RESOURCE MANAGEMENT COMPONENT

Introduction

The Florida Department of Environmental Protection (DEP), Division of Recreation and Parks (DRP) in accordance with Chapter 258, Florida Statutes, has implemented resource management programs for preserving for all time the representative examples of natural and cultural resources of statewide significance under its administration. This component of the unit plan describes the natural and cultural resources of the park and identifies the methods that will be used to manage them. Management measures expressed in this plan are consistent with the DRP's overall mission in natural systems management. Cited references are contained in Appendix 3.

The DRP's philosophy of resource management is natural systems management. Primary emphasis is placed on restoring and maintaining, to the degree possible, the natural processes that shaped the structure, function and species composition of Florida's diverse natural communities as they occurred in the original domain. Single species management for imperiled species is appropriate in state parks when the maintenance, recovery or restoration of a species or population is complicated due to constraints associated with long-term restoration efforts, unnaturally high mortality or insufficient habitat. Single species management should be compatible with the maintenance and restoration of natural processes and should not imperil other native species or seriously compromise the park values.

The DRP's management goal for cultural resources is to preserve historic properties of state and national significance and interpretive value and to interpret the history associated with them. This goal often entails active measures to locate, inventory and evaluate cultural resources and to preserve, restore, reconstruct or rehabilitate them for appropriate public use.

Because park units are often components of larger ecosystems, their proper management can be affected by conditions and events that occur beyond park boundaries. In order to effectively maintain the park's natural resources, park staff continually assess resource conditions, evaluate management activities and refine management actions and review local comprehensive plans and development permit applications for park/ecosystem impacts.

Management Goals, Objectives and Actions

Measurable objectives and actions have been identified for each of the DRP's management goals for Gilchrist Blue Springs State Park. Please refer to the Implementation Schedule and Cost Estimates in the Implementation Component of this plan for a consolidated spreadsheet of the recommended actions, measures of progress, target year for completion and estimated costs to fulfill the management goals and objectives of this park.

While the DRP utilizes the ten-year management plan to serve as the basic statement of policy and future direction for each park, a number of annual work plans provide more specific guidance for DRP staff to accomplish many of the resource management goals and objectives of the park. Where such detailed planning is appropriate to the character and scale of the park's natural resources, annual work plans are developed for prescribed fire management, exotic plant management and imperiled species management. Annual or long-term work plans are developed for natural community restoration and hydrological restoration. The work plans provide the DRP with crucial flexibility in its efforts to generate and implement adaptive resource management practices in the state park system.

The work plans are reviewed and updated annually. Through this process, the DRP's resource management strategies are systematically evaluated to determine their effectiveness. The process and the information collected is used to refine techniques, methodologies and strategies, and ensures that each park's prescribed management actions are monitored and reported as required by Sections 253.034 and 259.037, Florida Statutes.

The goals, objectives and actions identified in this management plan will serve as the basis for developing annual work plans for the park. The ten-year management plan is based on conditions that exist at the time the plan is developed. The annual work plans provide the flexibility needed to adapt to future conditions as they change during the ten-year management planning cycle. As the park's annual work plans are implemented through the ten-year cycle, it may become necessary to adjust the management plan's priority schedules and cost estimates to reflect these changing conditions.

Natural and Cultural Resource Management

The entire park is divided into management zones that delineate areas on the ground that are used to reference management activities (see Management Zones Map). The shape and size of each zone may be based on natural community type, burn zone, and the location of existing roads and natural fire breaks. It is important to note that all burn zones are management zones; however, not all management zones include fire-dependent natural communities. Table 1 reflects the management zones with the acres of each zone.

Table 1: Gilchrist Blue Springs State Park Management Zones

Management Zone	Acreage	Managed with Prescribed Fire	Contains Known Cultural Resources
GBS-1e	56.09	Y	Unknown
GBS-1w	70.58	Y	Unknown
GBS-2	21.01	N	Y
GBS-3	96.07	Y	Y
GBS-4	39.91	Y	Unknown

Table 1: Gilchrist Blue Springs State Park Management Zones			
Management Zone	**Acreage**	**Managed with Prescribed Fire**	**Contains Known Cultural Resources**
GBS-5	88.27	Y	Unknown
GBS-6	30.49	Y	Unknown

Soils and Geological Resources

Description and Assessment

Topography

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

Park elevations range from 20 feet at the north boundary along the Santa Fe River to approximately 75 feet above mean sea level (msl) at the south boundary (see Topographic Map). The property slopes up from the Santa Fe floodplain towards the uplands to the south. The 100-year floodplain (base flood elevation) as calculated by the Suwannee River Water Management District (SRWMD) for the Gilchrist Blue Spring reach of the Santa Fe River is 38.4 feet (i.e. based on NAVD88).

Some alterations of natural topography have taken place in the park. The most obvious alterations are the large powerline easement bisecting the western side of the park, the park entrance road, and terraced areas on the slopes above the main spring boil. Limited disturbances are associated with the former old fields and pine plantations in portions of zones GBS-4, GBS-5, and GBS-6. Minor furrowing appears to have occurred in the old fields in the SW area of zone GBS-5 and the NW area of zone GBS-6 prior to planting of pines in the 1990s. Native sandhill groundcover persists in the remaining uplands despite the planting of pines due to the lack of site preparation activities outside the old field areas. There is also a borrow pit located near the powerline in zone GBS-1e, as well as several deep gouges along the powerline where sand has been removed.

Soils

According to the Natural Resources Conservation Service (http://websoilsurvey.sc.egov.usda.gov), 6 soil types are found at Gilchrist Blue Springs State Park (see Soils Map). For detailed information on soils, see Appendix 4 (Weatherspoon et al. 1992).

The soil surface at Gilchrist Blue Springs has undergone significant alterations over the years with obvious signs of erosion and sedimentation that have impacted several localized areas in the park, including the entire upslope terrace (i.e. spring bowl) around the Gilchrist Blue main spring, the boil and spring run of both Gilchrist Blue and Naked springs, the campground, the main entrance road, and along the western powerline easement.

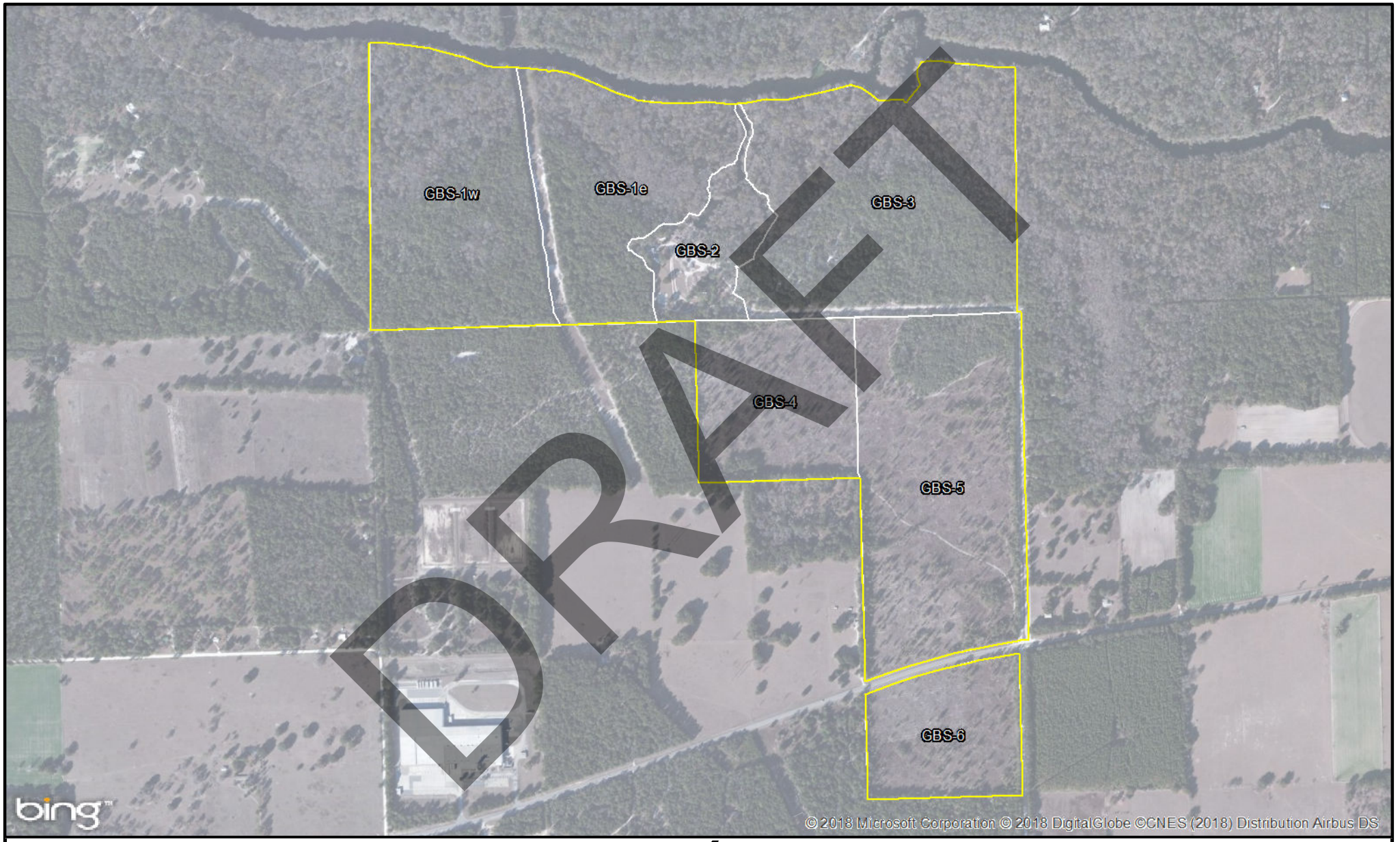
The vegetation on the slopes above the main spring is nearly absent due to intensive trampling from foot and vehicle traffic, and soil erosion is commonplace. Numerous exposed wooden timbers are imbedded throughout the steep slopes of the spring bowl that appear to have been strategically arranged for soil stabilization, including a large wooden wall around the entire main spring. Unfortunately, the surface terraces in the main spring bowl are not slowing down stormwater runoff enough to prevent substantial soil erosion and sedimentation. Additionally, exposed roots from many large trees scattered across the main spring bowl, as well as the wooden timbers, can act as tripping hazards.

It is also evident from visual observation and historic photos that a significant level of erosion and sedimentation has occurred over the years within the main spring of Gilchrist Blue and Naked Springs and their associated spring run streams. Evidence of significant erosion can be observed by a spring bottom partially devoid of submerged aquatic vegetation (SAV), as well as a similar wide deep barren trench that continues along the center of the entire spring run stream out to the mouth at the Santa Fe River. Recreational pressure from swimmers wading along the spring run has undoubtedly attributed to erosion and SAV impacts, especially when water levels are low. It is important to note that SAV is an important dietary component for a variety of native wildlife such as Florida manatees (*Trichechus manatus*) and freshwater turtles, and therefore the amount of vegetation biomass in this spring system is also highly dependent on the amount of forage pressure (Johnston et al. *in press* 2018). Additionally, SAV biomass in this spring system can be influenced by significant flood or brown-out events (see Hydrology section below).

Geology

Gilchrist Blue Springs is situated in the Gulf Coastal Lowlands, specifically within the Lower Santa Fe River (SRWMD 2013). The Gulf Coastal Lowlands consist of an extensive karst plain characterized by exposed surface limestone, sinkholes and internally drained swallet wetlands.

Several limestone outcrops are scattered throughout the park. The underlying limestone within this region has undergone extensive solution activity resulting in surface features characteristic of karst topography. Surface features such as sinkholes, springs, and swallet depressions were caused by the collapse of the upper layers of soil and mineral materials into underlying solution voids and caverns.

