Manatee Springs State Park

Advisory Group Draft
Unit Management Plan

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Division of Recreation and Parks
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INTRODUCTION

Manatee Springs State Park is located in Levy County (see Vicinity Map). Access to the park is from State Road 320 (see Reference Map). The Vicinity Map also reflects significant land and water resources existing near the park.

Manatee Springs State Park was initially acquired on January 23, 1968. Since this initial purchase, the State has acquired several additional parcels, through LATF and P2000/Acquisitions and Inholdings programs. The Board of Trustees of the Internal Improvement Trust Fund (Trustees) hold fee simple title to the park and on January 23, 1968, the Trustees leased (Lease Number 2324) the property to DRP under a 99-year lease. In 1988, the Trustees assigned a new lease number (Lease Number 3634) to the park without making any changes to the terms and conditions of Lease Number 2324. The current lease will expire on January 22, 2067.

Manatee Springs State Park is designated single-use to provide public outdoor recreation and other park-related uses. There are no legislative or executive directives that constrain the use of this property (see Addendum 1).

Purpose and Significance of the Park

Manatee Springs State Park was acquired for the purpose of protecting and developing Manatee Spring and the surrounding area as an exceptional public outdoor resource-based recreation opportunity for Florida residents and visitors.

Park Significance

- Manatee Springs State Park protects one of the largest first magnitude springs in the lower Suwannee River Basin that is the end point of 4.5 miles of mapped aquatic caves that exit to a 1,200-foot spring run stream. It offers remarkable resource-based outdoor recreation opportunities, including swimming, snorkeling, scuba diving, paddling, hiking and camping.
- The park protects, interprets, and provides access to numerous prominent karst features as well as an extensive mosaic of floodplain swamp, alluvial forest and upland mixed woodland that play important roles in the watershed and floodplain of the greater Suwannee River ecosystem.
- The park's 19 distinct natural communities provide habitat for seven imperiled plant species, including the giant and threebirds orchids, as well as 24 imperiled animal species, including the West Indian manatee, Florida black bear, and gopher tortoise.
- The park preserves and interprets a range of archaeological sites belonging to three broad eras, including the pre-Columbian, early European contact, and European frontier periods. William Bartram's memoirs recount his visit to Manatee Springs in 1774.

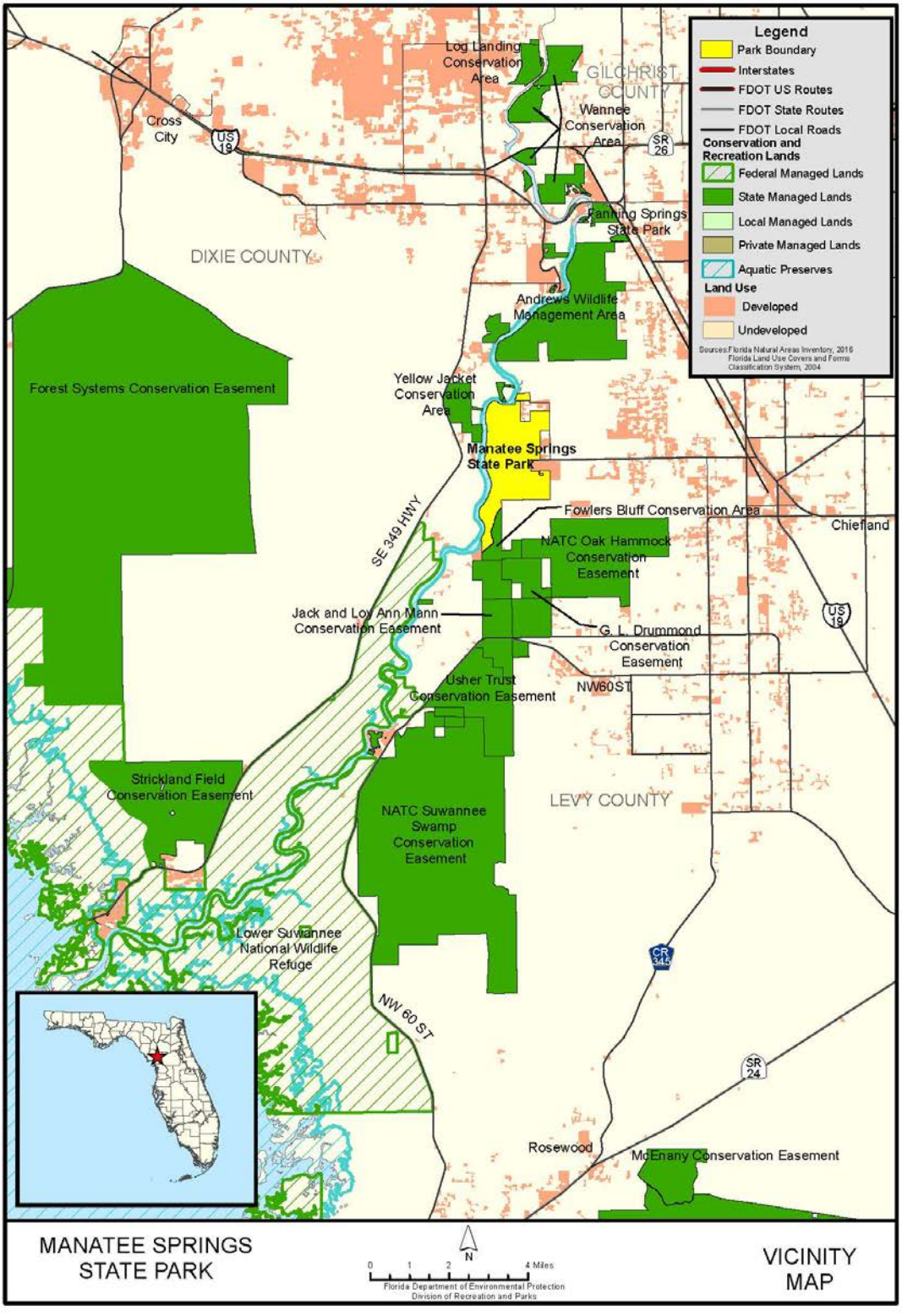
Manatee Springs State Park is classified as a State Park in the DRP's unit classification system. In the management of a State Park, a balance is sought between the goals of maintaining and enhancing natural conditions and providing various recreational opportunities. Natural resource management activities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

