincided with the acquisition of the property and the construction of a retention pond built to protect the water quality of the sink and the Ichetucknee River and springs (Dickinson and Wayne 2006). One site occurs in the area of the survey, 8CO33. It contains a mix of historic refuse, the remains of a mid-20th century habitation and culturally undiagnostic lithic debitage that is characteristic of a hunting site. Two other recently acquired parcels, McCormick Sink and Saylor Sink, have not been surveyed.

Prior to 2001, five sites were the subjects of small studies. A salvage investigation was conducted near 8SU28 before expansion of the headspring parking area in 1972 (Clauser 1972). The researcher concluded that the site had been previously disturbed but recovered materials spanning from the Deptford period (500 B.C.) to the Alachua period (1539 A.D.). Dampier's Landing (8CO15) has also been studied, primarily to recover Pleistocene fossils. This study recovered very few cultural remains (Cring 1989). Midpoint Mound (8CO43) and Mill Pond (8CO8) were also excavated (Weisman, 1989b).

Nearly half of the recorded sites at Ichetucknee Springs State Park are prehistoric sites. The historic sites are mostly from the 20th century, and many of them are associated with the phosphate mining industry. Three of the historic sites have 17th-century Spanish artifacts. Historic sites from the 19 and 20 centuries include an old mill site, the old Bellamy Road, disturbed areas such as phosphate pits and tram beds that are associated with phosphate mining, a 20th-century habitation that has been demolished, and historic refuse. In addition to Fig Springs, the old Bellamy Road (8CO57) and the Old Mill Pond site (8CO08) are likewise important archaeological sites. Old Bellamy Road, the historic road that connected Tallahassee and St. Augustine, passes near the Ichetucknee headspring. Alternate names for this road, the Old Spanish Trail and the Old Indian Trail, suggest it may have been used in prehistoric times as well. The other important recorded site with an historic component is the Old Mill Pond site (8CO08). With

the influx of agriculture into this area in the 1800s, a grist mill was established at what is now known as Mill Pond Springs. A mill race was cut into the limestone bank next to the spring. A log dam was placed in the spring run to divert water into the race to turn the mill wheel.

Evidence of the mill race, such as slots for the wheel and portions of the log dam, still exists. Interviews from the parks annual “Old Timers Days,” though undocumented, suggest that the town of Ichetucknee was located near Old Mill Pond. The town reportedly had a post office, general store and several residences, the locations of which are unknown (Bradbury and Hallock 1962). Spanish artifacts that date to the 17th century have also been found at Old Mill Pond, as have Aboriginal artifacts (Weisman 1989b).

Park staff has documented previously unrecorded cultural resources, which are scattered throughout the park, and submitted them to the Division of Historical Resources. While these have been assigned FMSF numbers, in the future the park may want to consolidate some of the ones associated with phosphate mining into fewer FMSF sites. Tram roads and other roads could be recorded as one resource group with the FMSF in the future, instead of individually. Phosphate was first mined at Ichetucknee between 1900 and 1920. Black laborers removed the phosphate with picks and shovels and used wheelbarrows to haul it away until a boiler was built and steam-powered winches were put into use. A tram road was constructed that bridged the Ichetucknee River at "Trestle Point.” The tram road was part of a maze of narrow-gauge railroads that existed in Florida at the time. During this period, only "pure rock" phosphate was taken. Around 1943, the value of the residue left behind by these early miners was realized, and mining crews returned to retrieve it. Using modern equipment, the operation lasted until about 1967. This was the last time phosphate was mined from the property. Numerous mine pits and tram roads still exist in the park.

From about the time the grist mill was established until shortly after the first phase of phosphate mining had begun, turpentining operations were conducted in the virgin pine forests. Evidence of the turpentine industry still exists in the form of "catface" scars on a few of the older trees. Most of the mature trees, however, were timbered by the early 1920s. Cedars were also cut from the lands adjacent to the river, purportedly for the manufacture of pencils in Perry, Florida, and many stumps remain along the river near Cedar Head Run.

Remnants of a moonshine still (CO1022), including large pieces of the boiler, have been found along Cedar Head Run. No information is available as to when or how long the still was in operation. At least three old home sites, and likely more, occur on park property. One is located in the northwest corner of the park and another on the west side of the river near the south end of the park. An old log cabin was situated in the headspring area. Numerous landings, likely dating from the early 20th century, also occur along the river.

Ichetucknee Springs State Park has created a program called “Old Timers Day,” held once a year, when persons with historical knowledge are interviewed. These interviews have yielded accounts of many potential unrecorded cultural resources. Some of the resources mentioned include the town of Ichetucknee near Old Mill Pond, numerous home sites and an old wagon road. A historic unmarked graveyard was reported outside the park boundary.

Condition assessment: The majority of the archaeological sites are in good condition. Those that are in fair condition are 8CO1, 8SU310 and 8SU249. As noted at the time of recording the sites with the FMSF, one site, 8SU28, is in poor condition because it was partially bulldozed.

In 1999, most of the sites that were recorded at that time were visited during a resource management evaluation. There was no evidence of looting, storm damage or other accelerating factors (Younker 1999). These sites were revisited in 2009. The 22 recently recorded sites were visited during December 2009 and January 2010.

Site 8CO1 is a proposed National Historic Register site. It is listed in fair condition because of potential impacts from tree roots and possibly from feral hogs. The site needs a maintenance plan and a preservation protocol to address the best ways of protecting it.

Site 8SU249 is also listed in fair condition because it is in the powerline right-of-way. There is the ongoing potential that powerline maintenance activities might affect it.

Site 8SU310 was recorded during the course of the ongoing restoration of the Ichetucknee headspring. It is listed in fair condition because restoration activities have the potential to impact the site. Restoration, which began in 1994, is discussed in the *Hydrology* section. As the restoration progressed to deeper levels, more prehistoric artifacts were recovered. Park staff requested assistance from the Division of Historical Resources. To date, historic and prehistoric artifacts have been recovered along with rubble, sand, and silt. Recovered artifacts have been transferred to the DHR Bureau of Archaeological Research through an existing procedure. Over the course of this project, concerns have been raised about the method of restoration and its potential to impact archaeological resources. Some have suggested that a geoarchaeological-based methodology could best guide the restoration project and help avoid archaeological and geological impacts.