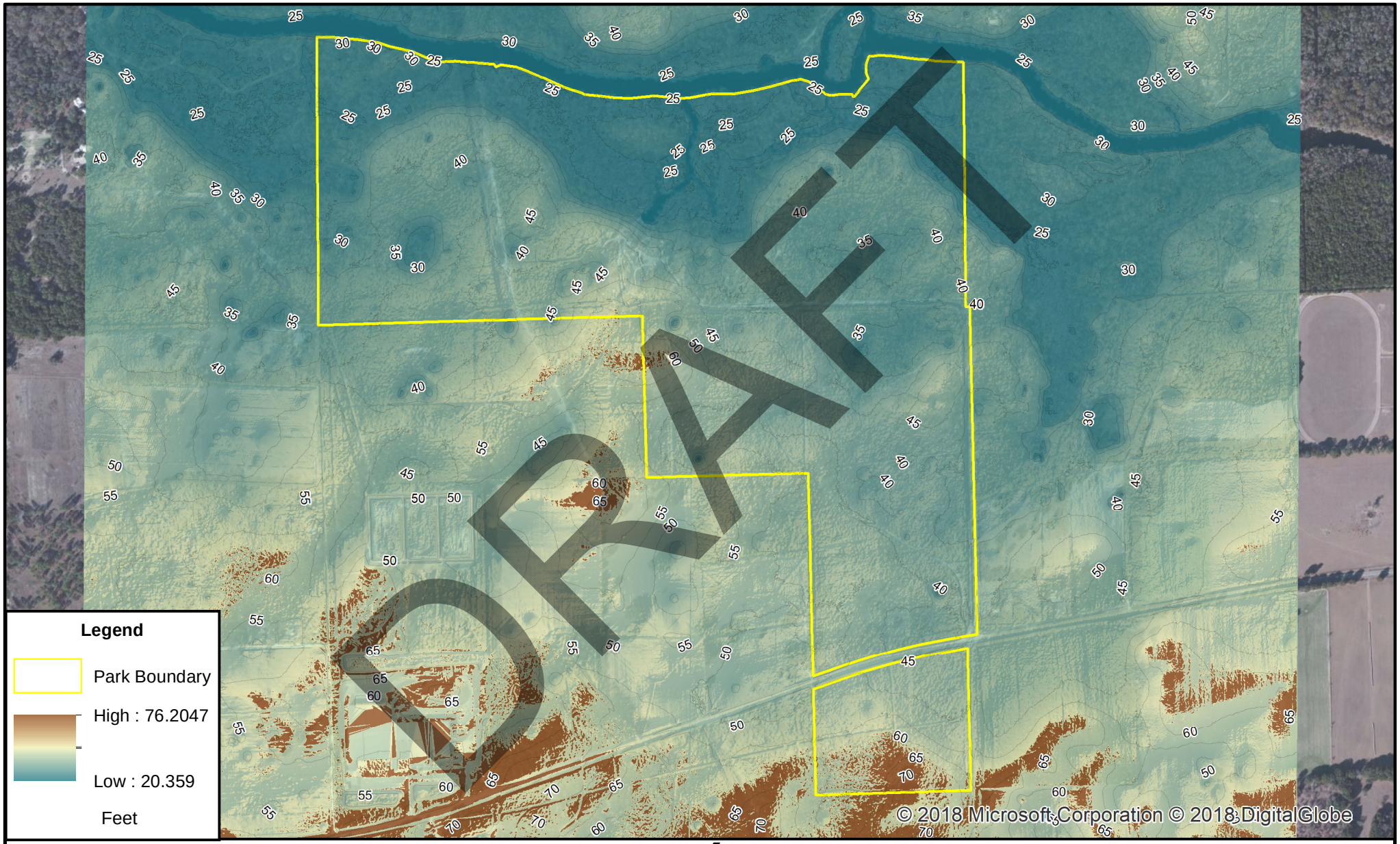


GILCHRIST BLUE SPRINGS
STATE PARK

0 250 500 1,000 Feet

Florida Department of Environmental Protection
Division of Recreation and Parks
Date of aerial; 2011

MANAGEMENT ZONES MAP

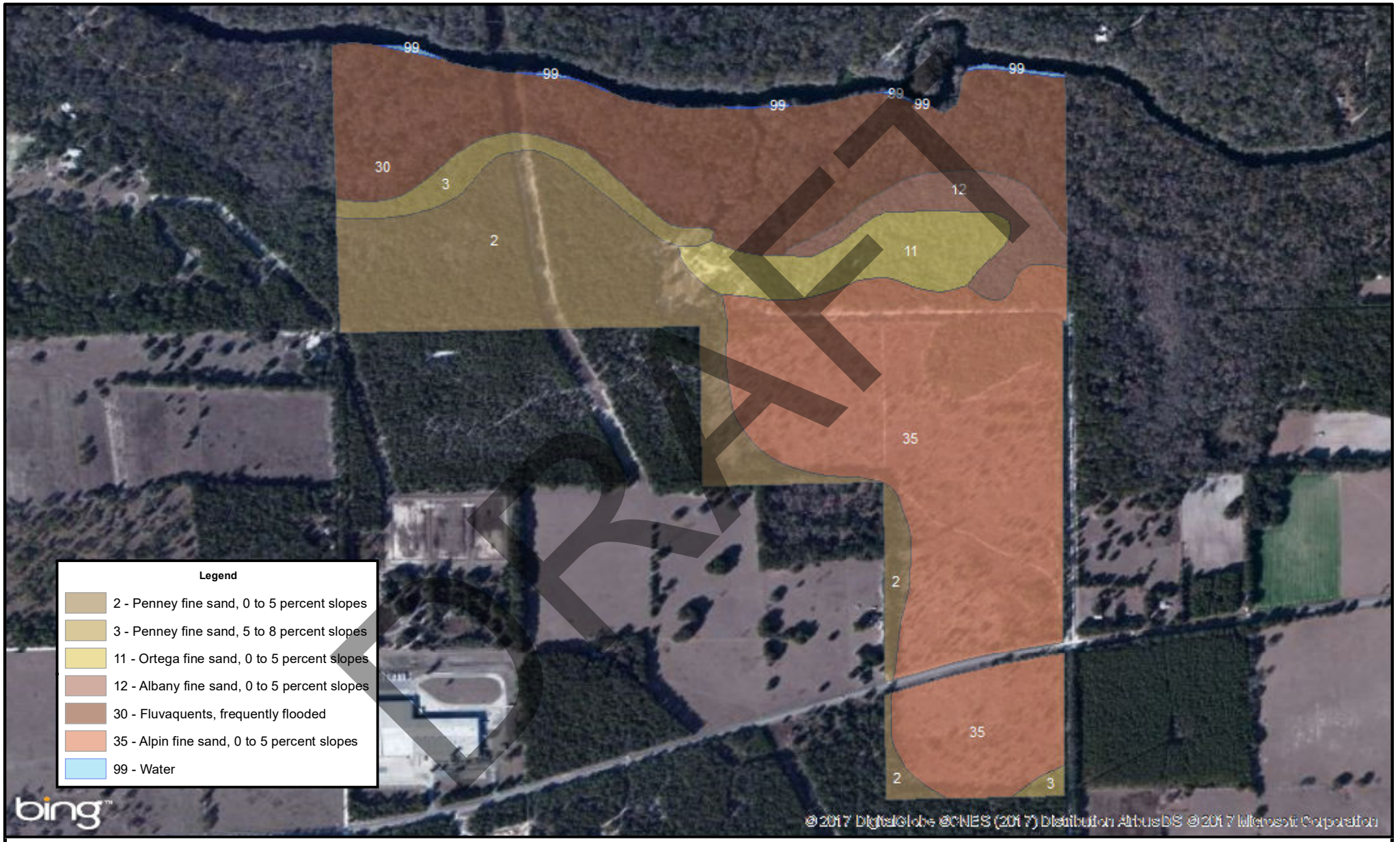


GILCHRIST BLUE SPRINGS STATE PARK

0 250 500 1,000 Feet

Florida Department of Environmental Protection
Division of Recreation and Parks
Date of aerial; 2011

TOPOGRAPHIC MAP



GILCHRIST BLUE SPRINGS STATE PARK

N

0 250 500 1,000 Feet

Florida Department of Environmental Protection
Division of Recreation and Parks
Date of aerial; 2011

SOILS MAP

Other physiographic landscape features that are important to Gilchrist Blue include Bell Ridge, Brooksville Ridge, Waccasassa Flats, and High Springs Gap (Williams et al. 1977; Upchurch et al. 2011). Bell and Brooksville Ridges are Pleistocene-age beach dunes that bisect Gilchrist County from north to south and consist of sandy overburden underlain with clastic Miocene sediments with significantly higher elevations and with very little surface drainage (Puri and Vernon 1964; Col et al. 1997). The Bell Ridge straddles the Waccasassa Flats, both of which are characterized by a perched water table and numerous surface wetlands. The High Springs Gap is a low area between these ridges and the Santa Fe River flows through this valley region.

Mineral Resources

Though no mining activities are known to have occurred in the park, limestone is extracted in the surrounding region for use as road base material. Whether mineral deposits of commercial value exist in the park is unknown.

Resource Management Activities

Objective A: Evaluate and mitigate impacts of soil erosion in the park

Action 1 Investigate best management options for additional erosion mitigation in public access areas.
Action 2 Monitor areas prone to erosion.
Action 3 Implement corrective measures where needed to reduce impacts of soil erosion on water resources (e.g., around all springs).

Several areas in the park continue to have erosion issues despite past corrective measures. The following are erosion control actions recommended for the park.

Mitigation of erosion and sedimentation sites, especially concerning karst features in the park, should be a top priority for the DRP. Staff will investigate best management options for additional mitigation of erosion in public access areas such as the slopes above Gilchrist Blue, Little Blue, Naked and Johnson springs. Staff will also regularly monitor areas of the park that are prone to erosion. Additional water bars may need to be installed in problem areas to minimize erosion during strong storm events by diverting storm water into surrounding woodlands and encouraging natural infiltration. Wherever necessary, the park will adopt corrective measures to reduce the impacts of soil erosion on water resources.

Water Resources

Description and Assessment

The northern boundary of Gilchrist Blue Springs State Park is located on the southern bank of the Lower Santa Fe River along the Columbia-Gilchrist County line (Upchurch et al. 2011). Gilchrist Blue is a large second magnitude spring group that provides a significant source of groundwater to the adjacent Santa Fe River. The Santa Fe River, Gilchrist Blue Spring Group (i.e. three major springs), and a unique basin swamp are the three most prominent hydrological features in the park.

The Santa Fe River is a 1,384-square mile surface watershed that occupies portions of nine north Florida counties, from Clay County in the east to Gilchrist and Suwannee counties in the west (Clark et al. 1964; Berndt et al. 1996). The overall flow of the Santa Fe is from the east to the west. The Santa Fe is also one of three major tributaries of the Suwannee River, encompassing nearly fourteen percent of the entire Suwannee watershed (SRWMD 2006). The Suwannee River is a free-flowing (i.e. unaffected by dams) natural system that drains approximately 10,000 square miles of the Florida/Georgia region and ultimately discharges into the Gulf of Mexico through Florida's largest publicly managed estuary, Big Bend Seagrasses Aquatic Preserve (FDEP 2014).

The Suwannee and Santa Fe Rivers are both designated as Class III Outstanding Florida Water (OFW) which is conferred to waterbodies with "*exceptional recreational or ecological significance*" (Chapter 62-302.700[3], F.A.C.). The average flow of the Santa Fe River contributes approximately 1 billion gallons per day to the Suwannee (Berndt et al. 1996; SRWMD 2013). Average annual rainfall for the Lower Santa Fe region approaches 60 inches a year (Fernald and Purdum 1998).

The Santa Fe River can be divided into an upper and lower reach based on distinctly different geological characteristics within each section (SRWMD 2007). Water scientists have described the Santa Fe River as one of Florida's most biologically diverse river systems because of its unique position in the ecological landscape.

The Upper Santa Fe River receives major surface water inputs from several significant tributaries such as Olustee Creek. Below the Olustee tributary, the Santa Fe River begins to cross the wide geologic transition known as the Cody Escarpment (White 1970; Upchurch 2002). As with most of the major streams that cross this scarp feature, a sizeable proportion of the river flow disappears underground into swallet openings and reemerges at various resurgence points after mixing with groundwater in the Floridan aquifer (Martin and Dean 2001).

In the Upper Santa Fe, stream flow is highly dependent on surface runoff, but there is some seepage input from the surficial aquifer as well. The surficial in this region has a well-defined confining unit that separates it from the Floridan aquifer below (Miller 1986). In contrast, groundwater inputs heavily influence river discharge in the Lower Santa Fe Basin (Clark et al. 1964). This region, which includes Gilchrist Blue, is part of an extensive karst plain where the confining units are discontinuous or absent, especially within the western third of the watershed (Williams et al. 1977). In fact, during periods of low surface water flows, discharge from the western portion of this watershed consists almost entirely of groundwater with most of its water supply from springs such as Gilchrist Blue. In other words, the base flow of the Santa Fe is derived principally from the Floridan aquifer (Meyer 1962; Meyer et al. 2008).

The Suwannee River Water Management District and FDEP adopted a minimum flow and level (MFL) for the Upper Santa Fe River in 2007 and for the Lower Santa Fe in

2013 (SRWMD 2007; SRWMD 2013). The Florida's Water Resource Act of 1972 requires Water Management Districts to establish MFLs to ensure that water bodies do not experience significant harm. If a waterbody is expected to fall below an MFL during a 20-year planning period, an MFL prevention and/or recovery strategy must be expeditiously developed (Subsection 373.0421(2), F.S.). In 2014, SRWMD and FDEP developed an MFL recovery strategy for the Lower Santa Fe and Ichetucknee River because the current flows (i.e. compared to historic) in both systems were undergoing unacceptable impacts due to regional groundwater withdrawals (Grubbs and Crandall 2007; Williams et al. 2011; SRWMD 2014).