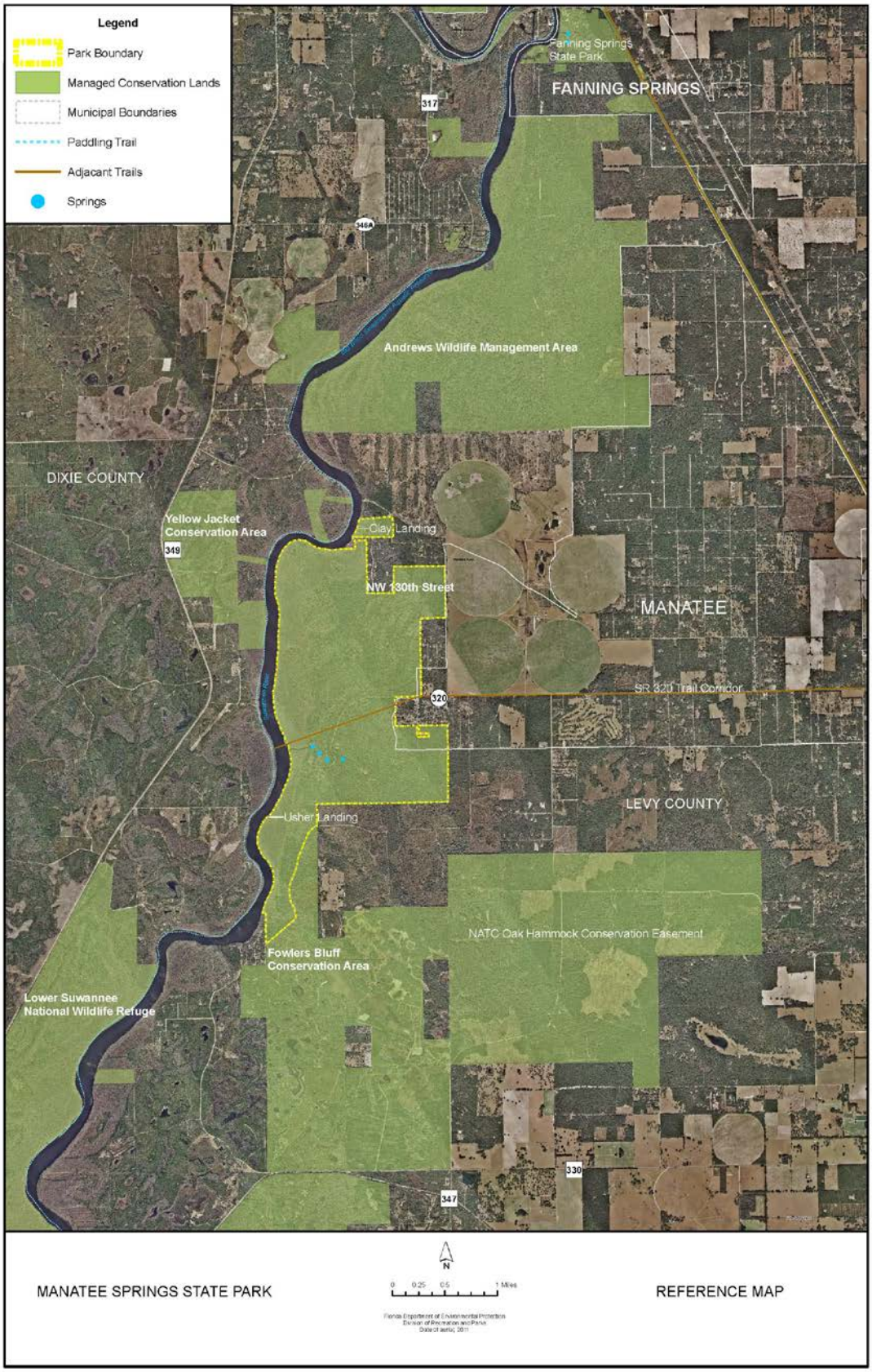
Purpose and Scope of the Plan

This plan serves as the basic statement of policy and direction for the management of Manatee Springs State Park State Park as a unit of Florida's state park system. It identifies the goals, objectives, actions and criteria or standards that guide each aspect of park administration, and sets forth the specific measures that will be implemented to meet management objectives and provide balanced public utilization. The plan is intended to meet the requirements of Sections 253.034 and 259.032, Florida Statutes, Chapter 18-2, Florida Administrative Code, and is intended to be consistent with the State Lands Management Plan. With approval, this management plan will replace the 2004 Manatee Springs State Park approved plan.

The plan consists of three interrelated components: Resource Management Component, Land Use Component and Implementation Component. The Resource Management Component provides a detailed inventory and assessment of the natural and cultural resources of the park. Resource management needs and issues are identified, and measurable management objectives are established for each of the park's management goals and resource types. This component provides guidance on the application of such measures as prescribed burning, exotic species removal, imperiled species management, cultural resource management and restoration of natural conditions.

The Land Use Component is the recreational resource allocation plan for the park. Based on considerations such as access, population, adjacent land uses, the natural and cultural resources of the park, and current public uses and existing development, measurable objectives are set to achieve the desired allocation of the physical space of the park. These objectives identify use areas and propose the types of facilities and programs as well as the volume of public use to be provided.


Legend
Park Boundary
Interstates
FDOT US Routes
FDOT State Routes
FDOT Local Roads
Conservation and Recreation Lands
Federal Managed Lands
State Managed Lands
Local Managed Lands
Private Managed Lands
Aquatic Preserves
Land Use
Developed
Undeveloped
Sources: Florida Natural Areas Inventory, 2016
Florida Land Use Covers and Forms Classification System, 2004
Log Landing Conservation Area
GILCHRIST COUNTY
Wannee Conservation Area
Cross City
US 19
SR 26
Panning Springs State Park
DIXIE COUNTY
Andrews Wildlife Management Area
Forest Systems Conservation Easement
Yellow Jacket Conservation Area
Manatee Springs State Park
SE 349 HWY
Fowlers Bluff Conservation Area
Chiefland
NATC Oak Hammock Conservation Easement
Jack and Loy Ann Mann Conservation Easement
G. L. Drummond Conservation Easement
US 19
Usher Trust Conservation Easement
NW60ST
Strickland Field Conservation Easement
LEVY COUNTY
NATC Suwannee Swamp Conservation Easement
Lower Suwannee National Wildlife Refuge
CR 345
NW 60 ST
SR 24
Rosewood
McEnany Conservation Easement
MANATEE SPRINGS STATE PARK
N
0 1 2 4 Miles
Florida Department of Environmental Protection
Division of Recreation and Parks
VICINITY MAP


Legend
Park Boundary
Managed Conservation Lands
Municipal Boundaries
Paddling Trail
Adjacant Trails
Springs
Fanning Springs State Park
FANNING SPRINGS
317
348A
Andrews Wildlife Management Area
DIXIE COUNTY
Yellow Jacket Conservation Area
349
Clay Landing
NW 130th Street
MANATEE
320
SR 320 Trail Corridor
LEVY COUNTY
Usher Landing
NATC Oak Hammock Conservation Easement
Fowlers Bluff Conservation Area
Lower Suwannee National Wildlife Refuge
330
347
N
0 0.25 0.5 1 Miles
MANATEE SPRINGS STATE PARK
REFERENCE MAP

The Implementation Component consolidates the measurable objectives and actions for each of the park's management goals. An implementation schedule and cost estimates are included for each objective and action. Included in this table are (1) measures that will be used to evaluate the DRP's implementation progress, (2) timeframes for completing actions and objectives and (3) estimated costs to complete each action and objective.

All development and resource alteration proposed in this plan is subject to the granting of appropriate permits, easements, licenses, and other required legal instruments. Approval of the management plan does not constitute an exemption from complying with the appropriate local, state or federal agencies.

In the development of this plan, the potential of the park to accommodate secondary management purposes was analyzed. These secondary purposes were considered within the context of the DRP's statutory responsibilities and the resource needs and values of the park. This analysis considered the park natural and cultural resources, management needs, aesthetic values, visitation and visitor experiences. For this park, it was determined that no secondary purposes could be accommodated in a manner that would not interfere with the primary purpose of resource-based outdoor recreation and conservation. Uses such as water resource development projects, water supply projects, stormwater management projects, linear facilities and sustainable agriculture and forestry (other than those forest management activities specifically identified in this plan) are not consistent with this plan.

The potential for generating revenue to enhance management was also analyzed. Visitor fees and charges are the principal source of revenue generated by the park. It was determined that multiple-use management activities would not be appropriate as a means of generating revenues for land management. Instead, techniques such as entrance fees, concessions and similar measures will be employed on a case-by-case basis as a means of supplementing park management funding.

DRP may provide the services and facilities outlined in this plan either with its own funds and staff or through an outsourcing contract. Private contractors may provide assistance with natural resource management and restoration activities or a concessionaire may provide services to park visitors in order to enhance the visitor experience. For example, a concessionaire could be authorized to sell merchandise and food and to rent recreational equipment for use in the park. A concessionaire may also be authorized to provide specialized services, such as interpretive tours, or overnight accommodations when the required capital investment exceeds that which DRP can elect to incur. Decisions regarding outsourcing, contracting with the private sector, the use of concessionaires, etc. are made on a case-by-case basis in accordance with the policies set forth in DRP's Operations Manual (OM).

Management Program Overview

Management Authority and Responsibility

In accordance with Chapter 258, Florida Statutes and Chapter 62D-2, Florida Administrative Code, the Division of Recreation and Parks (DRP) is charged with the responsibility of developing and operating Florida's recreation and parks system. These are administered in accordance with the following policy:

It shall be the policy of the Division of Recreation and Parks to promote the state park system for the use, enjoyment, and benefit of the people of Florida and visitors; to acquire typical portions of the original domain of the state which will be accessible to all of the people, and of such character as to emblemize the state's natural values; conserve these natural values for all time; administer the development, use and maintenance of these lands and render such public service in so doing, in such a manner as to enable the people of Florida and visitors to enjoy these values without depleting them; to contribute materially to the development of a strong mental, moral, and physical fiber in the people; to provide for perpetual preservation of historic sites and memorials of statewide significance and interpretation of their history to the people; to contribute to the tourist appeal of Florida.

The Board of Trustees of the Internal Improvement Trust Fund (Trustees) has granted management authority of certain sovereign submerged lands to the DRP under Management Agreement MA 68-086 (as amended January 19, 1988). The management area includes a 400-foot zone from the edge of mean high water where a park boundary borders sovereign submerged lands fronting beaches, bays, estuarine areas, rivers or streams. Where emergent wetland vegetation exists, the zone extends waterward 400 feet beyond the vegetation. The agreement is intended to provide additional protection to resources of the park and nearshore areas and to provide authority to manage activities that could adversely affect public recreational uses.

Many operating procedures are standardized system-wide and are set by internal direction. These procedures are outlined in the OM that covers such areas as personnel management, uniforms and personal appearance, training, signs, communications, fiscal procedures, interpretation, concessions, public use regulations, resource management, law enforcement, protection, safety and maintenance.

Park Management Goals

The following park goals express DRP's long-term intent in managing the state park:

- Provide administrative support for all park functions.
- Protect water quality and quantity in the park, restore hydrology to the extent feasible and maintain the restored condition.
- Restore and maintain the natural communities/habitats of the park.
- Maintain, improve or restore imperiled species populations and habitats in the park.
- Remove exotic and invasive plants and animals from the park and conduct needed maintenance-control.
- Protect, preserve and maintain the cultural resources of the park.
- Provide public access and recreational opportunities in the park.
- Develop and maintain the capital facilities and infrastructure necessary to meet the goals and objectives of this management plan.