Site 8SU28 is listed in poor condition because it was partially destroyed by a bulldozer and because the proposed extension of CR 238 would further impact the site.

The increasing numbers of feral hogs in the park pose a potential threat to all the terrestrial archaeological sites.

Level of significance: The park is designated the Ichetucknee River Archaeological Zone (sites 8CO49 and 8SU345). Most of the 54 archaeological sites have not been evaluated yet, however.

Two sites, 8CO1 and 8CO408, are considered National Register-eligible. Four sites, 8CO33, 8CO942, 8SU28 and 8SU251, have been evaluated as not significant. The remaining sites need evaluation.

General management measures: 8CO1, a proposed national register site, needs a preservation protocol and maintenance plan that addresses the best methods of protecting the site. Potential threats to the site include impacts from tree roots and possible damage by feral hogs. Potential solutions that should be considered in a preservation protocol and maintenance plan for the site include mowing, trapping of feral hogs or other measures.

Site 8SU249, located in a powerline right-of-way, needs a preservation protocol and maintenance plan that will help protect it during powerline maintenance activities.
A restoration plan for the headspring is needed to protect site 8SU310 and to guide restoration activities. A geoarchaeologically-based methodology should be one of the techniques considered when developing this plan to avoid archaeological and geological impacts during restoration.

Historic Structures

There are five historic structures recorded in the park. The south end of Ichetucknee Springs State Park had a roadside park built by the Florida Department of Transportation sometime between the 1950s and when the park was acquired in 1970. The McCormick parcel contains three 20th-century structures: a house, a pole barn, and a tobacco barn. Another historic structure, the Ironwood House, was recorded near Rose Sink (CO941) but was subsequently demolished or collapsed.

The three structures at the McCormick home site are recorded as the house (CO1033), tobacco barn (CO1086) and pole barn (CO1085). The old south use area (former FDOT Wayside Park) historic structure (CO1034) included concrete picnic pavilions and benches. The picnic pavilions and benches were documented and removed in 2013. CO941 was removed sometime soon after Jan. 23, 2006.

Condition assessment: The former FDOT wayside park pavilion structures CO1034 and the Ironwood House (CO941) have been demolished. The McCormick home site structures, (CO1033, CO1086, CO1085), are in poor condition, but they have not yet been formally evaluated. These sites need to be documented and evaluated to determine appropriate action (either stabilization or demolition). The tobacco barn (CO1086) is in a state of collapse.

Level of significance: The historic structures in the park have not been evaluated.

Collections

Ichetucknee Springs State Park currently has a number of museum objects, archaeological artifacts, and archival materials in both formal and informal collections. The formal collection is housed within the park's education and exhibit center located at the south entrance. This building contains approximately 16,000 cubic feet of displays designed to educate visitors about the park's history, wildlife, ecosystems, and water conservation. The center includes a wall-mounted timeline of the park's heritage dating from the late 1700s to 2001, with a small display of Indian beads, pottery sherds, points, and Spanish colonial artifacts. Additional collection items associated with the Spanish colonial period at the park are housed at the University of Florida Museum of Natural History and the Florida Department of State's Division of Historical Resources. A walkthrough, underwater cave replica displays fossils, animal skulls and bones found within the Ichetucknee River. Above the cave is a simulated wetland ecosystem with mounted fauna and flora commonly found in the park. Scattered throughout the center are incidental natural and manmade objects that were found on the property such as turtle shells, snakeskins, deer antlers, turpentine pots and a yellow jacket nest. The center also displays a Timucuan dugout canoe discovered at nearby Lake Montgomery in Lake City, Florida.

The informal collections are stored in multiple offices and outbuildings of the park. One such collection includes artifacts recovered from the headspring restoration project such as cans, bottles, bullet slugs, phosphate mining tools and coins. These have been retained in the park with the permission of DHR. A second collection of natural history objects is used in interpretive programs for the park (skulls, turtle shells, snakeskins, and a longleaf pine cross-section disk). Archived items include historic photographs dating from the 1950s, newspaper articles and a collection of anecdotes, photographs and interviews obtained during the park's annual "Old Timers Day" event, which celebrates people who visited the Ichetucknee River area before it became a state park.

The condition of the collections is good. Collections are stored in the park's education and exhibit center and in park offices.

The significance of the collections has not been evaluated.

Currently, the park has no organized collections management program. A Scope of Collections Statement needs to be developed and a collections management assessment needs to be completed, as well as an inventory or catalog. A housekeeping manual and a record-keeping system need to be developed. Climate, humidity, and pest control measures need to be evaluated for their adequacy in conserving collection objects. Recommendations for subsequent monitoring activities need to be made to ensure appropriate conservation of collections.

Detailed management goals, objectives, and actions for the management of cultural resources in the park are discussed in the *Cultural Resources* section of this plan. Table 6 contains the name, reference number, culture or period, and brief description of all the cultural sites within the park that are listed in the Florida Master Site File. The table also summarizes each site's level of significance, existing condition, and recommended management treatment. An explanation of the codes is provided following the table.