Gilchrist Springshed and its Major Springs

Gilchrist Blue and Naked Springs are two significant second magnitude springs found in the park. The park also contains an abundance of smaller springs and seepages scattered across the property (Rosenau et al. 1977; Scott et al. 2004). Gilchrist Blue Spring is the largest spring in the park and within its main spring pool are several linear vents that discharge groundwater from beneath the base of a submerged limestone ledge. The Gilchrist Blue spring-run stream, which heads briefly northeast before turning northward to the Santa Fe River, is approximately 1,200 feet long, 20-60 feet wide, and one to six feet deep.

As Gilchrist Blue flows northward through a forested floodplain canopy to the Santa Fe, two additional spring tributaries merge with the main spring-run; Little Blue Spring (i.e. fourth magnitude) enters from the west about 100 feet downstream from the main spring pool and Naked Spring enters from the east about 500 feet downstream (Hornsby and Ceryak 1998). The spring-run of Little Blue is much shallower and not as clearly defined as the larger Naked Spring. Naked Spring spring-run is over 400 feet long, 10-15 feet wide and 1-3 feet deep.

The discharge of Gilchrist Blue Spring (i.e. combined with Naked and Little Blue at its mouth) was first measured in April 1975 with a flow of 42 cubic feet per second (cfs). The average recorded flow for Gilchrist Blue is 45.16 cfs (N= 106), with a minimum 8.43 cfs (i.e. April 26, 2012) and maximum 89.4 cfs (i.e. October 21, 2015).

Another prominent karst feature on the property that mostly has direct discharge into the Santa Fe River is Johnson Spring, currently classified as a third magnitude vent (i.e. historic second magnitude). There is also a unique basin swamp with scattered limestone outcrops situated west of the main spring in zone GBS-1w.

Hydrologic models have identified as many as ten distinct springshed boundaries within the Santa Fe Basin, with the three largest spring groups (i.e. by area) in the contributing area being Ichetucknee, Gilchrist Blue-Rum Island, and Hornsby-Treehouse (Kincaid 2011; Upchurch and Champion 2004; Upchurch et al. 2011). The Gilchrist Blue-Rum Island springshed is a sub-basin of the Lower Santa Fe River, which ultimately flows into the Suwannee River. The Ginnie springshed lies immediately west of Gilchrist Blue and to its east is the Poe springshed. Gilchrist Blue-Rum Island, Ginnie, and Poe springsheds are all complex cavern-dominated,

and partially interrelated systems that should be treated as one until additional research can better delineate their boundaries (Upchurch et al. 2011). Delineation of the Lower Santa Fe River springsheds, including Gilchrist Blue began in the mid-1990s with dye trace studies that were conducted within the adjacent Ginnie springshed and more recently by groundwater modeling analyses (Kincaid 1998; Meyer et al. 2008; Upchurch et al. 2011). It is important to realize that determining the exact size of a groundwater basin is complicated because of the unconfined geology of the Lower Santa Fe region. At its greatest distance from north to south, the Gilchrist Blue Springshed measures nearly 30 miles, and its surface and groundwater basin encompass over 420 square miles. There has been very little aquatic cave system exploration conducted at Gilchrist Blue Springs. One portion of the Ginnie Springs cave system (i.e. Devils Ear) lies beneath the western park boundary.

One watershed level process that seldom receives adequate consideration during studies of river hydrology is flooding. Especially important is the relationship between downstream flooding in a major river and upstream back flooding in its tributaries (Pringle 1997; Diehl 2000; Garza and Mirti 2003).

In the case of the spring-run streams at Gilchrist Blue, back flooding occurs periodically when hydrologic conditions in the Suwannee River cause a reduction in outflow from 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 for it to reach flood stage; 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 Gilchrist Blue spring-run to flow into the Santa Fe occurs at the confluence of the two tributaries. The full flow of the Gilchrist waterbody is unable to penetrate the Santa Fe, and back flooding of the spring-run streams at the park is the result.

At Gilchrist Blue, at least four natural communities significantly benefit from this phenomenon of ephemeral back flooding: alluvial forest, floodplain swamp, basin swamp, and bottomland forest. 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 the species compositions of these communities would ensue. Alteration of the back-flooding regime on the Santa Fe 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).

River stage has been recorded on the Suwannee River since 1906, and it is important to understand that this 100-year plus record has provided water scientists with a unique dataset that can be used to determine historic flows and flood events (Verdi and Tomilson 2009). During that period, water scientists have closely documented every major flood and drought that has affected the Suwannee River. From 1942 to 2017, fourteen significant floods and nine major droughts were recorded in north peninsular Florida (Verdi et al. 2006; Verdi and Tomlinson 2009). Three of the most extreme droughts in the Suwannee River Basin during this period

occurred in 1954-1956, 1998-2002, and 2010-2012 (SRWMD 2018; Verdi et al. 2006). Numerous gages at unique locations along the Suwannee and Santa Fe Rivers track not only river stage, but discharge as well (USGS 2018; Verdi et al. 2006).

When the Suwannee, and therefore the Santa Fe River, floods the high river stage affects spring-run tributaries (e.g., Gilchrist Blue) along its reaches, gradually "pushing back" against the head pressure in the Floridan aquifer that causes springs to flow. As the Santa Fe back-floods into the Gilchrist spring run when river flooding occurs, river and spring waters begin to mix (Katz et al. 1999). The extent of mixing, as determined by monitoring of water clarity in springs, can be a helpful tool in documenting changes in groundwater discharge in spring systems (Anastasiou 2006). Marked changes in water clarity can be observed within the Gilchrist spring-run depending on factors such as discharge, clarity of the Santa Fe River (i.e., tannic or clear), and height of river stage. Partial or complete brownouts of the Gilchrist Blue spring system may result. A complete brownout is considered to have occurred when tannic river water covers the entire spring run and head spring, with water clarity reduced to less than four feet of visibility. If the surface water pressure exceeds the groundwater head pressure, the springs at Gilchrist may even reverse flow and function as "siphons", or inflow points into the Upper Floridan aquifer (Gulley et al. 2011). In that respect, Gilchrist can act as an estavelle, a type of spring whose fluctuations in discharge reflect a direct relationship between groundwater potential and river stage (Copeland 2003).

Another prominent ecosystem process occurring in the Gilchrist Blue springshed is the movement of contaminants and nutrients through surface and ground waters within the basin (Katz and Hornsby 1998; Heffernan et al. 2010). Deterioration of groundwater quality in the Gilchrist Springshed will ultimately threaten water resources within the park itself. There are numerous non-point sources of groundwater pollution in the region outside the park (Obreza and Means 2006).

Gilchrist County ranks among the top five largest counties in the Lower Santa Fe River Basin with the predominant land use being devoted to agriculture (Obreza and Means 2006). Levy County and Gilchrist County, both ranked among the highest in the state in silage corn production, use more than 5,700 tons of nitrogen fertilizer per year combined. As a result, nitrate levels in the Floridan aquifer in north Florida have increased by an order of magnitude or more over the past 50 years (Cohen et al. 2007; Upchurch et al. 2007). Human activity, especially the use of inorganic fertilizer, has long been the leading cause of this enrichment.

Water quality measurements have been collected sporadically at Gilchrist Blue Springs since 2001 (SRWMD 2018; FDEP 2018). During the period from 2001-2017 (N= 34), the average nitrate-nitrite level is nearly 2.2 mg/L, placing Gilchrist in the top 5 Florida springs with the poorest water quality based on that parameter. Naturally occurring background levels for nitrates in groundwater, for example, should be less than 0.01 mg/L (Cohen et al. 2007). There has also been trace amounts of at least three toxic chemical substances detected within water samples at Gilchrist, including arsenic, atrazine, and chromium (FDEP 2018).

Hydrologists have also 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 benthic macroalgae (i.e. periphyton) growth in marine and freshwater ecosystems (Stevenson et al. 2007). Excessive nitrogen, specifically in its nitrate form (NO_3), is partially responsible for the creation of unhealthy, polluted aquatic ecosystems worldwide (Quinlan 2003; Upchurch et al. 2007).

As illustrated in Table 2, the Santa Fe River watershed contributes a significant proportion of the yearly nitrate-nitrogen (NO_3) input to the Suwannee system.

Table 2. Total % contribution per year (NO_3)

	Suwannee River Sections and Tributaries						
	Upper	Middle	Lower	Alapaha	Withlacoochee	Santa Fe	Ichetucknee
Area (mi^2)	**2873**	**824**	**686**	**1801**	**2382**	**1184**	**200**
%Coverage	28.80%	8.30%	6.90%	18.10%	23.90%	11.90%	2.01%
Year							
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 DRP files). Nutrient loading from the Suwannee into the Gulf of Mexico over an eight-year period from 1998 to 2005 totaled nearly 40 thousand tons of nitrogen and 11 thousand tons of phosphorus (District 2 DRP files).

In most Florida's springs, including the Gilchrist Blue, increased nitrogen and phosphorus levels are now recognized as a significant driving force behind large-scale nuisance macroalgae blooms (Stevenson et al. 2007; Heffernan et al. 2010). Periphyton growth in many Florida springs is now so rampant that submerged macrophytes are being smothered, and in fact, large-scale macrophyte die-offs have occurred (District 2 DRP files; Wetland Solutions Inc. 2010). As of 2017, the Gilchrist Blue main spring and Naked Spring appears to have maintained a significant submerged aquatic vegetation (SAV) diversity in large portions of the system (Johnston et al. 2016; Johnston et al. *in press* 2018; Morris et al. 2017).

There are two non-native species, namely hydrilla (*Hydrilla verticillata*) and Indian swampweed (*Hygrophila polysperma*), however that are extremely dense in biomass throughout the largest two Gilchrist Blue springs.

Unfortunately, elevated groundwater nutrients have contributed to significant declines in the ecological health of spring systems across Florida (Jones et al. 1996; Munch et al. 2006; Cohen et al. 2007; Stevenson et al. 2007; Wetland Solutions Inc. 2010; Harrington et al. 2010). Studies suggest that the visible presence of nuisance algal biomass in a spring ecosystem is an indicator of an imbalanced distribution of aquatic flora (i.e., Rule 62-302.500 (48) (b) F.A.C.). The United States Environmental Protection Agency (EPA) states that water bodies with periphyton levels exceeding 150 mg/m^2 may be biologically impaired and may experience a decline in ecosystem health. It is important to remember that benthic algae has historically been considered a vital natural component of spring ecosystems, however current nuisance levels can be attributed to a system imbalance (Whitford 1956). There is now widespread recognition that periphyton levels, in response to nutrient enrichment, are increasing in nearly all of Florida's springs, and that this is a symptom of the declining ecological health of springs (Kolasa and Pickett 1992; Hornsby et al. 2000; Stevenson et al. 2007; Brown et al. 2008; Copeland et al. 2011; Knight and Clarke 2016).

Groundwater within the Gilchrist Springshed moves through a complex matrix of disjointed, and sometimes linked, underground conduits that may return the water to the surface through spring vents. Exploration of major conduits by cave divers can help us gain knowledge about the workings of the underground conduit matrix. Unfortunately, there are no records of aquatic cave exploration for Gilchrist Springs. Given the absence of data from cave exploration, a better understanding of the nature of the conduit connections within the Gilchrist Springshed will require additional research, particularly dye trace studies.

Dye trace research is an important tool in establishing the locations of definitive groundwater connections between surface water bodies (Aley 1999; Skiles et al. 1991). Dye tracing was conducted in the adjacent Ginnie Springshed in the late 1990's, but no similar work has been done in the Gilchrist Springshed. Several past dye trace studies in the lower Santa Fe region have revealed a direct link between surface/groundwater connectivity and rapid transport of surface runoff through karst features to exit points at springs (Hisert 1994; Hirth 1995; Karst Environmental Services 1997; Kincaid 1998; Butt and Murphy 2003; Champion and Upchurch 2003; Butt 2005; Butt et al. 2006). The studies have also provided scientists with a better understanding of how surface contaminants can move through the Floridan aquifer (Macesich 1988; Martin and Gordon 2000).

Resource Management Activities

Goal: Protect water quality and quantity in the park, restore hydrology to the extent feasible and maintain the restored condition.

The natural hydrology of most state parks was impaired prior to acquisition to one degree or another. Florida's ecosystems are 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. Hydrological restoration is done primarily by filling or plugging ditches, removing obstructions to surface water "sheet flow," installing culverts or low-water crossings on roads, and installing water control structures to manage water levels.