Management Coordination

The park is managed in accordance with all applicable laws and administrative rules. Agencies having a major or direct role in the management of the park are discussed in this plan.

The Florida Department of Agriculture and Consumer Services (FDACS), Florida Forest Service (FFS), assists DRP staff in the development of wildfire emergency plans and provides the authorization required for prescribed burning. The Florida Fish and Wildlife Conservation Commission (FWC) assists staff in the enforcement of state laws pertaining to wildlife, freshwater fish and other aquatic life existing within the park. In addition, the FWC aids DRP with wildlife management programs, including imperiled species management. The Florida Department of State (FDOS), Division of Historical Resources (DHR) assists staff to ensure protection of archaeological and historical sites. The Florida Department of Environmental Protection (DEP), Florida Coastal Office (FCO) aids staff in aquatic preserves management programs.

Public Participation

DRP provided an opportunity for public input by conducting a public meeting and an advisory group meeting to present the draft management plan to the public. These meetings were held on Tuesday, January 9 and Wednesday, January 10, respectively. Meeting notices were published in the Florida Administrative Register, Volume 43, Issue 250, included on the Department Internet Calendar, posted in clear view at the park, and promoted locally. The purpose of the advisory group

meeting is to provide the advisory group members an opportunity to discuss the draft management plan (see Addendum 2).

Other Designations

Manatee Springs State Park is not within an Area of Critical State Concern as defined in Section 380.05, Florida Statutes, and it is not presently under study for such designation. The park is a component of the Florida Greenways and Trails System, administered by the Department's Office of Greenways and Trails.

All waters within the park have been designated as Outstanding Florida Waters, pursuant to Chapter 62-302, Florida Administrative Code. Surface waters in this park are also classified as Class III waters by the Department. This park is within or adjacent to Big Bend Seagrasses Aquatic Preserve as designated under the Florida Aquatic Preserve Act of 1975 (Section 258.35, Florida Statutes).

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 Addendum 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 sites and objects that represent Florida's cultural periods, significant historic events, or persons. This goal often entails active measures to stabilize, reconstruct, or restore resources, or to 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. Ecosystem management is implemented through a resource management evaluation program that assesses resource conditions, evaluates management activities and refines management actions, and reviews local comprehensive plans and development permit applications for park/ecosystem impacts.

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.

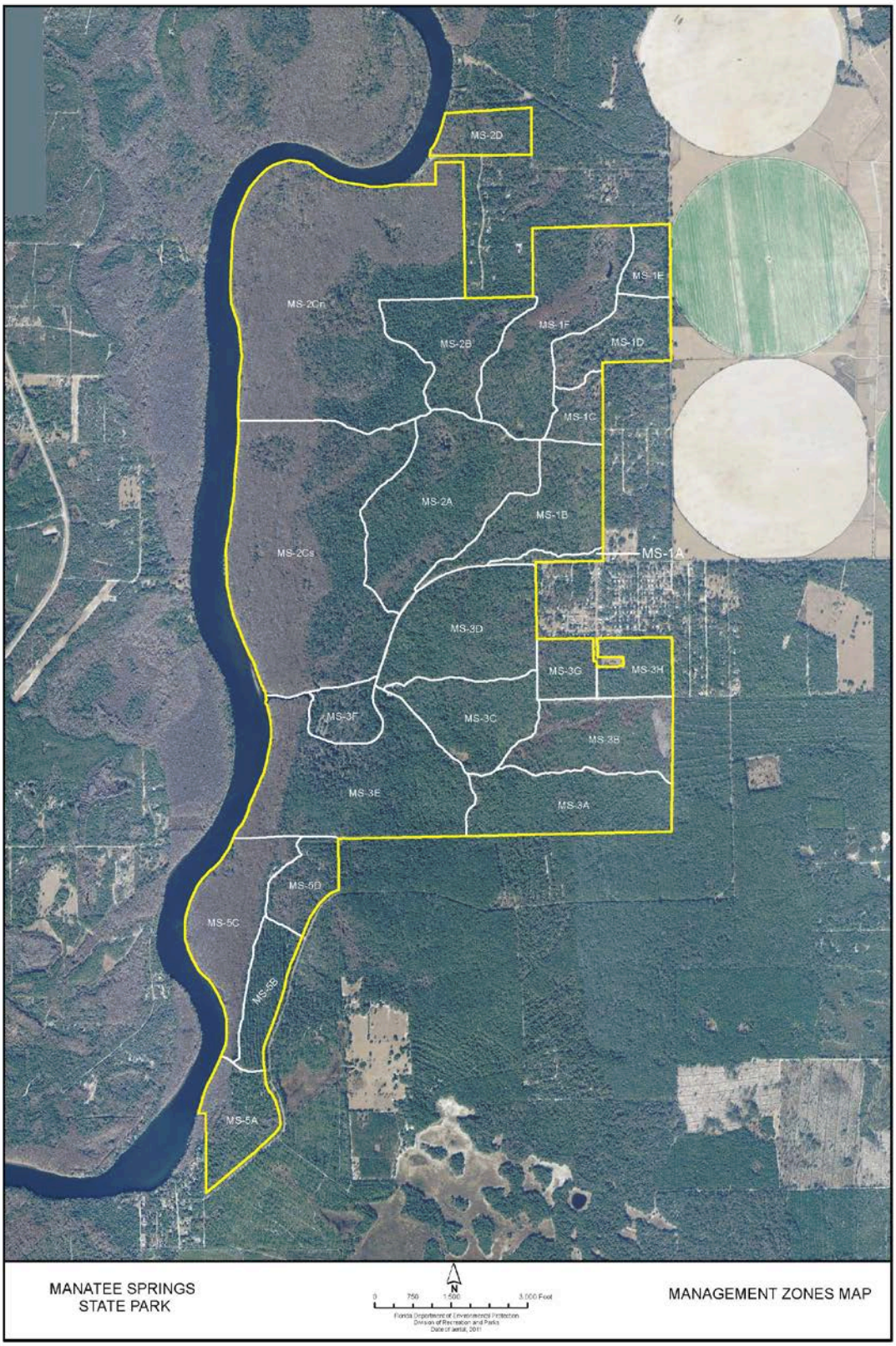
Table 1. Manatee Springs State Park Management Zones			
Management Zone	**Acreage**	**Managed with Prescribed Fire**	**Contains Known Cultural Resources**
MS-1A	8.14	Y	N
MS-1B	100.36	Y	Y
MS-1C	27.39	Y	N
MS-1D	58.84	Y	N
MS-1E	27.47	Y	N
MS-1F	146.14	Y	Y
MS-2A	176.07	Y	Y
MS-2B	88.79	Y	N
MS-2Cn	439.18	Y	Y
MS-2Cs	344.87	Y	Y
MS-2D	36.91	N	Y
MS-3A	110.05	Y	N
MS-3B	97.41	Y	N
MS-3C	84.49	Y	N
MS-3D	134.79	Y	Y
MS-3E	210.71	Y	Y
MS-3F	33.58	N	Y
MS-3G	31.30	Y	N
MS-3H	37.52	Y	Y
MS-5A	58.21	Y	Y
MS-5B	45.07	Y	N
MS-5C	100.73	N	Y
MS-5D	41.30	Y	N