Cultural Sites Listed in the Florida Master Site File

Site Name and FMSF #	Culture/Period	Description	Significance	Condition	Treatment
Fig Springs - San Martín de Timucua 8CO1	Deptford, Spanish, Spanish-First Period, Suwannee Valley and Leon-Jefferson	Archaeological site	NR	F	P
8CO2	Prehistoric Aboriginal	Archaeological site	NE	G	P
8CO3	Prehistoric Aboriginal	Archaeological site	NE	G	P
Little Spring and Run 8CO4	Prehistoric Aboriginal	Archaeological site	NE	G	P
8CO5	Leon-Jefferson	Archaeological site	NE	G	P
Old Mill Pond 8CO8	Historic, Leon-Jefferson, Spanish (17th century)	Archaeological site	NE	G	P
Old Mill Landing 8CO9	Prehistoric Aboriginal	Archaeological site	NE	G	P
Lowe's Field 8CO10	Prehistoric Aboriginal	Archaeological site	NE	G	P

Cultural Sites Listed in the Florida Master Site File					
Site Name and FMSF #	**Culture/Period**	**Description**	**Significance**	**Condition**	**Treatment**
New Ichetucknee River/Dampier's Landing 8CO15	Prehistoric Aboriginal	Archaeological site	NE	G	P
Columbia City 8CO24	Unspecified	Archaeological site	NE	G	P
Ichetucknee Railroad Crossing 8CO25	Possible Paleoindian	Archaeological site	NE	G	P
Sink of Rose Creek 8CO33	Twentieth Century American, 1900-present; Archaic, 8500 B.C. – 1000 B.C.; Prehistoric; Unknown	Archaeological site	NS	G	P
Old Fort White Landing 8CO36	Prehistoric Aboriginal	Archaeological site	NE	G	P
Midpoint Mound 8CO43	Weeden Island	Archaeological site	NE	G	P
Ichetucknee River Archeological Zone 8CO49	Resource Group Pre-historic unspecified, First Spanish, Early 1600-1699, American 1821 to present	Resource Group, Archaeological District	NE	G	P
Bellamy Road, Old Spanish Trail, Old Indian Trail 8CO57	Unspecified	Linear Resource Group	NE	G	P
Simpson's Flats 8CO173	Unspecified	Archaeological site	NE	G	P
Simpson's Camp 8CO174	Unspecified	Archaeological site	NE	G	P
Mill Pond South 8CO408	Lamar, Weeden Island II	Archaeological site	NR	G	P
Midpoint Sandhill 8CO934	Prehistoric	Archaeological site	NE	G	P

Cultural Sites Listed in the Florida Master Site File					
Site Name and FMSF #	**Culture/Period**	**Description**	**Significance**	**Condition**	**Treatment**
Olive jar Fragment Wesley Jones 8CO935	Spanish-First or Second	Archaeological site	NE	G	P
Ironwood House USFS05-20sc 8CO941	Historic c1950	Historic Structure	NS	G	P
ISSP Scatter 8CO942	Prehistoric	Archaeological site	NS	G	P
Substation CO1015	Deptford 700B.B.- 300 B.C.	Archaeological site	NS	G	P
Cedar Head Run Moonshine Still CO1022	Historic 20th century	Archaeological site	NE	G	P
Abandoned stolen safe CO1023	Historic 20th century	Archaeological site	NE	G	P
Cedar Head Spring Impoundment CO1024	Historic 20th century	Archaeological site	NE	G	P
Zone 4A Phosphate Pit Complex CO1025	Historic 20th century	Archaeological site	NE	G	P
Zone 4B Clay-settling Pond Remains CO1026	Historic 20th century	Archaeological site	NE	G	P
Zone 4E Phosphate pit CO1027	Historic 20th century	Archaeological site	NE	G	P
Zone 4 B Phosphate Pit CO1028	Historic 20th century	Archaeological site	NE	G	P
Zone 1 D Phosphate Pit CO1029	Historic 20th century	Archaeological site	NE	G	P
East Main Phosphate Narrow Gauge Tram Bed CO1030	Historic 20th century	Archaeological site	NE	G	P
Trestle Point Narrow Gauge Tram Bed/Logging Road CO1031	Historic 20th century	Archaeological site	NE	G	P
Old Ferry Landings East and West CO1032	Historic 20th century	Archaeological site	NE	G	P

Cultural Sites Listed in the Florida Master Site File					
Site Name and FMSF #	**Culture/Period**	**Description**	**Significance**	**Condition**	**Treatment**
McCormick Life Estate Structures CO1033	Historic 20th century	Historic Structure	NE	P	ST
Former DOT Wayside Park CO1034	Historic 20th century	Historic Structure	NE	P	R
McCormick Tobacco Barn CO1086	Historic 20th century	Historic Structure	NE	P	ST
McCormick Pole Barn CO1085	Historic 20th century	Historic Structure	NE	P	ST
Ichetucknee River 8SU5	Weeden Island (?)	Archaeological site	NE	G	P
8SU16	Prehistoric Aboriginal	Archaeological site	NE	G	P
8SU17	Prehistoric Aboriginal	Archaeological site	NE	G	P
8SU18	Prehistoric Aboriginal	Archaeological site	NE	G	P

Significance:
NRL - National Register Listed
NRE - National Register Eligible
LS - Locally Significant
NE - Not Evaluated
NS - Not Significant
Condition:
G - Good
F - Fair
P - Poor
Recommended Treatment:
RS - Restoration
RH - Rehabilitation
ST - Stabilization
P - Preservation
R - Removal

Condition Assessment

Objective: Assess and evaluate 25 of 55 recorded cultural resources in the park.

There is a need for additional assessment and evaluation of archaeological sites at the park, particularly those vulnerable to flooding or feral hog impacts. There is a similar need to evaluate historic structures as well, especially those in disrepair.

The reports generated will provide recommendations for needed preservation and stabilization. The following cultural resources are the highest priority for evaluation.

Site 8CO1 (Fig Springs Mission) needs to be assessed and evaluated to determine if it is adequately stabilized or if it needs additional protective measures. This is a National Register-eligible site, and it is an important point of Spanish and Native American contact. To protect it, the park formerly mowed it and generally tried to prevent trees from establishing there. Site 8SU310, discovered during restoration of the Ichetucknee headspring, should also receive further investigation. Some suggest that a geoarchaeological-based methodology could best guide the restoration project and help avoid archaeological and geological impacts.

DRP needs to evaluate and document three historic structures, McCormick Life Estate Structures CO1033, McCormick Tobacco Barn CO1086 and McCormick Pole Barn CO1085, to determine if they have any historic significance and whether they may be demolished.