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

Action 1	Continue to cooperate with other agencies and independent researchers regarding hydrological research and monitoring programs
Action 2	Continue monitoring of surface and ground water quality at Gilchrist Blue Springs and the tracking of water quality changes within this natural spring system
Action 3	Continue to seek expertise and funding opportunities within the Gilchrist Blue Springshed for dye trace studies to determine the groundwater sources for the spring and karst systems in the park
Action 4	Perform dye trace studies to determine the groundwater sources for the spring and karst systems in the park as funding becomes available
Action 5	Continue to monitor land use or zoning changes around the park's resources
Action 6	Continue to cooperate with the SRWMD to ensure MFLs for Santa Fe River are monitored for compliance to maintain historic river flows

Over the past 50 years, multiple factors have combined to cause a rapid decline in the ecological health of most of Florida's spring ecosystems, which have all experienced dramatic increases in nuisance benthic macroalgae. Increased nutrient loading into the Floridan aquifer, especially within a springshed has long been recognized as a contributing problem. During the period of record for Gilchrist Blue Spring, its nitrate levels have ranked among the highest all springs in Florida. The mitigation of erosion and sedimentation sites in the park, restoration of Gilchrist Blue Springs, and protection of the Gilchrist Springshed should remain top priorities for the Division. The following are hydrological assessment actions recommended for the park.

The DRP will continue its tradition of close cooperation with state and federal agencies and independent researchers engaged in hydrological research and monitoring in the park and on the Santa Fe River, and it will encourage and facilitate additional research in those areas. The DRP will rely upon agencies such

as the SRWMD, USGS, and FDEP to keep it apprised of any declines in surface water quality or any suspected contamination of groundwater in the region. It is important that DRP initiate a monitoring protocol to track all brownouts and dramatic water clarity changes in the park's major spring systems as part of the documentation of ecological responses to decreased spring discharge and Santa Fe River flooding. DRP staff will continue to monitor Environmental Resource Permit/Water Use Permit requests for the region and will provide timely and constructive comments as needed to promote protection of the park's water resources. Additional cooperative efforts may include facilitating the review and approval of research permits and providing researchers with assistance in the field, including orientation to park resources. Recommendations derived from these monitoring and research activities will be essential to the decision-making process during management planning.

Even though the Gilchrist Blue Springshed has been partially delineated, significant gaps remain in our understanding of the proximal sources of groundwater flow to the park's springs. For water managers to be able to protect water quality and potentially restore spring flows to historic levels, they will need to know the full extent of the springshed. To that end, the DRP will seek funding for dye trace studies that will more completely delineate groundwater sources for the park's springs. Previous dye trace studies in the region have provided the DRP with invaluable information about the various groundwater sources of the springs and the timing of surface water/groundwater interactions that potentially affect water quality.

DRP staff will continue to monitor land use or zoning changes within lands bordering the park. Major ground disturbances on neighboring properties or inadequate treatment of runoff into local streams or karst features could ultimately cause significant degradation of park resources. When appropriate, DRP District 2 staff will provide comments to other agencies regarding proposed changes in land use or zoning that may affect the park. In addition, District 2 staff will closely monitor mining permits and large consumptive use permits in the Gilchrist Blue Springshed for significant changes that may adversely affect park resources. The DRP will also continue to work closely with the SRWMD to ensure that the MFL developed for the Santa Fe River, including Gilchrist Blue Spring, is carefully monitored and that historic river flows are protected, or restored, if there is noncompliance with the MFL.

Objective B: Restore natural hydrological conditions and functions to approximately 2 acres of spring-run stream natural community.

Action 1	Continue to coordinate with agencies responsible for the protection and improvement of hydrological resources within the Gilchrist Springshed
Action 2	Develop a method to monitor, track and eradicate non-native SAV, especially Hydrilla and Hygrophila from the park's spring systems.

Action 3 Annually survey the spring-run stream for submerged aquatic vegetation

Action 5 Pursue outreach opportunities and develop programming to educate the public about anthropogenic impacts to the Gilchrist Springshed and recreation impacts to the parks spring systems

District and park staff will design and implement a monitoring plan to track changes in the SAV health of the spring run. If data indicate that the natural resources of the park's main spring and spring run are becoming significantly degraded recreational carrying capacities may need to be implemented in the future to protect them from further damage.

Aquatic plant beds adjacent to and downstream of the park's designated swimming areas will be monitored for negative impacts and, if necessary, may require restoration plantings and continuous removal of hydrilla if re-infestation occurs.

Park and District staff will collaborate with the Aquatic Preserve staff and the FWC's Wildlife and Invasive Plant Management bureau to control hydrilla in these areas. Within the next ten years, staff will examine the feasibility of conducting experimental plantings of key species of SAV at sites of significant damage.

Natural Communities

Description and Assessment

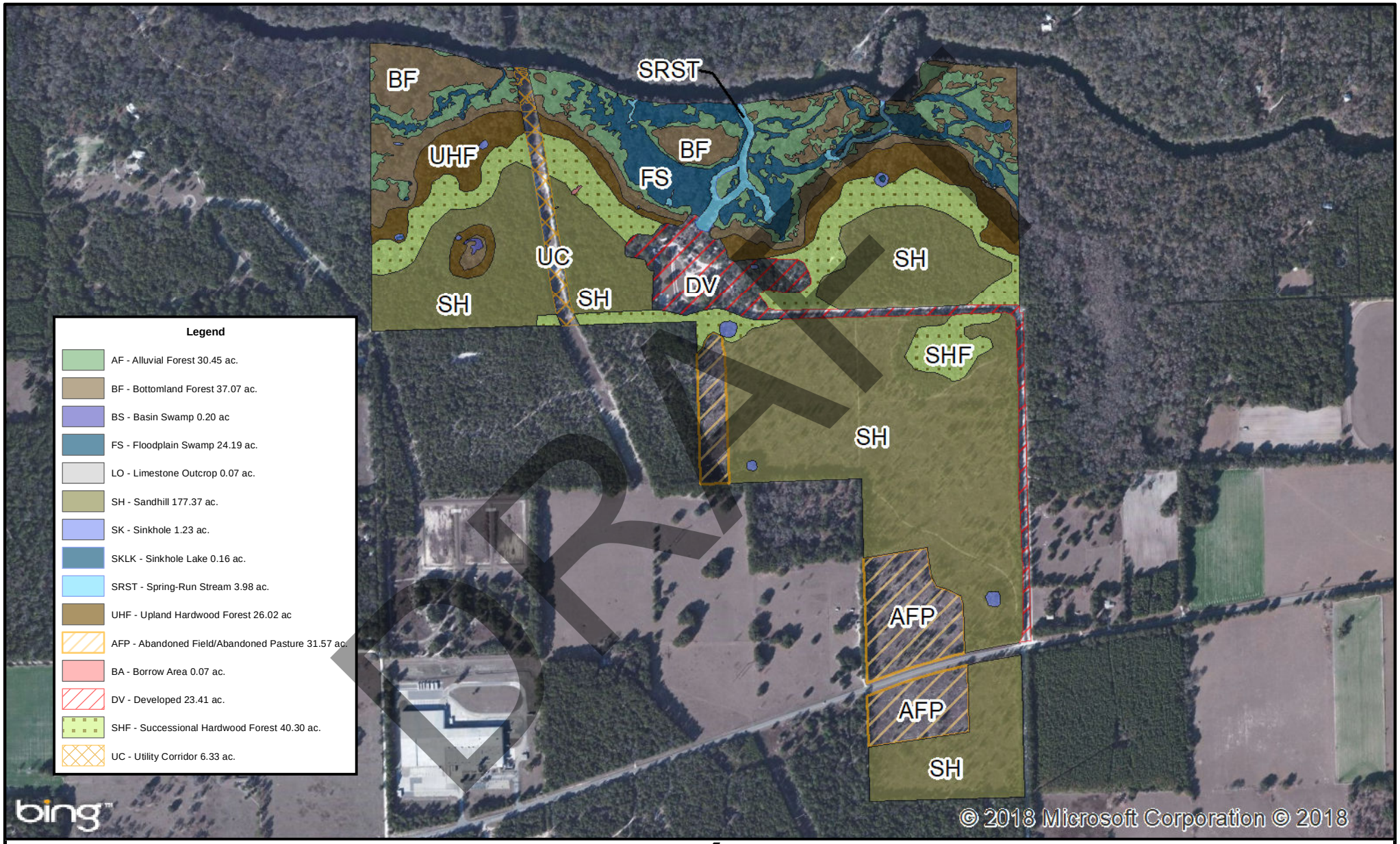
The system of classifying natural communities employed in this plan was developed by the Florida Natural Areas Inventory (FNAI). The premise of this system is that physical factors such as climate, geology, soil, hydrology and fire frequency generally determine the species composition of an area. Some physical influences, such as fire frequency, may vary from FNAI's descriptions for certain natural communities in this plan.

The park contains 12 distinct natural communities as well as 5 altered landcover types (see Natural Communities Map). A list of known plants and animals occurring in the park is contained in Appendix 5.

Limestone Outcrop

Description and Assessment: As might be expected given its location amidst a karst landscape along the Santa Fe River, Gilchrist Blue Springs State Park contains numerous limestone exposures. These occur as limestone outcrops situated along the sides of sinkholes and as large limestone boulders scattered within certain areas of hardwood and bottomland forest. A large outcrop is located near the eastern park boundary.

Desired Future Condition: Limestone outcrops are associated with karst topography and are often found within other features such as sinkholes, or as isolated features within mesic hammocks and upland hardwood forests. Various ferns, bryophytes, mosses and smaller herbs typically grow on the limestone surface or in crevices.



GILCHRIST BLUE SPRINGS STATE PARK

0 245 490 980 Feet

Florida Department of Environmental Protection
Division of Recreation and Parks
Date of aerial; 2011

NATURAL COMMUNITIES EXISTING CONDITIONS MAP

Characteristic species in north Florida will include partridgeberry (*Mitchella repens*), brittle maidenhair fern (*Adiantum tenerum*), netted chain fern (*Woodwardia areolata*), jack-in-the-pulpit (*Arisaema triphyllum*), southern shield fern (*Thelypteris kunthii*), and various species of panicgrass (*Panicum* spp.). Other rare fern species may also occur on limestone outcrops.

General Management Measures: Limestone outcrops must be protected from disturbance, particularly that caused by foot traffic. The park should take measures to prevent runoff and erosion from degrading the limestone outcrops, particularly near existing trails or roadways. Personnel involved in the control of exotic plants in sinkholes and upland hardwood or bottomland forests should consider it likely that limestone outcrops or boulders harboring rare plants are nearby, and should minimize ground disturbance and overspray of herbicide as much as possible. Mapping of significant limestone outcrops, accompanied by surveys for imperiled plant species, will be necessary to ensure their long-term protection.

Sandhill

Description and Assessment: The sandhill community occurs on the higher elevations in the park on the deepest and most well drained soils. Like much of the surrounding region, the sandhills were cleared of the original longleaf pines during the early 1900s or before. Natural regeneration of longleaf pines occurred to varying degrees in the landscape. Scattered mature longleaf are found within the sandhill in zones GBS-1e, GBS-1W and GBS-3. The sandhills of zones GBS-4, GBS-5, and GBS-6 were cleared of pines prior to the planting of a pine plantation prior to 1993. The plantation was harvested in 2008-2009.

Even though most of the sandhills at Gilchrist are in poor condition because they have been impacted by agriculture, silviculture, and fire suppression, it is encouraging to see that large areas of native groundcover remain onsite. Scattered clumps of wiregrass (*Aristida stricta* var. *beyrichiana*) and other characteristic sandhill groundcover species are found in all areas that were not converted to pasture in the past. Aerial photography from 1937 shows that limited areas of zones GBS-4, GBS-5 and GBS-6 were converted to pasture prior to that date.

Nearly all areas of the sandhill community in the park have large pockets of offsite hardwoods due to the absence of fire on this property. The southern zones have scattered areas of young laurel oaks and sweetgums due to the pine harvesting activities. The zones to the north, GBS-1e, GBS-1w and GBS-3, have extensive stands of mature laurel and sand live oaks. GBS-3 has been extensively fragmented by a network of sand roads and trails that are the result of a large informal camping area. The impacts to the remnant groundcover species are greatest in the areas closest to the main spring use area. The scattered remnant longleaf pines and groundcover patches offer some degree of hope for sandhill restoration in these areas.

A significant area of the sandhill was cleared as part of a major powerline corridor that bisects the western end of the park. This area is dominated by pasture grasses and weedy vegetation.

Pocket gophers (*Geomys pinetis*) and scattered gopher tortoises are still found on site, along with eastern diamondback rattlesnakes. So it is likely that many other sandhill animal species have been able to persist.