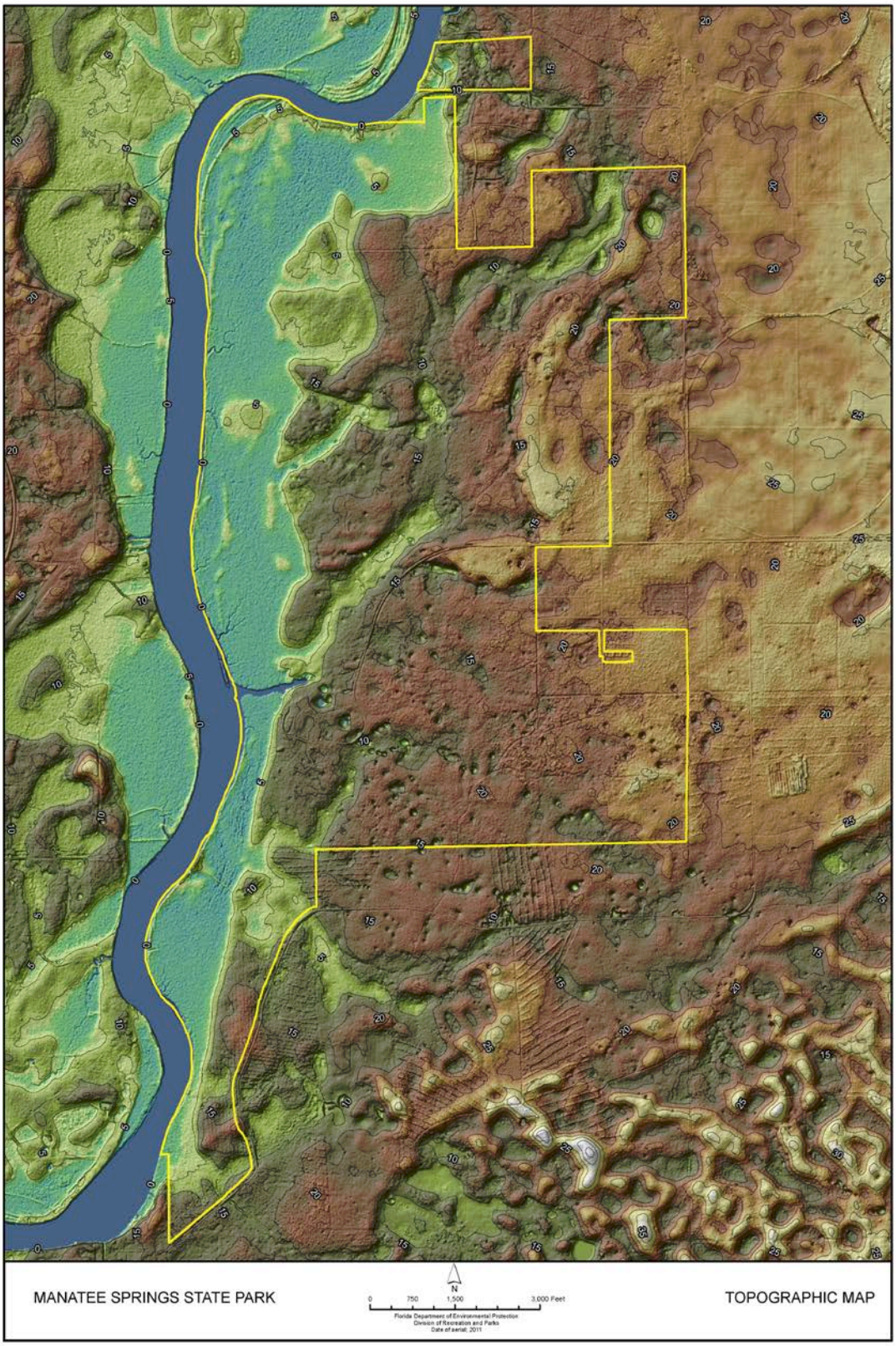
Resource Description and Assessment

Natural Resources

Topography

Manatee Springs State Park is situated on the Pamlico Terrace within the Gulf Coastal Lowlands, a physiographic division of the Northern Geomorphic Zone of Florida. Characteristic features of the Gulf Coastal Lowlands include Pleistocene epoch marine terraces of variable thickness, limestone exposures, and remarkable karst topography (Fernald and Purdum 1998). Stream valleys that cut through the lowlands contain alluvial deposits formed during the late Pleistocene. Tertiary-age limestone may be exposed along the stream channels. Lower reaches of the valleys have likely been entrenched in limestone bedrock since the last significant rise in sea level. Further from the river, the lowlands mature into a karst plain heavily laden with numerous large sinkholes that capture and rapidly transport surface runoff directly into the Upper Floridan aquifer.


MS-2D
MS-1E
MS-2Cn
MS-1F
MS-2B
MS-1D
MS-1C
MS-2A
MS-1B
MS-2Cs
MS-1A
MS-3D
MS-3G
MS-3H
MS-3F
MS-3C
MS-3B
MS-3E
MS-3A
MS-5D
MS-5C
MS-5B
MS-5A
MANATEE SPRINGS
STATE PARK
N
0 750 1,500 3,000 Feet
Florida Department of Environmental Protection
Division of Recreation and Parks
Date of aerial, 2011
MANAGEMENT ZONES MAP


MANATEE SPRINGS STATE PARK
N
0 750 1,500 3,000 Feet
Florida Department of Environmental Protection
Division of Recreation and Parks
Date of aerial: 2011
TOPOGRAPHIC MAP

Two geomorphic zones located just east of the Gulf Coastal Lowlands, namely Bell Ridge and Waccasassa Flats, are both of some importance to the Manatee Springshed, a description of which appears in the Hydrology section below. Waccasassa Flats is a high elevation plateau with low permeability, a characteristic that gives rise to numerous wetlands and streams whose waters flow westward off the flats, often funneling into the Upper Floridan through numerous small swallets. Bell Ridge is a Pleistocene-age beach ridge consisting of sandy overburden underlain with clastic Miocene sediments (Puri and Vernon 1964), with an elevation of about 70 feet above mean sea level (msl) and with very little surface drainage.

Topographic relief within the park is slight and slopes are gradual. Elevations range from less than 5 feet msl in the floodplain swamp along the Suwannee River to a maximum of about 25 feet msl on 2 knolls in the park. The park contains numerous karst features including springs, limestone outcrops, solution pipes and sinkholes.

By the time the state acquired the Manatee Springs property in 1949, numerous alterations of the natural terrain had already occurred. Several causeways had been constructed across lowland areas to facilitate vehicular passage. One such causeway was located in the Mead-Scott Tract, a southern extension of the park that is leased from the Suwannee River Water Management District (SRWMD). This causeway was removed in 1996 as part of a project to restore the natural floodway of the Suwannee River. At this time, the remaining causeways are necessary for public access or for park operations. Some of them may require additional or reengineered culverts or low water crossings to improve surface water conveyance.

Less obvious topographic disturbances in the park exist in the form of roads and firebreaks, fire plow scars, and spoil piles from past road maintenance. There are also dozens of relatively shallow ditches located in the floodplain swamp of the river. These ditches, oriented perpendicular to the river, extend linearly through a portion of the floodway and ultimately cut through the primary levee at the edge of the Suwannee River. The ditches may be byproducts of the cypress logging that took place in Suwannee River swamps in the early 20th century. In aerial photographs from 1940, the ditches are discernible as linear striations in the swampland. Apparently, felled trees were pulled to the river in the most direct line possible. Logs were then floated downstream for milling. Repeated use of the same pathways through the floodway would likely have formed linear ditches. Several of the ditches are deeper than can be satisfactorily explained by that interpretation, however. These ditches have low berms associated with them, perhaps indicating that they were deepened in an attempt to provide loggers with permanent hydrologic connections to the river channel.

After Manatee Springs became a state park, the topography of the head spring shoreline and upper spring run was modified several times in efforts to improve recreational access. A shallow children's swimming area was established along the north shoreline of the run just below the head spring. Over the years, erosion at this location caused the shoreline to recede significantly, eventually creating a scalloped-out cove.

In the early 1990s, an extensive area around the spring boil and along the upper part of the spring run was hardened with concrete bulkheads, stairs, and walkways in order to facilitate access for swimmers and divers, and to reduce bank erosion. This shoreline redesign succeeded at first, but the bulkheads gradually became undermined and and bank erosion continued to be an issue, so an alternative approach was proposed.

Efforts to rehabilitate the natural shoreline in the shallow-water swimming area began in the early 2000s, when DRP staff implemented the initial phase of restoration by removing hardened structures and re-contouring the slope to a more natural state.

In 2008, the Manatee Springs Shoreline Restoration Project, funded by the FDEP Springs Initiative, was designed with the goal of continuing the long-term process of restoring all natural shorelines around the head spring and upper spring run, using best management practices (Jones Edmunds and Associates 2008).

Geology

Listed in descending order of age, underlying deposits in the region include the Pamlico deposits, Ocala Limestone, Avon Park Limestone, Lake City Limestone, Oldsmar Limestone, and Cedar Keys Limestone. Suwannee Limestone, of Oligocene age, typically overlies the Ocala Limestone, but it is absent in Levy County (Slabaugh et al. 1996).

The Pamlico Terrace, the most diversified of the Pleistocene deposits laid down when sea levels fluctuated in response to successive glaciations, consists of irregular patches of sand or sandy clay alluvium, brackish water clay or sand and marl; pasty, sandy, non-fossiliferous limestone presumed to be a bay deposit; and sandy, coquina marl and marl sands that are locally dolomitized. The thickness of the terrace varies with the degree of erosion to which it has been subjected.

The Ocala Limestone, of Eocene age, is next in sequence. Outcrops of this deposit are visible about the main spring. Three limestone formations make up the Ocala; from youngest to oldest, these are the Crystal River, Williston, and Inglis Formations.

The Crystal River Formation is typically white to cream in color and consists of a soft, massive, friable coquina set in a pasty calcite matrix. It may reach a thickness of 125 feet. The Williston Formation comprises two variations of a commonly silicified, fossiliferous marine limestone. One type is essentially a cream-colored coquina while the other is a cream to tan, detrital limestone. This formation averages 30 feet in thickness. The Inglis Formation is a cream to tan, granular, rarely pasty, porous, very hard, massive, and shallow-water marine limestone having a plentiful fauna that is in part coquina. The base is dolomitized, the dolomite being tan to brown, highly porous but only slightly permeable. This formation averages 50 feet in thickness (Crane 1986).