Documentation of Recorded Sites
Objective: Compile reliable documentation for all recorded historic and archaeological sites.

The park needs to ensure that all currently known sites are recorded properly in the Florida Master Site File and that site records are updated regularly, especially when new discoveries are made.

A predictive model for locating archaeological sites within the park was completed in 2012 (Collins et al 2012). Ichetucknee Springs State Park is rich in archaeological and historic resources, including prehistoric and Spanish Colonial sites. The park also has a unique ecological setting with its spring-run stream and numerous springs bordered by high-quality uplands. The predictive model indicates areas of high, medium and low probability for the occurrence of prehistoric sites. The model also provides guidance for future development and will aid in selecting the best locations for future Phase 1 surveys.

There is a need for additional documentation of past mining operations in the park, especially given the extraordinary physical impact that historic phosphate mining has had on the natural and cultural landscapes. Many of the phosphate mining sites, though recently added to the FMSF, need further evaluation before changes to the sites are considered.

The park does not currently have a Scope of Collections Statement to guide the acquisition of collection items, so one needs to be developed and adopted. Collections can aid in the documentation of historic and archaeological sites.

The park should continue to gather information of historic interest during “Old Timers Day.” Verifiable information obtained from oral history interviews at this event and from other sources should be used to update the FMSF about new and currently recorded sites.

Preservation Measures
Objective: Bring six of 58 recorded cultural resources into good condition.

Most of the sites at Ichetucknee Springs State Park are in good condition, but a few are in poor condition. Significant archaeological sites may be elevated to good condition by preventing erosion, minimizing disturbance from tree roots and tip ups, and preventing animal damage, especially by feral hogs. Sites that may need particular attention because of their significance or nature are 8CO1, 8SU249 and 8SU310.

DRP needs to develop and implement a cyclical maintenance program for each cultural resource in the park. This is especially important now that feral hogs have established a population in the park. DRP also needs to design and implement a regular monitoring program for at least six cultural sites in the park. To the extent possible, annual visits should be made to all cultural sites.

The McCormick homestead, which is now recorded in the FMSF, contains several structures that are in poor condition. The park needs to develop and implement a plan to deconstruct or demolish the McCormick house, associated tobacco barn and pole barn (CO1033, CO1086, and CO1085). Some materials may be reusable if those sites deconstructed rather than demolished.

LAND USE COMPONENT

VISITATION

Visitors are drawn to the park's springs, the aquatic cave environments, and the adventure of experiencing one of the best-preserved spring run streams in Florida.

Trends

As a largely water-centric park, higher visitation is experienced during the hotter summer months, particularly June through Sept, and lower visitation is experienced during the cooler months of fall and winter.

EXISTING FACILITIES AND INFRASTRUCTURE

Visitor facilities at the park focus on providing access for swimming, paddling, or tubing. Facilities are located at both the north and south ends of the park, including staff support areas. Park infrastructure includes both visitor access and resource management roads, as well as a trail network.

Facilities InventoryNorth Use Area	
Paddling Launch	1
Tubing Launch	1
Bathhouse	1
Parking Area (120 spaces)	1
Grills	15
Picnic Tables	3
Nature Trail (0.8 mile)	1
North Support Area	
Storage Shed	2
Pole Shelter	1
South Use Area	
Entrance station	1
Information booth	1
Administrative offices	1
Parking Area (400 spaces)	1
Concession Building	1
Boardwalk Access Points (Midpoint, Dampier's Landing & South Takeout)	3
Grills	42
Restroom	3
Interpretive Center	1
South Support Area	
Storage Shed	2
Flammable storage building	1
Equipment Shelter	1
Ranger Residence	3
Volunteer sites	3

CONCEPTUAL LAND USE PLAN

Detailed Conceptual Land Use Plan Objectives

Three use areas at Ichetucknee Springs State Park and one use area at Ichetucknee Trace are listed below for improvements to be implemented within the 10-year planning cycle.

North Use Area

Objectives: **Improve infrastructure and facilities.**

Actions:

- Improve Walkways.
- Replace the aging restroom with a new bathhouse.
- Add six small picnic pavilions.
- Add one large picnic pavilion.
- Improve interpretation, as needed, in conjunction with new facilities and infrastructure.
- Repurpose/convert tubing launch.

The northern day-use area has historically been used as the tube launch for the upper reaches of the Ichetucknee River. With necessary changes in visitor management, implemented in 2021, to adequately protect the river environment, tube launching from the north use area was relocated to a point farther downstream where deeper water precludes anthropogenic damage to aquatic vegetation. The former tube launch area at the north end is now designated to accommodate paddlecraft only.

Swimming, which is a highly popular and traditional activity of the north use area, is allowed in both the adjacent Ichetucknee headspring and Blue Hole. Although many visitors simply pass through the north use area on the way to the river access, the longstanding and continuing popularity of swimming and picnicking merits facilities improvements.

Currently, the existing picnic facilities consist of scattered unsheltered picnic tables and grills located along the main access path to the tube launch. Although a generous hardwood canopy provides natural shade, the only structural shelter currently available is the alcove of the restrooms. This proves inadequate during the frequent rainstorms that characterize Florida summers. The addition of up to six small picnic shelters, containing two tables each, is needed in the vicinity of the restrooms and swimming area. This proposed development must be sensitive to the viewshed toward the Ichetucknee headspring and preserve unencumbered access to the river for paddlecraft. The existing approach to the river from the parking area could be redesigned to better integrate the picnic shelters, restrooms and pedestrian access to the river launch, especially to accommodate potentially increased volumes of paddlers carrying canoes, kayaks, or paddleboards through this area. To better accommodate groups exceeding eight visitors, one large picnic pavilion, sheltering eight tables, is recommended. Siting of this facility should utilize the footprint of the outgoing restroom building. The old restroom building is in proximity of the Ichetucknee headspring, the upper river access point and the new proposed bathhouse, making it an ideal location for a new picnic pavilion.