Desired Future Condition: Dominant pines will be longleaf pine in north Florida. Herbaceous cover is 80% or greater, and is less than 3 feet in height. In addition to groundcover and pine characteristics, there will be scattered individual trees, clumps, or ridges of onsite 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 some turkey oaks may be over 100 years old. Optimal Fire Return Interval for this community is 1 to 3 years.

General Management Measures: Fire is the primary tool for maintaining and improving sandhill vegetation. The Gilchrist Blue sandhills will need frequent prescribed fires to prevent and reverse the invasion of offsite 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. In addition, consideration will be given to removal or chemical control of the larger offsite hardwoods in the northern zones. The southern zones will require planting with longleaf pines as soon as possible after the initial prescribed fires.

Sinkhole and Sinkhole Lake

Description and Assessment: Due to the karst geology of the region, numerous sinkholes and depressions are scattered throughout the park. Some sinks remain dry the entire year, while others may contain water permanently or seasonally. The sinkholes within the park are relatively undisturbed and in good condition, however, at least one sinkhole in the park has evidence of being used as a trash dump. The sinkhole lakes include sinkholes in uplands areas that retain water and which may or may not have a direct connection with the Floridan aquifer, as well as sinkhole lakes at lower elevations in the floodplain which likely have direct Floridan aquifer connections.

Desired Future Condition: 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 upon 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 and being buffered by the lower elevation and a tree canopy. Desired future conditions include limiting unnatural erosion and protecting the microclimate from disturbance.

Desired Future Condition: Sinkhole lakes are relatively permanent and typically deep lakes characterized by clear water with a high mineral content formed in depressions within a limestone base. Vegetative cover may range from being completely absent, consist of a fringe of emergent species or be 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.

General Management Measures: 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, should be restricted except for legitimate research purposes or other management activities. Monitoring of these communities for impacts from invasive plant and animal species will also be necessary.

Upland Hardwood Forest

Description and Assessment: Within the park, historical aerials show a relatively thin band of hardwoods of varying width located upslope of the floodplain along the Santa Fe River. This transitional upland hardwood forest between the floodplain and sandhill communities has expanded upslope as a band of successional hardwood forest due to fire suppression in the past century. The boundary between the upland hardwood forest and sandhills is naturally dynamic and determined by local fire regimes and other disturbances such as windstorms. A portion of the upland hardwood forest was cleared as part of the powerline corridor. The upland hardwood forest at Gilchrist Blue Springs is in good to excellent condition with few impacts noted.

Desired Future Condition: Mature, closed canopy hardwood forest typically occurring 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.

General Management Measures: Management of the upland hardwood forest at Gilchrist Blue Springs State Park will require periodic monitoring and removal of invasive plant and animal species. Impacts from service roads and trails will require monitoring. Abandonment and restoration of unnecessary roads will also be pursued.

Alluvial Forest

Description and Assessment: At Gilchrist Blue, the alluvial forest occurs as a narrow strip along the Santa Fe River created by sand deposition, and as slightly elevated

terraces associated with lower floodplain swamps within the floodplain. These alluvial forest terraces occur at an intermediate level above the floodplain swamp and below the bottomland forest. These three floodplain community types are defined by the flooding regime based on topographic elevation, but may be difficult to distinguish at times. These community types have been mapped using a digital elevation model derived from LIDAR data obtained from the SRWMD. This high resolution topographic dataset allows these areas to be mapped much more accurately than previously possible. The alluvial forest in the park is in excellent condition; however, in the northwest portion of the park it has been impacted by a the powerline corridor.

Desired Future Condition: 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.

General Management Measures: Maintenance of a natural hydrological regime is critical to the long-term health of this community. Alluvial forest requires little active management other than protection from erosion impacts, control of feral hogs, and control of invasive exotic plant species.

Basin Swamp

Description and Assessment: The basin swamp at Gilchrist Blue is embedded within the western uplands. Intermittent overland flow from the Santa Fe River into this basin swamp during flood periods may play a hydrological role in this wetland. Basin swamps typically receive some inflow and can produce outflow, but they are not as heavily influenced by riverine systems as are floodplain swamps. Overall, the basin swamp is in good to excellent condition, with only a minimal sign of hog rooting disturbance.

Desired Future Condition: Basin swamps are forested basin wetlands that are highly variable in size, shape, and species composition and often hold water most days of the year. While mixed species canopies are common, the dominant trees in north Florida will be pond cypress (*Taxodium ascendens*) and swamp tupelo (*Nyssa sylvatica* var. *biflora*). Other canopy species will typically include slash pine (*Pinus elliottii*), red maple (*Acer rubrum*), dahoon holly (*Ilex cassine*), sweetbay (*Magnolia virginiana*), loblolly bay (*Gordonia lasianthus*), and sweetgum (*Liquidambar styraciflua*). Depending upon fire history and hydroperiod, the understory shrub component will be distributed throughout or concentrated around the perimeter. Shrubs will include a variety of species including Virginia willow (*Itea virginica*), swamp dogwood (*Cornus foemina*), wax myrtle (*Myrica cerifera*), and titi (*Cyrilla racemiflora*). The herbaceous component will also be variable and may include a wide variety of species such as maidencane (*Panicum hemitomon*), ferns, arrowheads (*Sagittaria* spp.), lizard's tail (*Saururus cernuus*), false nettle

(*Boehmeria cylindrica*), and sphagnum moss (*Sphagnum* spp.). Soils will typically be acidic nutrient-poor peats, often overlying a clay lens or other impervious layer.

General Management Measures: Prescribed fires should be allowed to burn into the edges of basin swamps to maintain the natural ecotone between them and surrounding uplands. Protecting the parks basin swamp from the impacts of erosion and feral hog rooting is an important management need.

Bottomland Forest

Description and Assessment: The bottomland forest at Gilchrist Blue occurs as a broad low-lying terrace that lies on the slopes below the upland hardwood forest and as rises and terraces within the floodplain. Bottomland forest is usually found at slightly higher elevations than alluvial forest, and inundation does not occur on an annual basis. In general, however, Santa Fe River flooding does heavily influence the bottomland forest of the park. Recent hurricanes and flooding did tip up a significant number of larger trees in the bottomland forest, but this is a natural successional process in these forests. A portion of the bottomland forest was also cleared as part of the powerline corridor. Overall, the bottomland is in good to excellent condition.

Desired Future Condition: Bottomland forest is a relatively low-lying, mesic to hydric community prone to periodic flooding. It is found on terraces and levees in river floodplains and in shallow depressions. Bottomland forest will typically have a closed canopy of mature deciduous and evergreen trees. The overstory in north Florida will usually contain species such as sweetgum (*Liquidambar styraciflua)*, sweetbay *(Magnolia viginiana)*, loblolly bay (*Gordonia lasianthus*), water oak (*Quercus nigra*), live oak (*Quercus virginiana*), swamp chestnut oak (*Quercus michauxii*), loblolly pine (*Pinus taeda*), and spruce pine (*Pinus glabra*). Red maple (*Acer rubrum*) and bald cypress (*Taxodium distichum*) may also be present. The understory will be open or dense. Understory species will typically include wax myrtle (*Myrica cerifera*), dwarf palmetto (*Sabal minor*), and swamp dogwood (*Cornus foemina*). Groundcover presence will be variable and may consist of witchgrass (*Dicanthelium* sp.) and various sedges (*Carex* spp.).

General Management Measures: Prescribed fires will be allowed to burn into the edges of bottomland forests to help maintain the natural ecotone between them and adjacent uplands. Some areas within these wetlands may require protection from erosion impacts along old roads or trails. The DRP should determine whether any roads/trails cause significant enough hydrological harm to warrant their restoration to natural contour. Monitoring for signs of invasive exotic plant species and feral hogs will continue.

Floodplain Swamp

Description and Assessment: Floodplain swamps at Gilchrist Blue occur adjacent to the Santa Fe River and in association with the various spring run streams and floodplain channels in the park. Bald cypress and swamp tupelo are the dominant tree species, both of which are adapted to long-term flooding. In many cases, floodplain swamp and alluvial forest are difficult to distinguish from each other and

form a complex mosaic based on local topography. A portion of the floodplain swamp was also cleared as part of the powerline corridor. The floodplain swamps at Gilchrist Blue are in excellent condition.

Desired Future Condition: 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.

General Management Measures: Maintenance of a natural hydrological regime is critical to the long-term health of this community. Floodplain swamps requires little active management other than protection from erosion impacts, control of feral hogs, and control of invasive exotic plant species.

Blackwater Stream

Description and Assessment: The Santa Fe River is a blackwater stream that forms the north boundary of the park. Additional information about the river is included in the Hydrology section above. While the condition of the river, despite declining water quality and quantity, is still generally good, erosion is occurring along portions of the riverbank. Some of the erosion is attributable to natural flooding and some is a result of increased visitor use. Within the lower Santa Fe River region, the influence of groundwater flow is especially important.

Desired Future Condition: Blackwater streams are characterized as perennial or intermittent watercourses originating in lowlands where extensive wetlands with organic soils collect rainfall and runoff, discharging it slowly 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. During low-flow periods in the Santa Fe, groundwater will constitute a significant amount of the overall river discharge, and water clarity becomes exceptional in this region. The flow of the Santa Fe, especially within the lower river basin, depends greatly on groundwater discharge from springs such as Gilchrist Blue Springs. 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.

General Management Measures: Management of a complex aquatic system such as the Santa Fe River is a difficult task. Since many impacts to this system have their origins either upstream or from groundwater sources, management considerations must necessarily extend beyond the park boundary. Protection of the Lower Santa Fe River basin is a priority. The park and district staffs will continue to work with state agencies responsible for monitoring water quality and quantity on the river,

and will continue to support the basic and applied research that is ongoing within this watershed.

Spring-Run Stream

Description and Assessment: Gilchrist Blue Spring is fed by the Floridan aquifer primarily through a single, large aquatic cave opening at the main spring. This second magnitude spring vent discharges to a short narrow spring-run stream that joins the Santa Fe River about 1,200 feet to the north. Two additional smaller spring vents are tributary to the main spring-run, including Naked and Little Blue springs. Naked Spring is the largest of the two and contributes nearly a third of the overall discharge (Scott et al. 2004). Numerous smaller spring-run streams and seepages occur within the park, along the edges of the river within the adjacent floodplain and contribute to the flow of the Santa Fe River. Additional descriptions of the springs may be found in the Hydrology section above.

Across Florida, water scientists are studying numerous water quality issues that can threaten the health of spring-run stream ecosystems. When the Santa Fe River is under extreme flood conditions, Gilchrist Blue and its numerous smaller spring-run streams can reverse flow and the aquatic cave system can act as an estavelle, with tannic surface water pushing into the Floridan aquifer. Unnaturally elevated nutrient levels in the groundwater has caused increased periphyton growth on submerged aquatic vegetation within most of Florida's spring-run streams. These stream systems can also experience high turbidity levels associated with peak periods of recreational use. Gilchrist Blue Spring has long been attractive to outdoor recreation enthusiasts. These activities, in addition to swimming, subject this aquatic system to highly intensive, and potentially destructive, pressures. Extensive damage occurs to both the stream vegetation and stream bottom, particularly in the area around the main spring vent. Foot traffic in the spring run 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. Turbidity, coupled with increased periphyton growth, can have a harmful effect on SAV, and by extension, the species that depend on them.

There are two highly invasive non-native SAV species that are found throughout the Santa Fe River, Gilchrist Blue Springs and their spring-run streams, namely hydrilla (*Hydrilla verticillata*) and Indian swampweed (*Hygrophila polysperma*). Hydrilla heavily predominates the main spring, but both are found all throughout the system. FWC has long had an herbicide program to control hydrilla in the Santa Fe River.

Desired Future Condition: Perennial water courses which derive most, if not all, of their water from limestone artesian openings from the underground aquifer. The waters will be typically cool, clear, and circumneutral to slightly alkaline. These factors allow for optimal sunlight penetration and minimal environmental fluctuations which promote plant and algae growth. However, the characteristics of the water can change significantly downstream as surface water runoff becomes a greater factor. Areas of high flow will typically have sandy bottoms while organic materials concentrate around fallen trees and limbs and slow moving pools. Typical

vegetation will include tapegrass, arrowheads, southern naiads (*Najas guadalupensis*), and pondweeds (*Potamogeton* sp.).

General Management Measures: Management of complex aquatic systems is a difficult task. Since many factors affecting the spring-run stream originate outside the park within the Gilchrist Blue springshed, management considerations must necessarily extend beyond the park boundary. Protection of groundwater sources within the Gilchrist Blue springshed will be a priority. Park and district staffs will continue to work with the appropriate water experts and to coordinate the numerous research projects associated with the river and its springshed.