Below the Ocala Limestone lies the Avon Park Limestone, also of Eocene age. In Levy County, this limestone is variable in lithology. Three variations are found, all having a distinct fossiliferous fauna and a high content of lignitic and other carbonaceous plant residues. Any of them may be irregularly or completely dolomitized. One variation is a cream to brown, highly fossiliferous, fragmental to pasty, marine limestone that weathers to white and purple-tinted hues. Another is a cream to brown, very fossiliferous, pasty and fragmental, peat-flecked and seamed, marine limestone. The last is a tan to brown, thin-bedded and laminated, finely crystalline, marine dolomite, intermingled with layers of lignite and carbonaceous plant remains. The Avon Park Limestone can reach a thickness of at least 300 feet.

Below the Avon Park formation is Lake City Limestone. In Levy County, the composition of this deposit varies. In general, the formation consists of a tan to cream-colored, fragmental, often peat-flecked, granular and pasty limestone embedded with foraminifera, crystals of calcite, and echinoid plates. Sometimes the limestone is a coquina. Gypsum may be present, so much so that fossils appear to be embedded in the mineral. Thin beds and seams of anhydrite and selenite may also be present. Dolomitization occurs in varying degrees. Finally, concentrated in the upper portions but found throughout, are pseudo-oolite beds; a brown to coffee-colored chert; an oftentimes silicaceous clay; and a brownish-gray, laminated, finely crystalline dolomite with carbonaceous and perhaps fossiliferous seams. This deposit measures from 575 to 900 feet in thickness.

The deepest deposit of Eocene age is Oldsmar Limestone, a brown, porous, friable, granular limestone of calcite grains loosely embedded in a limestone paste and intermingled with brown, coarsely crystalline, sugary, porous dolomite having seams of white chert and anhydrite; coffee-colored chert; and finely crystalline, tan to brown dolomite. The base is commonly a brown, granular, porous, foraminiferous coquina in a soft limestone paste. This formation varies from just under 400 feet to slightly over 550 feet in thickness.

The Cedar Keys Limestone, of Paleocene age, in this area is composed of intermingled tan to gray, granular, fragmental, often fossiliferous limestone and tan to brown, crystalline to chalky dolomite. Gypsum has impregnated large sections and may occur as thin lenses. The Cedar Keys formation is some 600 feet thick (Crane 1986).

No significant alterations of the park's geological formations are known to have occurred in recent history.

Soils

According to the USDA NRCS Web Soil Survey, (http://websoilsurvey.nrcs.usda.gov/), 12 soil types exist within Manatee Springs State Park (see Soils Map). Addendum 4 contains complete descriptions of these soils. However, a brief 2014 exploratory field investigation by NRCS staff found that at least one additional soil type, Apopka series, occurs in some of the pinelands in the northwest portion of the park (Robbins 2014). In addition, while the eastern

potion of the park is broadly mapped as Otela-Tavares complex, the field exploration found unmapped areas of the Adamsville series along the sandhill and scrubby flatwoods natural communities' transition in the southeast area of the park. Additional mapping of soils within the park would benefit the understanding and management of the natural communities within this park.

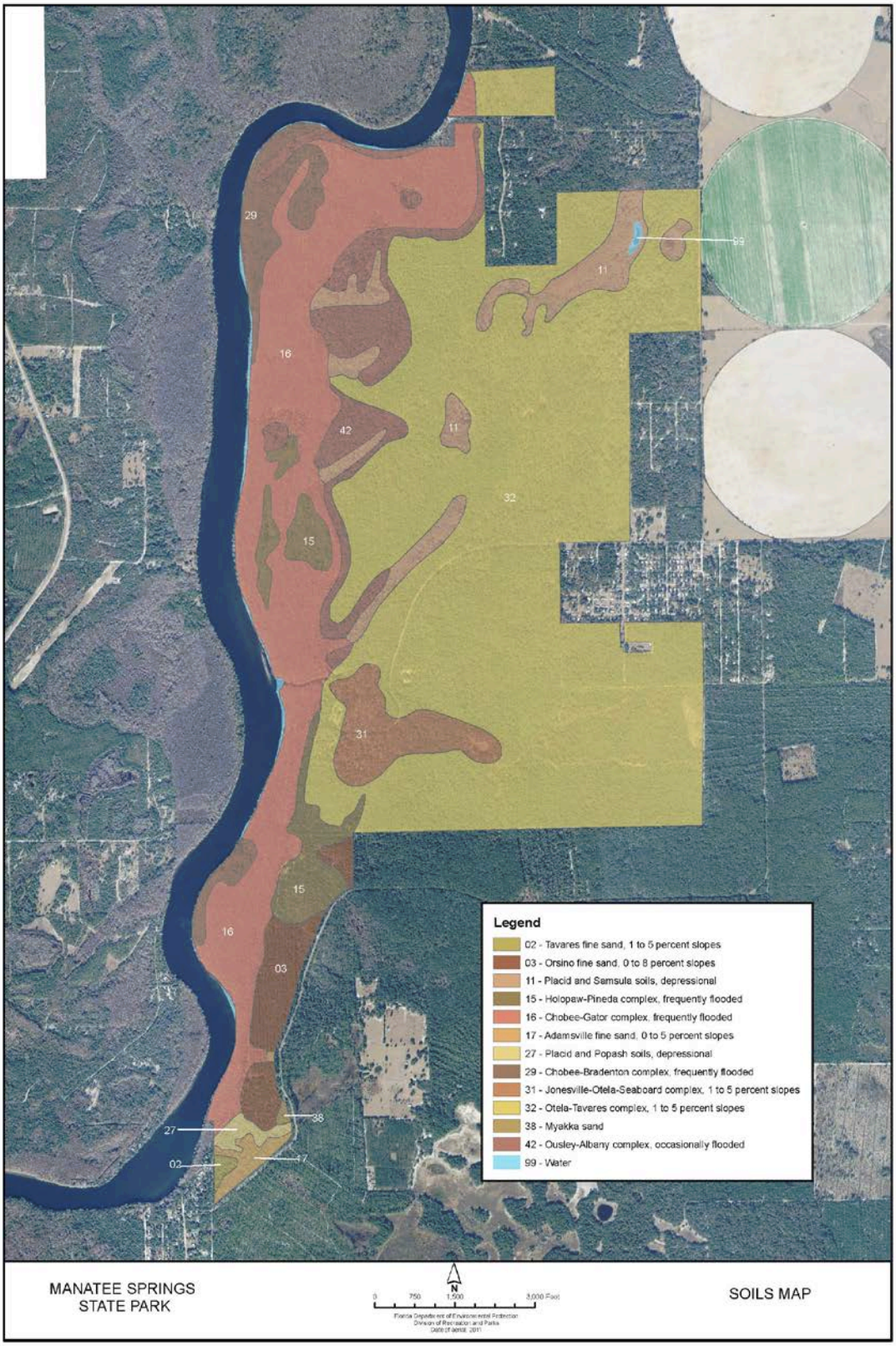
Generally, upland soils in the park are moderately well-drained and sandy, whereas soils within the floodplain of the Suwannee River tend to be very poorly drained and mucky. The Levy County soil survey characterizes most of the soils in the park as very deep and nearly level to gently sloping, the exception being upland soils, predominantly of the Oleta-Tavares complex, in which limestone underlies the sand at a relatively shallow depth (Slabaugh et al. 1996).

Major soil disturbances in the park that are attributable to past management practices include at least three borrow areas that once supplied materials for road construction and other purposes. Two of these borrow sites were pits that have since been re-contoured and replanted with native species. The other, Red Dome, was disturbed sometime between 1963 and 1971. The site was abandoned prior to 2001. Oral history indicates that originally it was a dome of red clay. The site was mined to the level of the surrounding soil and used for road fill. Native vegetation is now becoming reestablished on the site.

Another type of soil disturbance, probably the result of historical logging activities, was the creation of ditches that extended from the river floodplain through the natural levee to the river (previously described in the Topography section). Past agricultural activities such as crop farming, turpentine production, and cattle ranching undoubtedly also caused soil disturbances in some areas of the park.

Present day sources of soil disturbance in the park include firebreak maintenance, feral hog rooting, timber harvesting, facilities construction, and public use, particularly in the main spring and spring-run area. Actions designed to reduce soil disturbance in the spring area have included restricting boat access in the spring-run, improving visitor access, and restoring shoreline vegetation. While these actions have significantly reduced human-induced shoreline erosion, recreational activities in the spring (e.g., swimming and foot traffic) still cause significant soil disturbance.