South Use Area

Objectives: **Improve infrastructure and facilities.**

Actions:

- Improve walkways.
- Improve landscaping.
- Add two new medium picnic pavilions.
- Add new restroom.
- Improve interpretation in conjunction with new facilities and infrastructure.
- Update, repair or replace interpretive exhibits in the visitor center, as needed.

Since tubing activity is not restricted by a daily cap from Dampier's Landing to the southernmost takeout, a high volume of activity occurs at the South Use Area during the warmer months. Picnicking is largely accommodated by picnic tables scattered along landscape medians, three pavilions, and within the alcove of the concession. As with the north use area, expansion of picnic amenities would benefit the large number of visitors during the summer season. Separation of picnic facilities from the altered parking area setting would offer significant aesthetic improvements and provide for interpretive opportunities within a more natural landscape. Picnicking in small to large groups is a popular and traditional activity at the park, with high demand for the facilities currently available. Group picnicking is especially popular, and improved sheltered picnic facilities are needed.

Given the complex mix of trams, vehicles, and visitors transporting recreation and picnic supplies, current facilities are insufficient for safe and efficient shared-use circulation. Safety improvements and renovations to better access facilities are needed along the boardwalks and walkways to the existing tube launches at the river midpoint and Dampier's Landing. Solutions to the multifaceted site planning issues of the South Use Area should be addressed through a new conceptual master plan for improved facilities development from the midpoint tube launch to the southernmost takeout. The conceptual master plan should consider the expansion and improvement of picnic facilities, expansion of restroom and concession facilities, improved tram operations, visitor parking and vehicle circulation, and improved trails and walkways that better accommodate pedestrian movement and safety. Particular attention should be focused on improving spatial organization and efficiency of stacking at the Tram loading area. A carefully considered master plan can remedy current problems and address the park's potential future needs. The conceptual master plan for the south use area should be a short-term goal to be completed prior to any potential redevelopment.

Parkwide Trails

Objectives: **Expand trail opportunities.**

Actions:

- Extend portions of the park trail network

Extensions of existing trails within the central portion of the park are proposed. Trails should be unpaved single-track nature or hiking trails, with potential to connect the north and south use areas. Attention should be given to sensitive natural community types, especially where trails may impede prescribed fire, alter hydrology or result in erosion and downslope sedimentation. DRP biologists will survey and evaluate any protected zones through which new or extended trails may traverse. Estimated extent of total trail extention(s) is approximately 1 mile.

Proposals
Parking Lots
Structures
Park Trails
Proposed Hiking Trail

1 North Use Area - Improve walkways, add picnic pavilions, and new bathhouse.

2 South Use Area - Expand visitor facilities with the addition of restrooms, one new bathhouse, and improved walkways for safety. Renovate bathrooms and construct one tram shelter.

3 Parkwide Trails - Extend existing park trails to the center of the park. Trails should be unpaved single track nature or hiking trails.