Water quality issues that originate within the park are mostly related to recreational use. The greatest impacts from foot traffic occur during low water periods within the main spring and in the shallower reaches of the spring-run stream. Efforts to educate visitors to refrain from touching the bottom or damaging aquatic plants are underway. Sediments disrupted in shallow areas can cause increased turbidity downstream from the original point of disturbance.

The park will develop a plan to remove Hydrilla to keep the infestation at maintenance levels.

Subterranean Cave- Aquatic

Description and Assessment: Aquatic caves are associated with all of the springs within the park to a greater or lesser extent and lie beneath much of the park. At this time there are only a few aquatic caves that have been mapped in the park, but these are only associated with the adjacent Devil's Ear Spring system to the west. Nonetheless, the conduit system associated with the Gilchrist Blue Springs caves are likely to be very extensive and may have a significant connection to the Devil's Ear caves.

Desired Future Condition: 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. Aquatic caves vary from shallow pools that are highly susceptible to disturbance to systems that are more stable and totally submerged. Cave systems are extremely fragile. Desired future conditions include protecting against alterations that may increase pollution in aquatic systems. Desired future cave management at Gilchrist Blue will include protecting caves from changes that may affect flows, light penetration or microclimate, or that may cause increased pollution.

General Management Measures: It is very important that district and park staff begin to understand the upstream conduit connections for the Gilchrist Blue springshed, specifically the conduit system that is connected to the Devil's Ear Cave system that divers are currently exploring. Dye trace work in the Gilchrist Blue springshed is lacking, and any research that expands our understanding of the connections between the Ginnie and Gilchrist springsheds could fill a large gap in our knowledge of groundwater movement in this region.

To prevent silting in of the aquatic caves, staff will have to carefully monitor the erosion of slopes above the spring run and correct problems as they arise. A significant amount of planning will be necessary in order for the park to control visitor access more effectively and restore the shoreline area of this spring.

Altered Landcover Types

Desired future condition: Where altered landcover types occur, the desired future condition will, in most cases, be the historical natural community types described above.

Abandoned Field/Abandoned Pasture

Portions of zones GBS-4, GBS-5, and GBS-6 were converted to improved pastures prior to 1937. These areas were subsequently planted with pines at least once, with the last pines being harvested in 2008-2009. Bahia grass still occurs onsite and most of the groundcover is made up of weedy species. Like the adjacent sandhills in the same zones, there was no pine regeneration or planting after the last harvest. These former pasture/plantation areas will be burned along with the adjacent sandhills and will be planted with longleaf pines. These areas may need selective herbiciding of the remnant pasture grasses and may require seeding with native groundcover species to aid restoration of the sandhill natural community.

Borrow Area

There are several borrow areas scattered across the property, primarily in zone GBS-1e. The largest is a shallow borrow area along the service road west of the shop. At least two smaller borrow areas are located immediately adjacent to the powerline. These borrows were likely used as a source of fill onsite, prior to state ownership. There are no current plans to fill in borrow areas, but the goal would be to restore these areas back to the appropriate historic natural community.

Developed

The developed area of the park is associated with the main spring. The day use area is centered around the main spring. Development there consists of a toll booth, parking area, picnic pavilions, and bathrooms. To the east of the main spring are campsites, and to the west are the shop and concession facilities.

Management of the developed areas will include removal of all priority invasive exotic plants (FLEPPC Category I and II species). Other management measures will include proper storm water management and the designing of future development so that it is compatible with springs and river protection and prescribed fire management in adjacent natural areas.

Utility Corridor

A significant electric utility line corridor bisects the NW portion of the park and is maintained by Duke Energy. The lines run roughly north-south across the park and

pass over the Santa Fe River. Removal of the tree canopy occurred in the early 1960s and these areas are kept open by routine maintenance. Should these utility corridors ever be abandoned, the desired future conditions would include sandhill, upland hardwood forest, and floodplain natural communities. General management measures include control of priority invasive plant species and prescribed fire in the former sandhill. The park will coordinate with Duke Energy to try to minimize the impacts of the utility corridors on adjacent natural communities and on the aesthetics of the state park.

Successional Hardwood Forest

The successional hardwood forests occur along the ecotone between the upland hardwood forest and sandhill community. Due to fire exclusion in the sandhills, laurel oaks and other offsite hardwoods moved into the sandhills from the adjacent upland hardwood forests. In addition, the sand live oaks in the sandhills expanded and created closed canopy areas due to lack of fires. Areas closest to the main spring were also heavily impacted by informal campsites that were established along with a network of trails and unimproved roads. Scattered adult longleaf pines still persist in these areas. Native groundcover species are present in some areas and will likely become more prevalent as the prescribed fire program proceeds. The desired future condition for the successional hardwood forest is sandhill.

Restoration efforts will require removal of the offsite hardwoods through chemical or mechanical treatment. It may also be necessary to do supplemental plantings with native groundcover species and longleaf pines. Ongoing management of these areas will include removal of all priority invasive exotic plants (FLEPPC Category I and II species) that are encountered.

Resource Management Activities

Goal: Restore and maintain the natural communities/habitats of the park.

The 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 communities' improvements. Following are the natural community management objectives and actions recommended for the state park.

Prescribed Fire Management: Prescribed fire is used to mimic natural lightning-set fires, which are one of the primary natural forces that shaped Florida's ecosystem. Prescribed burning increases the abundance and health of many plant and 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 wildland fuels.

All prescribed burns in the Florida state park system are conducted with authorization from the FDACS, Florida Forest Service (FFS). Wildfire suppression activities in the park are coordinated with the FFS.

Prescribed fire is planned for each burn zone on the appropriate interval. The park's burn 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 burn objectives. In order to track fire management activities, the DRP maintains the the Natural Resource Tracking System (NRTS). NRTS allows staff to track various aspects of each park's fire management program. NRTS is used for annual burn planning which allows the DRP to document fire management goals and objectives on an annual basis. Each annual burn plan is developed to support and implement the broader objectives and actions outlined in this ten-year management plan. Each quarter reports are produced that track progress towards meeting annual burn objectives.

Natural Community Restoration: In some cases, the reintroduction and maintenance of natural processes is not enough to reach the desired future conditions for natural communities in the park, and active restoration programs are required. Restoration of altered natural communities to healthy, fully functioning natural landscapes often requires substantial efforts that may include mechanical treatment of vegetation or soils and reintroduction or augmentation of native plants and animals. For the purposes of this management plan, restoration is defined as the process of assisting the recovery and natural functioning of degraded natural communities to desired future condition, including the re-establishment of biodiversity, ecological processes, vegetation structure and physical characters.

Examples that would qualify as natural community restoration, requiring annual restoration plans, include large mitigation projects, large-scale hardwood removal and timbering activities, roller-chopping and other large-scale vegetative modifications. The key concept is that restoration projects will go beyond management activities routinely done as standard operating procedures such as routine mowing, the reintroduction of fire as a natural process, spot treatments of exotic plants, and small-scale vegetation management (see Natural Communities - Desired Future Conditions Map).

Natural Community Improvement: Improvements are similar to restoration but on a smaller, less intense scale. This typically includes small-scale vegetative management activities or minor habitat manipulation. Following are the natural community/habitat improvement actions recommended at the park.

Objective A Complete a comprehensive floral and faunal survey and create/update the park's baseline plant and animal list.

Action 1	Complete a comprehensive survey.
Action 2	Create a baseline plant and animal list.

Initial plant and animal surveys were conducted in late 2017 after acquisition of the park by the State of Florida. Additional surveys will be required to develop a more comprehensive species list. Surveys in other seasons of the year will allow detection of migratory animal species and will facilitate identification of plant species during growing and flowering seasons.

Objective B: Within 10 years, have 250 acres of the park maintained within the optimum fire return interval.

Action 1	Develop/update annual burn plan
Action 2	Manage fire dependent communities by burning between 85 - 235 acres annually.
Action 3	Create 1.4 miles of perimeter firebreaks

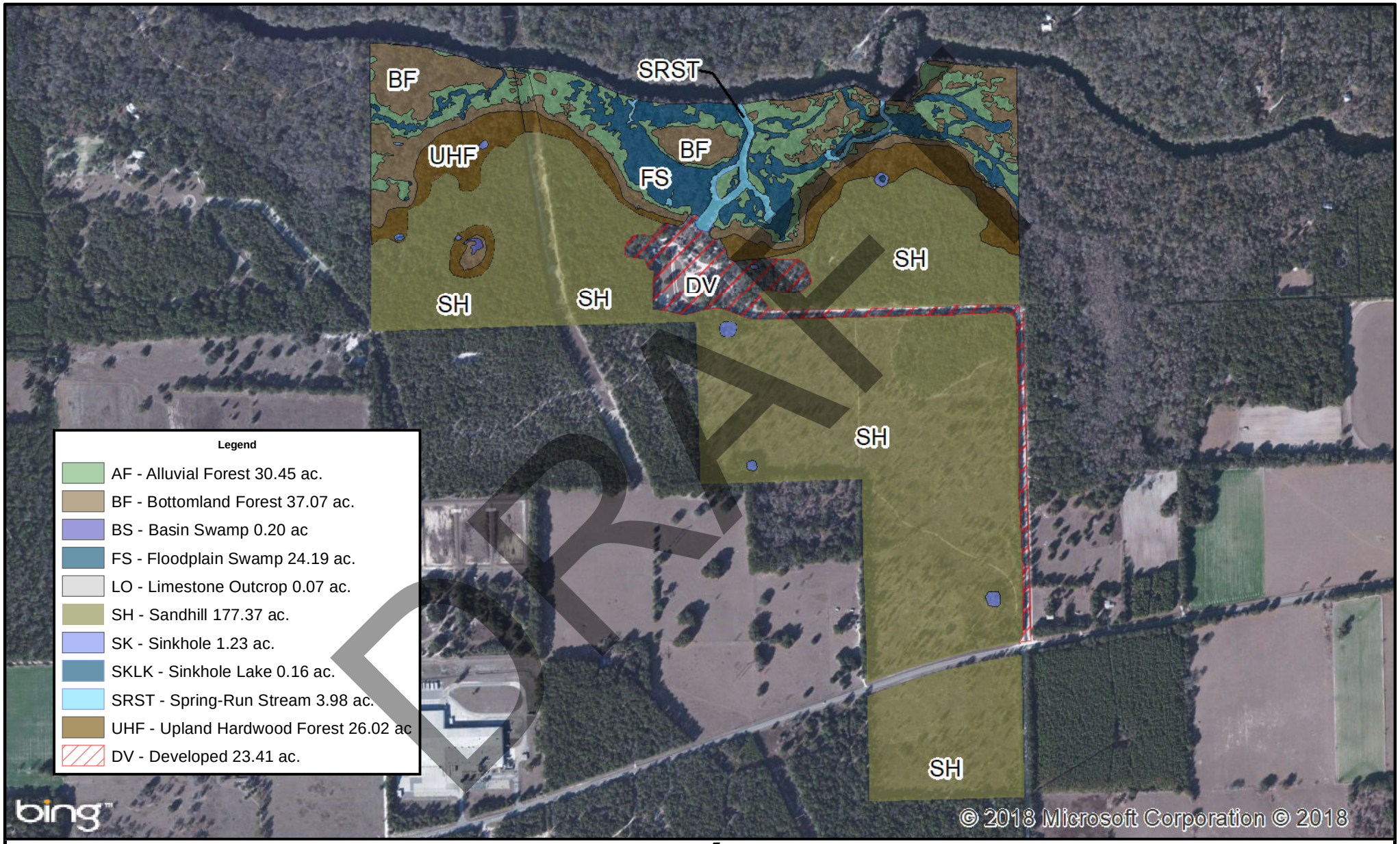
Table 2 contains a list of all fire-dependent natural communities found within the park, their associated acreage and optimal fire return interval, and the annual average target for acres to be burned.

Table 3: Prescribed Fire Management

Natural Community	Acres	Optimal Fire Return Interval (Years)
Sandhill	177	1-3
Abandoned Field/Abandoned Pasture	32	1-3
Successional Hardwood Forest	40	2-3
Utility Corridor	6	1-3
Annual Target Acreage	85-235	

Most of the park is either current or former sandhills. The sandhills to the south of the entrance road retain scattered native groundcover species despite having slash pines planted and harvested. No longleaf pines remain in zones GBS-4, GBS-5 and GBS-6, but enough native grasses and herbaceous species persist to carry fire. Offsite hardwoods are scattered across these zones, but the pine harvesting in 2008-2009 has left the site relatively open. Zones GBS-1e, GBS-1w, and GBS-3, north of the entrance road retain scattered adult longleaf pines with patches of native groundcover, including wiregrass. But these zones are heavily invaded by offsite hardwoods making prescribed fire more difficult.