Erosion of bottom sediments in the spring regularly occurs in the primary swimming areas, particularly at public access points. Displacement of sandy sediments in natural springs has always been a common issue in parks that feature this type of recreational activity. Although foot traffic on the south shoreline of Manatee Spring has been partially mitigated by the use of bulkheads and designated access points, the seasonal variability of water depths continues to allow visitors to walk on the sandy spring bottom or stand on exposed limestone substrate. Soil erosion


29
99
11
16
42
11
32
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31
15
16
03
38
27
02
47
Legend
02 - Tavares fine sand, 1 to 5 percent slopes
03 - Orsino fine sand, 0 to 8 percent slopes
11 - Placid and Samsula soils, depressional
15 - Holopaw-Pineda complex, frequently flooded
16 - Chobee-Gator complex, frequently flooded
17 - Adamsville fine sand, 0 to 5 percent slopes
27 - Placid and Popash soils, depressional
29 - Chobee-Bradenton complex, frequently flooded
31 - Jonesville-Otela-Seaboard complex, 1 to 5 percent slopes
32 - Otela-Taveres complex, 1 to 5 percent slopes
38 - Myakka sand
42 - Ousley-Albany complex, occasionally flooded
99 - Water
MANATEE SPRINGS
STATE PARK
N
0 750 1,500 3,000 Feet
SOILS MAP

continues to gradually undermine stairs at the southern and westernmost access points to the spring.

Foot traffic is no longer permitted in what historically has been one of the most impacted areas along the south shore of the main spring. The soil in this area was stabilized with jute mesh, and natural vegetation could recover gradually. This has resulted in vegetative regrowth. Some of the only remaining aquatic vegetation in the system can be found downstream of this area.

A shallow area with a sandy beach on the north side of the spring run just downstream from the main spring continues to be used as a swimming area for children. Prior to the 1990s, this area was repeatedly replenished with beach sand in efforts to replace sand that had washed away during the busy swimming season. However, the installation of vegetated terraces at the children's swimming area in the 1990s has significantly reduced the loss of soil there. Limited erosion continues to occur though, so additional control measures may be needed in the future.

Soil erosion is also a concern in the Hickory Campground area because of the close proximity of two significant karst openings into the aquifer, Sue Sink and Catfish Hotel Sink. During typical rainfall events, storm water is carried directly into these two sinkholes. More details about this issue will be discussed below in the water quality section of Hydrology.

Minerals

Although there is no known history of previous mining activity within what is now Manatee Springs State Park, limestone mines once operated in the general vicinity of the park. The nearest such mine, currently inactive, is located within one mile of the northeast boundary of the park. Mining for another mineral, limonite, also once occurred near Manatee Springs. Limonite is an iron ore that was used during the Civil War by the Confederacy in the manufacture of cannons.

Hydrology

Manatee Springs State Park is located in northwestern Levy County within the fifth and last reach of the Lower Suwannee River Basin (SRWMD 2005). This lower basin occupies an area of about 700 square miles, encompassing nearly 7 percent of the entire Suwannee watershed (SRWMD 2006). As a whole, the Suwannee Basin drains approximately 10,000 square miles of the Florida/Georgia region and ultimately discharges into the Gulf of Mexico about 40 miles southwest of the park through Florida’s largest publicly managed estuary, Big Bend Seagrasses Aquatic Preserve (FDEP 2014a).

The Suwannee River and Manatee Spring are the two most prominent hydrological features of the park. The Suwannee’s average flow is 7,100 million gallons per day (mgd). The river has been designated an Outstanding Florida Water (OFW) and is a Class III water body. Average annual rainfall for the lower Suwannee region approaches 60 inches a year (Fernald and Purdum 1998).

Water scientists have identified approximately 300 natural springs, including Manatee, within the Florida portion of the Suwannee River system (Harrington and Wang 2011). The large areas of exposed, unconfined karst aquifer that occur in the Middle and Lower Suwannee basins and along the Santa Fe River give rise to numerous individual springs that significantly augment the Suwannee's base flow. The springs are more abundant within the central region of the Suwannee than in any other area of the entire Suwannee Basin (Scott et al. 2004). In fact, during periods of low surface water flows, groundwater from the central region is the source of nearly all inflow to the Suwannee River (Pittman et al. 1997).

Manatee Springshed and Sensitive Karst Features

Manatee Spring is a first magnitude spring, one of the largest in the lower Suwannee River Basin. It uniquely shares a portion of its watershed with its neighbor to the north, Fanning Spring. The Manatee head spring is located approximately 1,200 feet east of the Suwannee River. It is conical in shape and more than 25 feet deep, depending on river stage. Bordering the spring run are floodplain swamps with dense stands of bald cypress.

Springshed delineation within the Manatee-Fanning watershed began in the early 2000s with geostatistical analysis of groundwater wells that are scattered across the lower Suwannee River Basin (Upchurch et al. 2005). Water managers have come to understand a considerable amount about the surface water and groundwater basin that contributes to the overall discharge of Manatee Spring (Scott et al. 2004; Upchurch and Champion 2004). However, it is important to understand that there is substantial overlap between the groundwater basins of Manatee and Fanning, depending on the season. Additionally, the actual extent of groundwater connectivity and the precise location of the divide between the two springsheds remains poorly defined. Because the groundwater divide between them is so indistinct, hydrologists often treat the Manatee and Fanning springsheds as one. At its greatest distance from east to west, the Manatee Springshed measures nearly 18 miles, whereas the Fanning Springshed extends more than 15 miles. The surface watershed and groundwater basin that together form the Fanning-Manatee Springshed encompasses up to 450 square miles (SRWMD 2005). Of that figure, approximately 200 square miles are considered of major importance to Manatee.

One unfortunate consequence of grouping the Manatee and Fanning springsheds as one unit is that this can perpetuate a misperception that flow properties of these two spring systems are the same. To the contrary, tidal cycles significantly influence spring discharge and flooding of wetlands at Manatee, whereas Fanning and its associated floodplain function ecologically as non-tidal wetlands (Light et al. 2002).

One prominent feature that defines the groundwater characteristics of Manatee Springs State Park is an unnamed transitional karst region situated between the Manatee Springshed and the Waccasassa Flats to the east (Upchurch et al. 2005). This karst plain behaves very much like areas along the Cody Scarp to the north, where high groundwater recharge directly into numerous large sinkholes is a

prominent characteristic (Upchurch 2002). The Cody Scarp is an outfacing, relict marine feature that constitutes the most persistent topographic break in the state (White 1970). The many incidences of subsidence and sinkhole collapse that occur along the Cody Scarp are also a common feature in other transitional karst areas, strongly influencing hydrologic characteristics of the region (Upchurch and Champion 2002). In the Manatee Springshed, a large proportion of surface runoff, including that from Waccasassa Flats, drains across this unnamed transitional scarp, eventually disappearing into sinkholes and rapidly infiltrating the subsurface limestone conduits of the Upper Floridan aquifer (Upchurch and Champion 2004).

Groundwater within the Manatee Springshed moves through a complex matrix of disjointed, and sometimes linked, underground conduits that may return the water to the surface through multiple karst features such as the main spring vent, “Manatee Spring.” Included among the more prominent karst openings at Manatee Springs State Park are named features such as Catfish Hotel, Sue Sink, and Friedman Sink. All three features are significant entry points into the Manatee aquatic cave system.

Manatee head spring is the endpoint for one of the longest and best explored interconnected aquatic cave systems in the world. This labyrinth is world-renowned for its complexity and length (Exley 1994). Professional divers have explored and mapped Manatee’s aquatic caves over the past 50 years, providing us with a substantial knowledge base about this underground ecosystem. Most of those divers are now associated with the National Speleological Society Cave Diving Section (NSS-CDS), and they continue to map, maintain, and promote conscious conservation of the park’s aquatic cave system as a recreational, training, and research destination.

By 2015, cave divers had mapped more than 33,000 feet (ca. 6.27 miles) of conduits within the Manatee system, ranking it as the fourteenth longest aquatic cave in the world (Gulden and Coke 2011; Poucher, unpublished report 2014). One of the more significant findings is that this maze of conduits is now known to extend southeasterly from the park toward the city of Chiefland. In order for scientists to attain a better understanding of the nature of conduit connections within the Manatee Springshed, additional research will be required, particularly the use of dye trace technologies.

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). The only dye trace work completed in the Manatee-Fanning Springshed to date occurred in 2009. Dye placed in a sinkhole 7 miles east of Manatee in Chiefland appeared in less than 6 days at the Manatee head spring (Karst Environmental Services 2009). The dye trace work, in conjunction with cave mapping, supports the premise that surface runoff entering the Upper Floridan aquifer within the Fanning-Manatee Springshed can travel through conduits as fast as 1.5 miles per day. Comparable studies, such as in the Ichetucknee Springshed, have demonstrated even faster travel times (Champion and Upchurch 2003). These and other dye trace studies 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; 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).

Water Quantity

The U.S. Geological Survey (USGS) first measured discharge at Manatee Spring in 1932. In recent years, the USGS has worked with the SRWMD to track discharge for this spring system (USGS, 2014; SRWMD, 2014). Automated satellite-based tracking of daily discharge for Manatee Spring at Station #02323566 began in 2001 and continues today in 2016. Manatee Spring discharge is continuously monitored with real-time data uploaded via satellites to the world-wide web, and the data are fully accessible to any interested parties (USGS 2014; SRWMD 2014).