ICHTUCKNEE RIVER

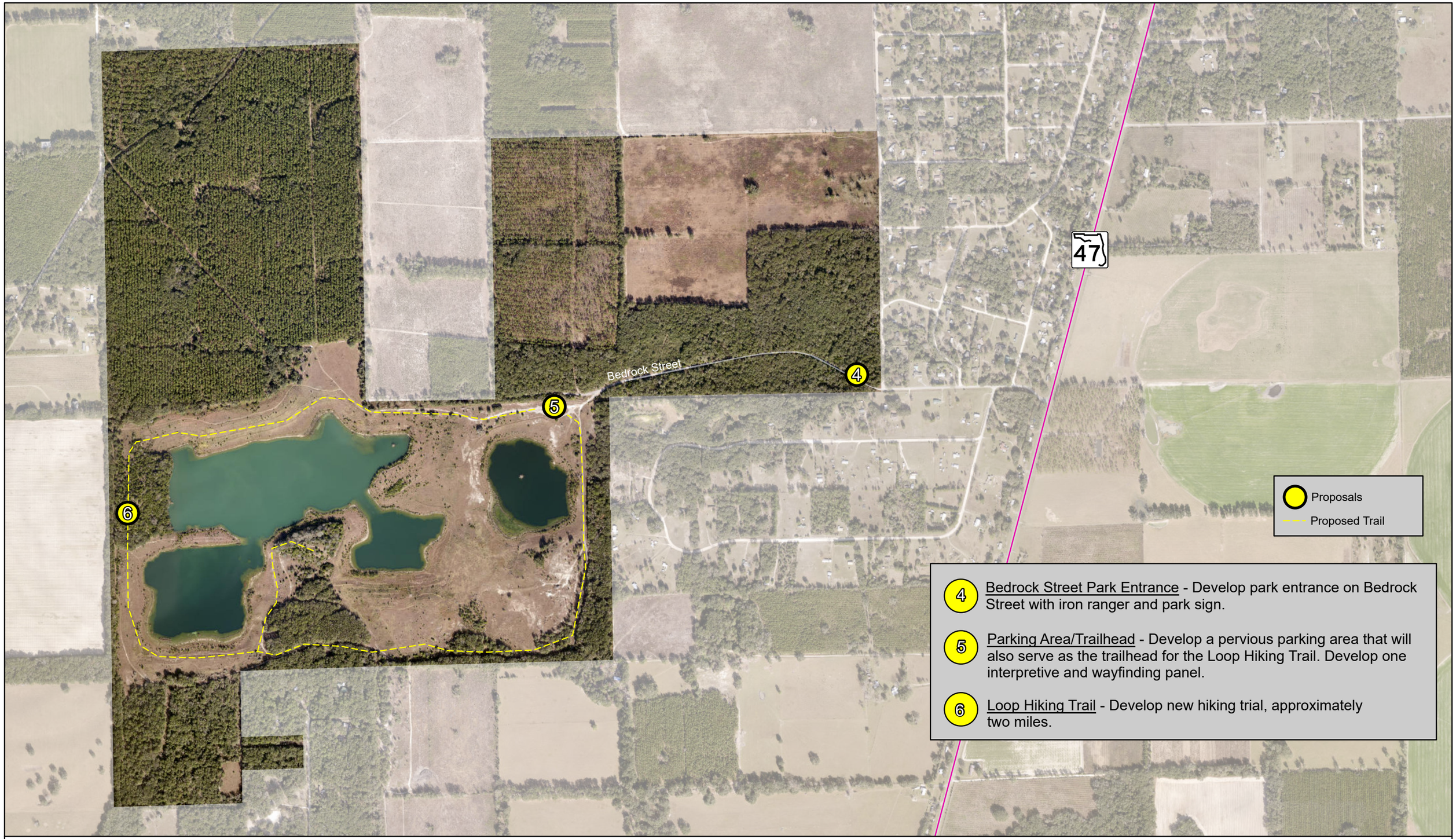
27

Ichetucknee Springs State Park

Conceptual Land Use Plan

0 0.5 1 Miles

N



Ichetucknee Springs State Park - Ichetucknee Trace

Conceptual Land Use Plan 2 of 2

0 1,500 3,000 Feet

N

Ichetucknee Trace

Objectives: Provide access.

Actions:

- Consider providing trail access and interpretation of the property's role in protecting the water quality of the Ichetucknee Springs complex

Ichetucknee Trace contains two artificial lakes, which are remnants of a former phosphate mining operation. One lake stretches approximately one-half mile from east to west and includes several embayments. These artificial lakes are surrounded by open, rugged and terraced terrain that is mostly devoid of trees. A loop hiking trail surrounding the mining lakes would offer a sweeping and scenic viewshed to users. This open landscape with unusual topographic characteristics would provide a unique hiking experience in north Florida.

The loop trail should originate at a minimally developed trailhead with a portable or vault system restroom and pervious parking. Bedrock Street, with its direct connection to State Road 47, has the potential to serve as the site's primary entrance point. This highway connects to Interstate 75, 6 miles to the northeast, where Fort White, lies 9 miles to the south, and High Springs, 19 miles to the southeast. An existing area of disturbance is located near the point at which Bedrock Street enters the park boundary. This disturbed area would be an acceptable location to construct a pervious parking area.

VISITOR USE MANAGEMENT

Objectives

One visitor use area at Ichetucknee Springs State Park is identified as having a specialized need for improved management.

River Access Management

Objective: Improve protection of the upper Ichetucknee River while maintaining parkwide level of recreational access

Actions:

- Selectively close portions of the spring run as necessary to ensure health of the upper river, particularly the submerged aquatic vegetation.

The ecosystem of the Ichetucknee River faces impacts that originate well beyond park boundaries, as well as from impairing use patterns within the river itself. Solutions to water quality and quantity issues are regional and addressed long-term through basin management planning efforts. Near-term solutions for improving the ecological health of the Ichetucknee River can be addressed within the park boundaries by modifying the ways visitors access and experience the river.

DRP has long implemented interpretive and educational strategies to promote rule compliance and encourage visitors to refrain from touching the river bottom or inadvertently damaging submerged aquatic vegetation (SAV). Despite these ongoing efforts, the cumulative effects of frequent, often unintentional, noncompliance with river rules has significantly diminished annual recovery of SAV between summer seasons, DRP has therefore been evaluating the benefits of changing visitor use patterns on the Ichetucknee River for the past several years. Both past approved plans and the 2017 draft plan (which was previously submitted to ARC) have identified reducing the carrying capacity in upper sections of the river as necessary. This conclusion was further supported in 2020 when a rare one-year pause in intensive recreational activity was necessary for the protection of public health during the

COVID-19 pandemic. As a result of this pause in tubing on the upper river, the otherwise declining SAV rebounded in an unprecedented way. Evidence indicates that while the interval between tubing seasons (approximately 6 months) is decreasingly sufficient for regeneration of SAV, the longer 15-month period (consisting of the off-season coupled with the COVID-19 pandemic) was markedly beneficial in terms of overall SAV recovery and species abundance. With the relocation of tubing to more appropriate downstream segments of the river, the current recovery trend is expected to continue with a trajectory toward the environmental conditions observed prior to 2000.

30+ years of biannual transect studies suggest that if recreational river usage returns to previous patterns, this much-needed SAV recovery will be reversed, and the river will resume the trend of severe annual SAV loss with insufficient recovery periods between seasons. For this reason, DRP has redistributed tubing from the upper river to the lower river where the water is deeper and SAV is less vulnerable to tactile/erosive visitor impacts. It is important to note that there has been no net loss of recreational opportunity as the previously allocated 750 tubers per day on the upper river has been reallocated to a more suitable segment downstream beginning at Dampier's Landing. According to this management strategy, the river ecosystem is expected to continue its recovery, while visitors will continue to be able to experience the scenery and serenity of the upper river via paddling (100 canoes, kayaks or paddleboards per day).

Responsible protection and stewardship must include discussion of the need to restrict food items and drink containers while recreating on the river. The DRP expended significant time and energy removing layers of bottles, cans, and plastics from the river bottom that had accumulated from decades of unregulated use prior to state acquisition. The improvements to the Ichetucknee River, particularly the benthic environment, cannot be overstated. The stream portion within the state park has only remained litter free due to the restriction of all food items and disposable drink containers, a responsible management approach that will continue in effort to protect the river's health and scenic beauty.

Recreational Carrying Capacity

Carrying capacity is an estimate of the number of users a recreation resource or facility can accommodate and still provide a high quality recreational experience and preserve the natural values of the site. The carrying capacity of a unit is determined by identifying the land and water requirements for each recreation activity at the unit, and then applying these requirements to the unit's land and water base. Next, guidelines are applied which estimate the physical capacity of the unit's natural communities to withstand recreational uses without significant degradation. This analysis identifies a range within which the carrying capacity most appropriate to the specific activity, the activity site and the unit's classification is selected (see Table 9).