Initial burns on site should concentrated on burning the southern zones as completely as possible to reduce hardwoods and stimulate groundcover species in preparation for replanting with longleaf pines. Initial burns in the northern zones should concentrate on burning existing groundcover patches and introducing low intensity fires in the vicinity of the adult longleafs to gradually reduce accumulated duff layers. The annual burn goal for the park is 85 to 235 acres per year.



GILCHRIST BLUE SPRINGS
STATE PARK

0 245 490 980 Feet

Florida Department of Environmental Protection
Division of Recreation and Parks
Date of aerial; 2011

NATURAL COMMUNITIES
DESIRED FUTURE CONDITIONS MAP

Although much of the park boundary is protected by a perimeter road that can be used as a firebreak, approximately 1.4 miles of the park boundary will need a perimeter road/firebreak installed. Approximately 40 acres of former sandhill is classified as successional hardwood forest. Removal of offsite hardwoods may be necessary in this area, and in some of the sandhills, to help promote better penetration of prescribed fires.

The sandhills at Gilchrist Blue Springs still support a population of gopher tortoises, and may also support burrow commensals. Frequent burning of the sandhills will be essential to sustain and increase the gopher tortoise population onsite.

Objective C: Conduct natural community/habitat improvement activities on 148 acres of sandhill natural community.

Action 1 Mechanically and or chemically treat off-site hardwoods in the 32 acres abandoned field in zones GBS-4, GBS-5 and GBS-6.

Action 2 Plant longleaf pine in zones GBS-4, GBS-5 and GBS-6 on 148 acres of sandhill and abandoned pasture after the initial site burn.

Gilchrist Blue Springs has areas of sandhill that were recently logged but contain good native groundcover. These areas are lacking fire and longleaf pines. Adjacent to this and within the same management zones are smaller areas with off-site hardwoods and some exotic pasture grasses mixed with native ground cover. All of these areas are lacking longleaf pines. Some areas may need treatment of exotic pasture grasses as well as off-site hardwoods.

Approximately 32 acres of off-site hardwoods need mechanical and or chemical treatment. Exotic pasture grass cover ranges from 5 to 50% in these same areas and will need chemical treatment.

Post mechanical and chemical treatment and fire all of these acres should be planted with longleaf pine at the rate of 400-500 trees per acre.

Native ground enhancement needs will be evaluated post treatment and fire.

Objective D: Conduct natural community/habitat improvement activities on 96 acres of sandhill natural community.

Action 1 Treat selected hardwoods adjacent to existing longleaf pines in zones GBS-1w, GBS-1e and GBS-3.

The sandhill and successional hardwood forest in zones GBS-1w, GBS-1e and GBS-3 retain mature longleaf pines embedded in a matrix of excessively high density mature sand live oaks and laurel oaks. This is due to the absence of fire over many years. To stimulate the native groundcover and improve the impact of prescribed

fire specific sand live oak and laurel oaks adjacent to remnant longleaf pines will be identified for removal.

Objective E: Conduct natural community/habitat improvement activities on 32 acres of sandhill natural community.

Action 1 Determine if the abandoned pasture areas within the sandhill need treatment of exotic pasture grasses and native groundcover seeding in addition to longleaf pine planting.

Action 2 Develop a plan for native groundcover improvement if needed.

Because of the presence of exotic pasture grasses in parts of zones GBS-4, GBS-5 and GBS-6 these areas may need additional treatment of the exotic grasses and supplemental planting of native sandhill groundcover.

Conduct an evaluation to determine the presence of native groundcover and exotic grasses after treatment and fire.

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), NOAA – National Marine Fisheries Service (NMFS), Florida Fish and Wildlife Conservation Commission (FWC) or the Florida Department of Agriculture and Consumer Services (FDACS) as endangered, threatened or of special concern.

Initial plant and animal surveys of Gilchrist Blue Springs State Park have detected several imperiled species within the park. Additional surveys will be needed to document additional imperiled species within the park. The only imperiled plant species detected so far is the rainlily (*Zephyranthes atamasca*) which occurs in the floodplain areas of the park and along the spring-run streams. Potential threats to this species include damage by feral hogs and recreational foot traffic.

Imperiled reptiles within the park include the gopher tortoise, American alligator, and Suwannee alligator snapping turtle. A gopher tortoise burrow survey was conducted by the previous landowner. Staff will request those data from the previous owner as a baseline population estimate for gopher tortoises in the park. Any future surveys should utilize the Line Transect Distance Sampling technique recommended by FWC (Smith et al 2009). The aquatic turtles at Gilchrist Blue Springs have been monitored as part of a long-term population study by researchers from Santa Fe College and other institutions (Johnston et al 2016, Johnston et al *in press* 2018). The Suwannee alligator snapping turtle is one focus of these ongoing studies. Staff will continue to facilitate research within the park to monitor trends in turtle populations.

Federally listed wood storks and West Indian manatees have also been observed within the park. Staff will monitor the spring runs for the presence of manatees and will ensure that recreational activities do not disturb manatees within the park. This

is particularly important during colder weather when manatees may be seeking warm water refugia.

Table 3 contains a list of all known imperiled species within the park and identifies their status as defined by various authorities. It also identifies the types of management actions that are currently being taken by DRP staff or others, and identifies the current level of monitoring effort. The codes used under the column headings for management actions and monitoring level are defined below the table. Explanations for federal and state status as well as FNAI global and state rank are provided in Appendix 6.

Table 4: Imperiled Species Inventory

Common and *Scientific Name*	**Imperiled Species Status**				**Management Actions**	**Monitoring Level**
	FWC	**USFWS**	**FDACS**	**FNAI**		
PLANTS						
Rainlily *Zephyranthes atamasca*			LT		4,10	Tier 1
REPTILES						
American Alligator *Alligator mississippiensis*	FT (S/A)	SAT		G5,S4	10	Tier 1
Gopher tortoise *Gopherus polyphemus*	ST			G3,S3	1,6,7,10,13	Tier 2
Suwannee Alligator Snapping Turtle *Macrochelys suwanniensis*	SSC			G1G2, S1S2	4,10	Tier 2
BIRDS						
Wood Stork *Mycteria americana*	FT	LT		G4,S2	4	Tier 2
MAMMALS						
West Indian Manatee *Trichechus manatus*	FT	LT		G2,S2	4,10	Tier 1

Management Actions:

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

Monitoring Level:

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

Resource Management Activities

Goal: Maintain, improve or restore imperiled species populations and habitats in the park.

Ongoing inventory and monitoring of imperiled species in the state park system is necessary to meet the DRP's mission. Long-term monitoring is also essential to ensure the effectiveness of resource management programs. Monitoring efforts must be prioritized so that the data collected provides information that can be used to improve or confirm the effectiveness of management actions on conservation priorities. Monitoring intensity must at least be at a level that provides the minimum data needed to make informed decisions to meet conservation goals. Not all imperiled species require intensive monitoring efforts on a regular interval. Priority must be given to those species that can provide valuable data to guide adaptive management practices. Those species selected for specific management action and those that will provide management guidance through regular monitoring are addressed in the objectives below.

In the preparation of this management plan, DRP staff consulted with staff of the FWC's Imperiled Species Management Section or that agency's Regional Biologist and other appropriate federal, state and local agencies for assistance in developing

imperiled animal species management objectives and actions. Likewise, for imperiled plant species, DRP staff consulted with FDACS. Data collected by the USFWS, FWC, FDACS and FNAI as part of their ongoing research and monitoring programs will be reviewed by park staff periodically to inform management of decisions that may impact imperiled species in the park. Management of imperiled species will be guided by Florida's Imperiled Species Management Plan (FWC 2016) and appropriate Species Action Plans.

Objective A: Develop baseline imperiled species occurrence inventory lists for plants and animals.

Action 1 Develop baseline imperiled species occurrence inventory lists for plants and animals.

Initial surveys at the park have detected several imperiled species, but additional surveys are needed to establish an accurate list of imperiled species.

Objective B: Monitor and document 3 selected imperiled animal species in the park.

Action 1 Develop monitoring protocols for 1 selected imperiled animal species, including the West Indian manatee.

Action 2 Implement monitoring protocols for 3 imperiled animal species, including those listed in Action 1 above and the Suwannee alligator snapping turtle and imperiled bird species.

District staff will work with park staff to develop a monitoring/reporting system for the West Indian manatee to track the use of the spring-runs by manatees. This information will be shared with appropriate FWC, USFWS, and SRWMD staff as needed. Staff will also continue to work the researchers from Santa Fe College and the North American Freshwater Turtle Research Group to facilitate the long-term monitoring of the turtle populations at Gilchrist Blue Spring and other state parks along the Santa Fe River. In December 2017 Gilchrist Blue Spring was included for the first time in the Ichetucknee/Santa Fe/O'Leno Christmas Bird Count. This annual count will be used to monitor all avian species in the park, including any imperiled species.

Objective C: Monitor and document 0 selected imperiled plant species in the park.

The only imperiled plant species detected so far within the park, the rain lily, is relatively common. As the imperiled plant list is expanded through additional survey work, additional monitoring needs may be necessary for specific species.

Exotic and Nuisance Species

Exotic species are plants or animals not native to Florida. Invasive exotic species are able to out-compete, displace or destroy native species and their habitats, often because they have been released from the natural controls of their native range, such as diseases, predatory insects, etc. If left unchecked, invasive exotic plants and animals alter the character, productivity and conservation values of the natural areas they invade.

Exotic animal species include non-native wildlife species, free ranging domesticated pets or livestock, and feral animals. Because of the negative impacts to natural systems and cultural resources attributed to exotic animals, the DRP actively removes exotic animals from state parks, with priority being given to those species causing the greatest 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 venomous snakes or raccoons and alligators that are in public areas. Nuisance animals are dealt with on a case-by-case basis in accordance with the DRP's Nuisance and Exotic Animal Removal Standard.

A complete survey for invasive exotic plants will need to be conducted at the park. This information will be entered into the statewide NRST database.

District biological staff conducted brief initial surveys in late 2017 at Gilchrist on several visits and observed a few localized non-native plant species. From these brief surveys as well as other records in 2017, four Florida Exotic Pest Plant Council (FLEPPC) Category I species were discovered, including mimosa (*Albizia julibrissin*), Chinese tallow (*Triadica sebifera*), hydrilla and Indian swampweed (*Hygrophila polysperma*). Hydrilla (*Hydrilla verticillata)* and Indian swampweed were present in the park's springs and spring-run streams. Historic photos of the spring and spring-run (i.e. as late as March 2017) indicate that significant portions of the upper third of the stream is predominated by hydrilla. Both of these highly invasive SAV species are found all throughout the system. Impacts of Hurricane Irma in 2017 completely browned out the entire spring and may have caused a temporary die-off of hydrilla.

Two other non-native plants not on a FLEPPC list but are found at the park include pitted beardstem (*Bothriochloa pertusa*) and centipede grass (*Eremochloa ophiuroides*). These two species are of concern because they may present an unexpected challenge for future groundcover restoration within the sandhill community. The exotic pasture grass, Bahia grass (*Paspalum notatum*) is also present. It is of less concern during restoration but it should be treated in areas outside of the day use part of the park.

Table 5: Inventory of FLEPPC Category I and II Exotic Plant Species			
Common and Scientific Name	**FLEPPC Category**	**Distribution**	**Management Zone (s)**
PLANTS			
Chinese tallow *Triadica sebifera*	I	1	GBS-5
Mimosa *Albizia julibrissin*	I	1	GBS-5
Indian swampweed *Hygrophila polysperma*	I	3	GBS-2
Hydrilla *Hydrilla verticillata*	I	5	GBS-2

Distribution Categories:

0 No current infestation: All known sites have been treated and no plants are currently evident.
1 Single plant or clump: One individual plant or one small clump of a single species.
2 Scattered plants or clumps: Multiple individual plants or small clumps of a single species scattered within the gross area infested.
3 Scattered dense patches: Dense patches of a single species scattered within the gross area infested.
4 Dominant cover: Multiple plants or clumps of a single species that occupy a majority of the gross area infested.
5 Dense monoculture: Generally, a dense stand of a single dominant species that not only occupies more than a majority of the gross area infested, but also covers/excludes other plants.
6 Linearly scattered: Plants or clumps of a single species generally scattered along a linear feature, such as a road, trail, property line, ditch, ridge, slough, etc. within the gross area infested.

Appendix 7 contains a list of the FLEPPC Category I and II invasive, exotic plant species found within the park (FLEPPC 2017). The Appendix also identifies relative distribution for each species and the management zones in which they are known to occur. An explanation of the codes is provided following the table.