In 2005, the SRWMD calculated a period-of-record median discharge for Manatee Spring of 204 cubic feet per second (cfs), with an average discharge of 189 cfs (SRWMD 2005). The minimum instantaneous flow ever recorded for Manatee Spring was two cfs on April 5, 2005, while the maximum was 546 cfs on October 14, 2004 (USGS 2014). It is important to understand why Manatee's discharge is so highly variable.

When water scientists deployed instrumentation in 2001 to track Manatee Spring's flow on a daily basis, it rapidly became evident that the instruments were dramatically influenced by Gulf of Mexico tidal fluctuations and Suwannee River flooding (measured as river stage). Quite clearly, shifting tides in the Gulf and significant Suwannee flood events are two major factors that can complicate the precise measurement of discharge at Manatee Spring. Both factors, whether individually or in combination, can significantly influence the velocity of groundwater discharge at Manatee Spring. Hence they are critical to the discussion of water quantity at Manatee.

During periods of low flow along the Suwannee River, falling tides have little effect on the discharge of Manatee Spring; the spring essentially flows unconstrained. When tides are rising, however, they can significantly affect Manatee discharge by decreasing spring flow and increasing the probability of small-scale back flooding in associated floodplains (Light et al. 2002). Back flooding is especially important ecologically in floodplain wetland communities such as those associated with the spring-run at Manatee.

Based on overall discharge, the Suwannee River is the second largest river in Florida (Berndt et al. 1998). Other than the Suwannee Sill water control structure, which is located where the Suwannee exits the headwaters of the Okefenokee Swamp, there are no dams along the entire length of the river and natural flood events are commonplace within the system (Garza and Mirti 2003). These floods are typical of river systems such as the Suwannee, and often occur in response to large scale surface water events (Pringle 1997; Diehl 2000; Garza and Mirti 2003).

In fact, the likelihood of the Suwannee flooding is directly proportional to the amount of rainfall within its basin. Typical high flows in the lower Suwannee River occur in March and April (Light et al. 2002). During significant flood events along the lower Suwannee, tides do not influence flow measurements taken at Manatee Springs State Park (Light et al. 2002).

River stage has been recorded on the Suwannee River since 1906, and it is important to understand that this 100-plus years of recordkeeping has provided water scientists with a unique dataset that has been used to determine historic flows at Manatee Spring (Verdi and Tomlinson 2009). During that period, water scientists have closely documented every major flood and drought that has affected the Suwannee River. From 1942 to 2013, 14 significant floods and 9 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 2014; Verdi et al. 2006). Numerous gauges at unique locations along the Suwannee track not only river stage, but discharge as well (USGS 2014; Verdi et al. 2006).

When the Suwannee floods, the high river stage affects spring-run tributaries (e.g., Manatee) along its reaches, gradually “pushing back” against the head pressure in the Floridan aquifer that causes springs to flow. As the Suwannee back-floods into the Manatee spring run during high tides or 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; unpublished data in files at District 2 office, DRP). Marked changes in water clarity can be observed within the Manatee spring run depending on factors such as current clarity of the Suwannee River (i.e., tannic or clear), tidal influences, and height of river stage. Partial or complete brownouts of the Manatee 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 4 feet of visibility. If the surface water pressure exceeds the groundwater head pressure, the springs at Manatee may even reverse flow and function as “siphons”, or inflow points into the Upper Floridan aquifer (Gulley et al. 2011). In that respect, Manatee 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).

The park staff has documented all complete brownouts at Manatee since March 2003, but sporadic spring assessments (i.e., from photographs or qualitative assessments by staff or cave divers) extend the record back to 1973 (unpublished data in files at District 2 office, DRP; Exley 1994). During the period from 1973 to 2013, there were at least 21 complete brownout events at the Manatee head spring, with an occurrence rate at just over 8 percent of the time. In comparison, during that same time period, Fanning Spring’s brownout occurrence rate was nearly 3 times greater than Manatee’s (20 percent with at least 53 complete brownouts). This illustrates that the trend at Manatee is for brownouts to be of much shorter duration with significantly less chance of flow reversal than occurs at Fanning, even though both springs are considered to be estavelles. Flow reversals,

however, do occur at Manatee and have even been documented by park staff twice in the past 5 years (unpublished data in files at District 2 office, DRP).

In April 2009, District 2 biologists and park staff implemented a more rigorous methodology for continuously tracking water quality/clarity in all District 2 springs. In the process, they coincidentally recorded the first flow reversal ever documented for Manatee Spring (unpublished data in files at District 2 office, DRP). The characteristics and timing of this flow reversal, during which tannic waters of the Suwannee River poured into the main vent at Manatee, are noteworthy enough to deserve the brief description provided below.

Tannin stained waters of the Suwannee River began to siphon into the aquatic cave system at Manatee Spring sometime in early April 2009. By April 11, river water was observed channeling as far back into the cave system as Friedman Sink, approximately 2,000 feet from the head spring. On April 21, 2009, cave divers observed that tannic river water was still “barely flowing out” of Catfish Hotel about 500 feet from the head spring. A second flow reversal event was documented at Manatee Spring on July 2, 2012; this event was also witnessed by divers.

Comparison of corresponding stage readings at the Suwannee River gauge at Manatee (i.e., USGS Station #02323566) and the Fanning Springs (Wilcox) gauge (i.e., USGS Station #02323500) reveals an interesting correlation between the gauges that may help indicate when flow reversals have occurred in the past. According to the SRWMD, the location of the Wilcox gauge at the mouth of the Fanning Spring’s spring run allows river levels at both Fanning and Manatee springs to be determined (SRWMD 2005). Records of the Suwannee River stage at the Wilcox gauge were first obtained in October 1930, while data collection at the Manatee gauge began in April 1982. Review of datasets from both river gauges in combination has allowed water scientists to estimate the number of flow reversals that have taken place at the two spring systems over the past 70 years. A conservative estimate based on all available data from 1942 through 2013 is that Manatee Spring has probably reversed its flow as many as 12 times and Fanning as many as 53 times during that period.

River stage data alone, however, is insufficient in determining the occurrence of flow reversals at Manatee. The highest stage recorded at the Manatee gauge during the 2009 Manatee flow reversal was 10.45 feet, with a corresponding stage of 14.22 feet measured at the Wilcox gauge. In contrast, the maximum stage at the Wilcox gauge during the 2012 Manatee flow reversal was 9.09 feet, more than 5 feet below the stage recorded in the 2009 reversal. Apparently, the head pressure at Manatee Spring was insufficient to prevent flow reversal during the lower flood stage of 2012, but adequate during the higher flood stage of 2009. It seems likely that flow reversal would have also occurred at Manatee Spring during the exceptional 100-year flood of 1973 when the Wilcox gauge recorded a maximum stage of 18.03 feet. But cave diving notes from Scheck Exley in that year clearly documented that Manatee’s aquatic caves were not being affected by the tannin-stained waters of the Suwannee River (Exley 1994). However, a prolonged period of complete brownout (estimated at 36 days) probably did occur at Manatee in

response to the very high stage recorded on the Suwannee at that time. Regardless of recent happenings, flow reversals at Manatee during significant Suwannee floods prior to 1973 do not appear to have occurred at any point other than the record 1948 event when the river stage at Wilcox exceeded 21 feet.

Whether the evidence indicates that fluctuations in groundwater supply are natural (i.e., due to Atlantic multi-decadal oscillation) or anthropogenic (i.e., due to water supply withdrawals) is still unclear (Kelly 2004; Williams et al. 2011). Nonetheless, many water managers worry about the unsustainable depletion of groundwater resources in the Floridan aquifer (Bush and Johnston, 1988; Grubbs and Crandal 2007; Copeland et al. 2011). Concerns over decreased water supplies heightened during the recent droughts of 1998-2002 and 2010-2012, as water scientists documented significant declines in spring discharge at nearly all of Florida's first magnitude springs, including Manatee (Copeland et al. 2011; Pittman 2012).

When rainfall levels in the Manatee Springshed are high, the age of the groundwater discharging from the spring is relatively young because of rapid infiltration of the aquifer by surface water and its speedy transport through the extensive conduit system in the basin. The thin freshwater lens that constitutes the Floridan aquifer sits atop a larger mass of much denser saline water (Copeland et al. 2011). During periods of abundant rainfall when aquifer recharge exceeds spring discharge, this freshwater lens increases in size. On the other hand, during times of drought when there is less young surface water available to recharge the Floridan, groundwater levels decline and the lens decreases in size. With less recharge, groundwater head pressure decreases and spring discharge also declines. Consequently, older and deeper Floridan water eventually replaces the younger, fresher groundwater near the surface (Upchurch 1992; Katz 2004).