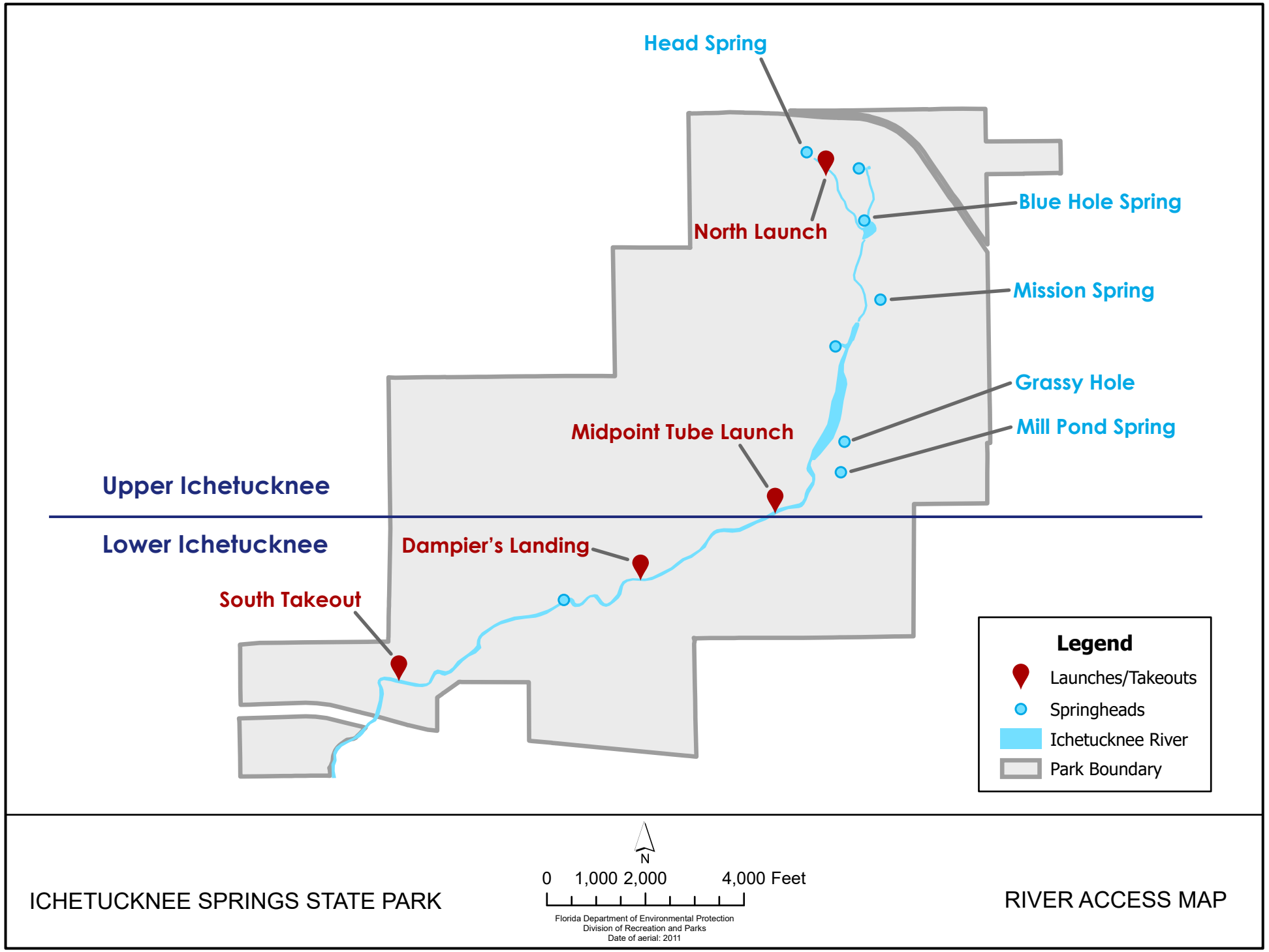
The recreational carrying capacity for this park is a preliminary estimate of the maximum number of users the unit could accommodate after the current conceptual development program has been implemented. When developed, the proposed new facilities would approximately increase the unit's carrying capacity as shown in the following table. For Ichetucknee Springs State Park, the highest rates of visitation occur seasonally on the Ichetucknee River south of Headspring and Blue Hole. The vast majority of this visitation is by tubers.

As indicated in the Resource Management Component and prior sections of the Land Use Component, carrying capacity for seasonal tubing is managed by counting a daily total. Capacity is not calculated for the number of tubers on the river at one time. Tubers entering the river at the North Launch are capped at 750 per day and may exit at Dampier's Landing or proceed to the South Takeout. An additional 2,250 tubers are permitted to launch daily from Midpoint. Proposed changes to tubing patterns will

discontinue use of the northern portion of the river and redistribute all tubing to the lower portion, consistent with the recommendations of the DuToit carrying capacity study, which has guided carrying capacity on the Ichetucknee River since 1979.

Recreational Carrying Capacity						
	Existing Capacity*		Proposed Change to Capacity		Estimated Future Total Capacity	
Activity/Facility	**One Time**	**Daily**	**One Time**	**Daily**	**One Time**	**Daily**
Tubing*						
North-Dampier's/South		750		-750		0
Midpoint-South		2,250		750		3,000
Paddling*						
North-Dampier's/South	25	100			25	100
Spring Swimming						
Headspring	55	110			55	110
Blue Hole	35	70			35	70
Cavern/Cave Diving						
Blue Hole	5	25			5	25
Trail Use						
Hiking	20	80	10	40	30	120
Picnicking						
North Use Area	12	24	80	160	92	184
South Use Area	64	128	32	64	96	192

*Existing capacity revised from approved plan according to DRP guidelines.
*Capacity for tubing is measured only as a daily total.
*Allowance for unlimited use of lower-most river from Dampier's Landing to South Takeout is not represented in this table.
*Paddling capacity is measured by vessels.