Plant and Animal Disease and Nuisance Insects

If symptoms of disease in native plant or animal populations are observed and appear to be spreading in any park, the DRP will consult with FFS or FWC, as appropriate, to determine an appropriate and timely management response.

In 2002, the red bay ambrosia beetle (*Xyloborus glabratus*) was first detected in the United States in southeast Georgia. The beetle carries the fungal pathogen (*Raffaelea lauricola*) which it transmits to red bay trees (*Persea borbonia*) and other species in the Lauraceae family, causing laurel wilt disease and death. The beetle and its associated pathogen spread rapidly, and by 2005 it had appeared in Duval County, Florida. It was first detected in Gilchrist County in 2012. The beetle (and laurel wilt) has now spread throughout most of Florida and into many of the neighboring states.

It is not currently known if laurel wilt is present in the park although in neighboring parks most adult red bay trees have been top-killed by this beetle-transmitted disease. Fortunately, red bay trees can re-grow from their root systems. It may be that members of the Lauraceae family will continue to survive in shrub form as the

remnant tree root systems continue to grow. At this point, much remains unknown about the long-term impacts of this disease on red bays and other Lauraceae. Since firewood can transport the ambrosia beetle, park staff should restrict the movement of firewood into and out of the park and educate visitors about the issue.

Mosquito control occurs on some state parks. All DRP lands are designated as "environmentally sensitive and biologically highly productive" in accordance with Section 388.4111, Florida Statutes. If a local mosquito control district proposes treatment, the DRP works with them to adopt a mutually agreeable plan. By policy of the DEP since 1987, treatment plans may not include aerial adulticiding but typically allow larviciding. DRP policy also allows park managers to request typical truck spraying (adulticide fogging) in public use areas even in the absence of a treatment plan. The DRP does not authorize new physical alterations of marshes through ditching or water control structures. Mosquito control plans temporarily may be set aside under declared threats to public or animal health, or during a Governor's Emergency Proclamation.

There has been no arthropod management plan developed for Gilchrist Blue Springs State Park.

Resource Management Activities

Goal: Remove exotic and invasive plants and animals from the park and conduct needed maintenance control.

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

Objective A: Annually treat all infested acres of exotic plant species in the park.

Action 1	Annually develop/update exotic plant management work plan
Action 2	Implement annual work plan by treating all upland acres in park, annually, and continuing maintenance and follow-up treatments, as needed
Action 3	Develop a plan to manage hydrilla and Indian swampweed

The DRP calculates the acreage of exotic plants proposed for treatment using the concept of "infested area." The concept defines an area of land (Gross Area Acres) and multiplies the number of acres by the percent cover of exotic plants to estimate the infested acres. This calculation provides an estimation of area (acres) covered by the exotic plants if the plants were accumulated into one area. This methodology more accurately estimates the actual acres of plants removed (DRP Invasive Exotic Plant Protocol 2013).

Currently the number of infested acres in the park is not known since a complete survey has yet to be conducted. Based on preliminary surveys it appears that the

number of infested acres will be quite low with the possible exception the spring run area.

While it is known that hydrilla and Indian swampweed are present in the spring run it has not be possible to determine their abundance without further survey effort. However historic photos of the spring run indicate that significant portions of at least the upper third of the stream is predominated by hydrilla. Impacts of Hurricane Irma in 2017 completely browned out the entire spring and may have caused a temporary die-off of hydrilla. DRP will develop a plan to monitor these non-native species, and to manage them.

To protect the park from further spread of centipede grass and pitted beardstem the park should develop a mowing and fireline protocol that includes recognition of these species, control of known populations and a clean equipment protocol that avoids spreading the species via mowers and during fireline construction and maintenance.

Objective B: Implement control measures on 1 exotic animal species in the park.

Action 1 Control feral hogs on an as needed basis.

Feral hogs (*Sus scrofa*) are present in the park but only a small amount of sign has been observed at this time. DRP staff will monitor damage and implement control measures as needed.

Special Natural Features

Certainly, the most significant natural features at Gilchrist Blue Springs State Park are the two second magnitude freshwater springs and the numerous other springs scattered across the property. Several limestone outcrops are also scattered across the Gilchrist Blue landscape, including a significant cascade on the eastern portion of the property.

Despite the heavy recreational use that the two main springs of the park endure in the warmer seasons, many of the spring ecosystems on the property still retain their natural character. At certain times of the year, the Gilchrist Blue and Naked Springs offer a magically spectacular crystal blue glimpse of the Floridan aquifer. Nonetheless, visible changes to these spring ecosystems are happening below the surface. Like so many of our other Florida springs, Gilchrist Blue has been slowly damaged from afar. Nitrates, pesticides and other pollutants, carried in runoff to sinks or percolating through the soil within the springshed, have found their way into the underground conduits that feed the many springs at Gilchrist Blue. Recreational use has also impacted large sections of SAV within the spring, and much of this aquatic vegetation is covered by nuisance periphyton. Long-term preservation of the Gilchrist Blue Springs will require strict adherence to carrying capacities and close monitoring of recreational, and agricultural impacts within its springshed.

Cultural Resources

Description and Assessment

This section addresses the cultural resources present in the park that may include archaeological sites, historic buildings and structures, cultural landscapes and collections. The Florida Department of State (FDOS) maintains the master inventory of such resources through the Florida Master Site File (FMSF). The DRP maintains the master inventory of its collections. Section 267.061, F.S., requires that all state agencies locate, inventory and evaluate cultural resources that appear to be eligible for listing in the National Register of Historic Places (NRHP). Appendix 8 contains the FDOS, Division of Historical Resources (DHR) management procedures for archaeological and historical sites and properties on state-owned or controlled properties; the criteria used for evaluating eligibility for listing in the National Register of Historic Places (NHRP), and the Secretary of the Interior's definitions for the various preservation treatments (restoration, rehabilitation, reconstruction and preservation). For the purposes of this plan, the term "significant" refers to those cultural resources listed, eligible for listing or potentially eligible for listing in the NRHP. To be eligible for listing, cultural resources must be at least 50 years old or of exceptional importance if younger. This plan includes cultural resources that are at least 50 years old or of exceptional importance or that will reach 50 years of age during the term of this plan.

Evaluating the condition of cultural resources is accomplished using a three-part evaluation scale, expressed as good, fair and poor. These terms consider the site's current level of stability and the rate and amount of decline in its condition. The rating is not a comparison of the site's present condition to an idealized condition. "Good" describes a condition of structural stability and physical wholeness, where no obvious deterioration other than normal occurs. "Fair" describes a condition in which there is a discernible decline in condition between inspections, and the wholeness or physical integrity is and continues to be threatened by factors other than normal wear. A fair assessment is usually a cause for concern. "Poor" describes an unstable condition where there is palpable, accelerating decline, and physical integrity is being compromised quickly. A resource in poor condition suffers obvious declines in physical integrity from year to year. A poor condition suggests immediate action is needed to reestablish physical stability.

Table 4 contains the name, FMSF number, cultural or temporal period and cultural resource type (FMSF category) of all the cultural sites within the park that are listed in the FMSF. The table also summarizes each site's level of significance, present condition and recommended preservation treatment. An explanation of the codes is provided below the table.

Table 6: Cultural Sites Listed in the Florida Master Site File					
Site Name and FMSF #	**Cultural/Temporal Period**	**Resource Type**	**Significance**	**Condition**	**Treatment**
GI20 Between Blue and Lily Springs	Prehistoric	Archaeological Site	NE	NE	P
GI21 Blue Spring	Prehistoric	Archaeological Site	NE	NE	P

Significance:

NRL	National Register listed
NR eligible	National Register
NE	Not evaluated
NS	Not significant
II	Insufficent Information

Condition

G	Good
F	Fair
P	Poor
NA	Not accessible
NE	Not evaluated

Recommended Treatment:

RS	Restoration
RH	Rehabilitation
P	Preservation
R	Removal
N/A	Not applicable

Prehistoric and Historic Archaeological Sites

Description and Assessment: The park has two known archaeological sites, GI20 and GI21. These sites were recorded in 1966 and artifacts are stored in the Simpson Collection. Very little is known about these pre-historic sites. Their condition has yet to be determined.

While these sites are nominally included in two surveys (Smith et al 1997; Hendryx 2003) no predictive sensitivity model or detailed survey have occurred in the park. Threats to the sites are currently human foot traffic and any future development.

Desired Future Condition: All significant archaeological sites within the park that represent Florida's cultural periods or significant historic events or persons are preserved in good condition in perpetuity, protected from physical threats and interpreted to the public.

Historic Structures

Description and Assessment: The park does not have any historic structures.

Desired Future Condition: All significant historic structures and landscapes that represent Florida's cultural periods or significant historic events or persons are preserved in good condition in perpetuity, protected from physical threats and interpreted to the public.

Collections

Description and Assessment: The park does not have any collections.

Desired Future Condition: All archival material and historic, natural history and archaeological objects within the park are preserved in good condition in perpetuity, protected from physical threats and interpreted to the public, except those sites determined to be insignificant by the DRP.

Resource Management Activities

Goal: Protect, preserve, interpret and maintain the cultural resources of the park.

The management of cultural resources is often complicated because these resources are irreplaceable and extremely vulnerable to disturbances. The advice of preservation and archaeological experts is required in this effort. All activities related to land clearing, ground disturbing activities, major repairs or additions to historic structures listed or eligible for listing in the NRHP must be submitted to the FDOS, Division of Historical Resources (DHR) for review and comment prior to undertaking the proposed project. DHR recommendations may include, but are not limited to concurrence with the project as submitted, monitoring of the project by a certified archaeological monitor, cultural resource assessment survey by a qualified professional archaeologist or modifications to the proposed project to avoid or mitigate potential adverse effect. In addition, any demolition or substantial alteration to any historic structure or resource must be submitted to the DHR for consultation and the DRP must demonstrate that there is no feasible alternative to removal and must provide a strategy for documentation or salvage of the resource. Section 267.061, F.S., further requires that the DRP consider the reuse of historic buildings in the park in lieu of new construction and must undertake a cost comparison of new development versus rehabilitation of a building before electing to construct a new or replacement building. This comparison must be accomplished with the assistance of the DHR.

Objective A: Assess and evaluate the physical condition of* GI21 *cultural resource in the park.

Action 1 Complete DRP condition assessment of archaeological sites.

Before a protection plan can be developed, if needed, a condition assessment for GI21 is needed. Nothing is known at this time.

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

Action 1 All known archaeological sites have been recorded with the FMSF. Any new sites discovered will be recorded with the FMSF.

Action 2 Complete an archaeological sensitivity model for the park.

Action 3 Conduct a Phase 1 survey in advance of any ground disturbance.
Action 4 Develop a protocol to address archaeological artifacts found in the park
Action 5 Develop and adopt a Scope of Collections Statement that indicates the park will not maintain a collection.
Action 6 Conduct oral history interviews with the park's previous owners.

Because Gilchrist Blue Springs is a new park that has recently entered public ownership no predictive model or Phase 1 survey has been conducted. It is important that these be conducted prior to any ground disturbing activity.

Research is needed on the pre-Columbian history of the park and its relation to the cultures along the Santa Fe River.

Objective C: Bring 1 of 2 recorded cultural resources into good condition.

Action 1 Develop a protection and treatment plan for GI21 cultural resources if necessary.

At this time, it is unknown what, if any, management measures are needed. This will be determined as part of a condition assessment.

Special Management Considerations

Timber Management Analysis

Chapters 253 and 259, Florida Statutes, require an assessment of the feasibility of managing timber in land management plans for parcels greater than 1,000 acres if the lead agency determines that timber management is not in conflict with the primary management objectives of the land. The feasibility of harvesting timber at this park during the period covered by this plan was considered in context of the DRP's statutory responsibilities and an analysis of the park's resource needs and values. The long-term management goal for forest communities in the state park system is to maintain or reestablish old-growth characteristics to the degree practicable, with the exception of those communities specifically managed as early successional.

A timber management analysis was not conducted for this park since its total acreage is below the 1,000-acre threshold established by Section 253.036, F.S. Timber management will be re-evaluated during the next revision of this management plan.

Submerged Lands Management

The Trustees have granted management authority of certain sovereign submerged lands to the DRP under Management Agreement MA 68-086 (as amended January 19, 1988). Management of Gilchrist Blue Springs State Park may include certain

management activities within the buffer zone of sovereign submerged land, beginning at the mean high water or ordinary high-water line, or from the edge of emergent vegetation extending waterward for 400 feet and all sovereign submerged lands surrounded by any state park.

This area includes the portion of the Santa Fe River, a blackwater stream, that runs along the north boundary line of the park. Visitors may access the river from the park, or by boat from access points outside the park. Management activities in the buffer zone will include removal of trash and other litter, protection of imperiled species, resource inventories and monitoring, and control of visitor access to the park.

Additional Considerations