Head Spring
North Launch
Blue Hole Spring
Mission Spring
Grassy Hole
Mill Pond Spring
Midpoint Tube Launch
Upper Ichetucknee
Lower Ichetucknee
Dampier's Landing
South Takeout
Legend
Launches/Takeouts
Springheads
Ichetucknee River
Park Boundary
N
0 1,000 2,000 4,000 Feet
Florida Department of Environmental Protection
Division of Recreation and Parks
Date of aerial: 2011
ICHETUCKNEE SPRINGS STATE PARK
RIVER ACCESS MAP

OPTIMUM BOUNDARY

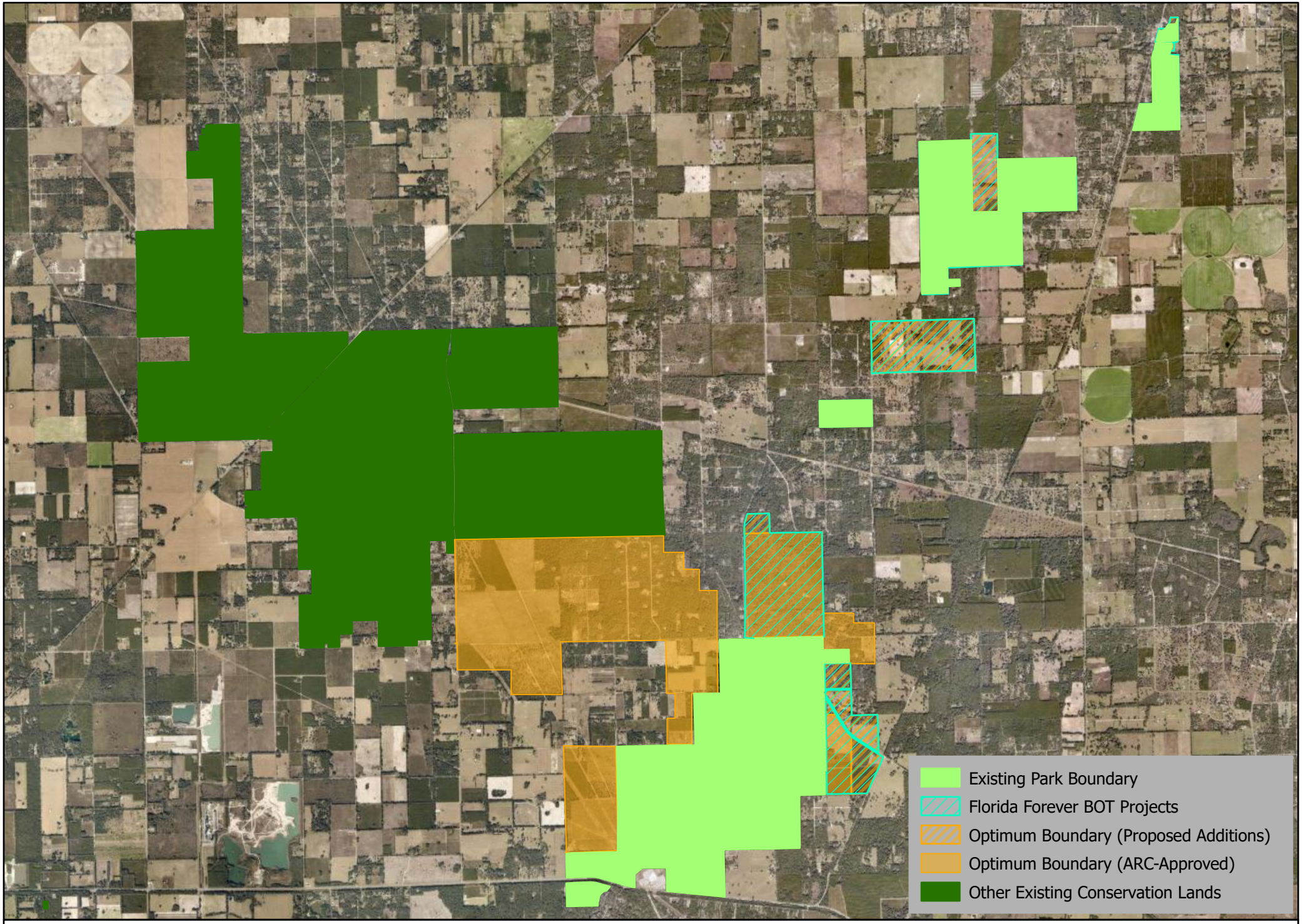
Connectivity with adjacent undeveloped areas plays a significant role in sustaining the park's wildlife populations and protecting the sensitive springshed. Ensuring the environmental sustainability of the greater landscape by increasing the acreage of the park and improving connections between the park and other natural areas would provide for greater conservation of natural resources. Establishment of new linkages with other natural areas in the Ichetucknee Springs vicinity is also an essential step in preventing the isolation of the park and a decline in species diversity.

Approximately 8,500 acres have been identified as desirable for addition to Ichetucknee Springs State Park. Much of the additional land lies to the northwest of the park and contains significant examples of xeric uplands including sandhill. The area will offer additional protected habitat for listed species such as the southern fox squirrel and the southeastern American kestrel, among others. Several aquatic caves, which have been demonstrated to share hydrological connections with the park's springs, exist within the area as well.

The recommended additions north of the park have a significant and demonstrated relationship with the spring system. Potential agricultural or urban development near the park may alter long-term resource conservation and restoration goals. Acquisition of these recommended areas will help to protect surface and groundwater flows into the Ichetucknee springs and river. Therefore, any optimum boundary parcels that would move closer to connecting Ichetucknee Trace to Ichetucknee Springs State Park should be a high priority for acquisition.

Lands immediately adjacent to the park on the east, south and west boundaries are considered significant for each of the reasons stated above. These areas also contain resource elements that will complement the recreational opportunities currently found within Ichetucknee Springs State Park.

No lands are considered surplus to the management, conservation, or public access needs of the park at this time.



Ichetucknee Springs State Park

Optimum Boundary

0 1.5 3 Miles

N