The discharge of Manatee Spring at base flow consists primarily of older groundwater ranging from 15 to 30 years in age (Katz et al. 1999). This older, deeper groundwater contains higher levels of limestone-based analytes (e.g., calcium, bicarbonate, etc.) than the younger, shallower upper Floridan or surficial aquifer because it has been in the aquifer longer. Water experts use these limestone-based analytes, as well as saline indicators such as chloride, strontium, and conductivity, as diagnostic tools to ascertain the presence of saltwater encroachment (Neuendorf et al. 2005). The significance of saltwater encroachment at Manatee Springs will be addressed in the water quality overview below.

Many water management experts acknowledge that the 2 most recent long-term droughts and increased consumptive use of groundwater combined have caused significant lowering of water tables and decreased spring flows statewide (Mirti 2001; Swihart 2011; Still 2010; Copeland et al. 2011). Water managers can now correlate specific regional drawdowns of the aquifer with shrinking springsheds and declining spring flows (Mirti 2001; Champion and Starks 2001; Grubbs and Crandall 2007; Grubbs 2011). Given the projected water supply needs for the area, the USGS predicts that groundwater levels throughout Florida, including those in the Manatee Springshed, will continue to decline (Sepulveda 2002).

The SRWMD is the state agency responsible for issuing water use permits in the Manatee-Fanning Springshed, and in so doing, it must ensure that proposed uses are in the public interest, which includes the conservation of fish and wildlife habitat and the protection of recreational values. Currently, Florida's water management districts are only required to derive an approximation of groundwater extraction yields (Fernald and Purdum 1998). Groundwater models are then used to determine sustainable yields for water supply (for a summary of all Florida models, see Schneider et al. 2008). Numerous water scientists now suggest that Florida can no longer rely on estimation techniques to monitor groundwater extraction, especially for agricultural purposes, and they recommend that all freshwater consumptive use of the Floridan aquifer be accurately tracked (Kincaid 2011; Gao et al. 2007).

In 2005, the SRWMD completed its first ever Minimum Flows and Levels (MFL) guidance document for the Lower Suwannee River Basin, including Manatee and Fanning springs (SRWMD 2005). This MFL document recommended that for Manatee Spring to function adequately as a critical thermal refuge for Florida manatees (*Trichechus manatus latirostris*), spring discharge between November 1 and April 30 should not fall below 130 cfs.

Water Quality

The two primary water quality issues at Manatee Springs are local/regional groundwater contamination and a corresponding significant decline in ecological health of the springs and spring-run stream. A vast amount of water quality data is available for Manatee Spring (SRWMD 2014; Hornsby and Ceryak 1998; Scott et al. 2004; USGS 2014). Many water management agencies collect, store, and manage hydrological information that is accessible to all through a variety of web-based databases (USGS 2014; SRWMD 2014; FDEP 2014b; FDEP 2014c).

The unconfined nature of the Floridan aquifer in the Manatee region makes it highly vulnerable to pollution from contaminants that may funnel through numerous karst features directly into the groundwater below (Cichon et al. 2004). The porous soils and multiple conduits and fractures in karst environments allow pollutants to move rapidly from the surface and into underground caverns and spring systems (Harden et al. 2008). Any deterioration of groundwater quality within the Manatee Springshed could ultimately threaten sensitive water resources within Manatee Springs State Park. Significant sources of groundwater contamination in the Manatee Springshed are fertilizers, animal waste, domestic waste water, and standard septic systems (Hallas and Magley 2008; Harrington et al. 2010).

Conventional septic systems are the most widespread method of wastewater disposal in the Suwannee River Basin (FDEP 2001). Relative to other sources of surface contaminants in the basin such as fertilizers, septic systems may contribute a smaller percentage of nutrient pollution. However, if onsite sewage treatment and disposal systems (OSTDSs) happen to be located near a spring, the percentage of nutrient pollution increases significantly (FDEP 2001; Harden et al. 2008).

State and federal authorities have determined that the use of OSTDSs in karst environments is of significant concern because it contributes to groundwater quality

problems (EPA 2006). For more than a decade, research efforts throughout the state have continuously monitored and evaluated the effectiveness of OSTDSs within karst environments, including at Manatee Springs State Park (Roeder 2004; Roeder et al. 2005; Chanton 2009). Two of Manatee's wastewater treatment systems, located at the two campground facilities in the park, Hickory and Magnolia, were included in this research. Both facilities are located in proximity to the main spring as well as near prominent karst features, and both lie above the mapped aquatic cave system (Harden et al. 2008). Subsequent to initiation of the OSTDS research in 2000, the DRP has upgraded the campground septic systems using advanced treatment technologies, with a major emphasis on improving system performance and efficiency. Currently, there are several additional standard septic systems in the park that have not yet been upgraded to advanced treatment, including staff residences and administrative offices.

Surface water runoff from significant rainfall events may also be a source of groundwater pollution in the park. Wherever storm water runoff is concentrated in the park, staff will follow best management practices in encouraging the growth of groundcover vegetation and capturing runoff from impervious surfaces via swales that divert flow away from sensitive aquatic resources.

One historic source of storm water runoff that was mitigated successfully in the past decade is the old boat ramp located on the south side of the spring run just downstream from the designated swimming area at the head spring. Portions of the impervious paved road above the boat ramp were removed and the area restored using broad-based, vegetated dips and water bars to help disperse surface runoff and divert it away from the spring run into adjacent wooded areas.

Hickory Camping Loop has long been a major water quality concern because of its proximity to two prominent sinkholes. This campground was designed and constructed long ago with little consideration given to treatment or attenuation of storm water runoff. Runoff from the campground access road and from many of the campsites has historically flowed directly into Catfish Sink and Sue Sink, both hydraulically connected to the main spring. The DRP has attempted to redirect runoff by building up the campsites and closing a couple of campsites adjacent to the sinks. The closed sites may need additional revegetation. The natural topography of the area and the proximity of the road and campsites to the sinks make it very challenging to achieve effective control of the situation.

The Manatee Springshed contains numerous nonpoint sources of groundwater pollution located outside the park. Rural agriculture, primarily consisting of row crops and dairies, is the predominant land use in the springshed (SRWMD 2005). 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 (Obreza and Means 2006). Nine dairies are located within the Manatee-Fanning Springshed, six of which are large enough to require industrial wastewater permits.

Scientists conducting nitrogen-15 isotope research at Manatee Spring have confirmed that heavy fertilizer use and the numerous large dairy operations in the region are the primary sources of the inorganic/organic nitrogen contamination of groundwater in the Manatee Springshed (Katz et al. 1999; Albertin et al. 2007). 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 nutrient enrichment. The small city of Chiefland in the Manatee Springshed has an equally critical influence on water quality in the park.

For the past 25 years, water managers have monitored groundwater quality and levels in numerous wells throughout the state. In the Manatee-Fanning Springshed alone, more than 250 different wells are tracked for changes in groundwater quality (FDEP 2014c). Some of these wells are monitored specifically to document changes associated with known contamination sites (Maddox et al. 1998). Of 188 wells in the Manatee Springshed for which nitrate data was available, more than 57 percent had nitrate concentrations higher than 1 milligram per liter (mg/L), and over 5 percent had nitrate concentrations higher than the 10 mg/L groundwater standard (Harrington and Wang 2011). The highest nitrate concentration measured in a well within the Manatee Springshed was 62 mg/L. Naturally occurring background levels for nitrates in groundwater should be less than 0.01 mg/L (Cohen et al. 2007).

There are 8 sewage treatment facilities in the Manatee region that discharge treated wastewater indirectly to groundwater via spray fields or settling ponds. The two largest facilities are in Chiefland, which produces 0.475 million gallons per day (mgd), and in Trenton, which produces 0.20 mgd. In the Manatee-Fanning Springshed there are at least 13 waste cleanup sites equipped with monitoring wells, and 100 other wells are used for monitoring of aquifer contamination (FDEP 2014c). An additional 50 monitoring wells in the region provide background data about the Upper Floridan aquifer. The FDEP, in cooperation with the SRWMD, conducts long-term trend analyses on some of these groundwater wells. There is also a permanent surface water site, Station #MAN 010C1, located at Manatee Spring on the Suwannee River. This station is part of the Temporal Variability Network program (FDEP 2014d; Jenkins et al. 2010).

From 2000 to 2006, quarterly monitoring of surface water quality took place at 18 important springs in Florida, including Manatee Spring (FDEP 2008). Reports from this monitoring work, referred to as Ecosummary, contain quarterly ecosystem health assessments. During the 6-year Ecosummary monitoring period, nitrate-nitrite levels were consistently high at Manatee Springs, ranging from 1.3 to 3.6 mg/L (Harrington and Wang 2011).

Unfortunately, elevated groundwater nutrients have contributed to significant declines in the ecological health of spring systems throughout Florida, including Manatee (Jones et al. 1996; Munch et al. 2006; Cohen et al. 2007; Albertin et al. 2007; Wetland Solutions Inc. 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. 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). The most notable evidence of the ecological decline of Manatee Spring was its dramatic shift in the 1980s and 1990s from a healthy ecosystem in which submerged aquatic vegetation (SAV) was dominant to the situation in 2014 in which algae had become dominant and SAV was almost absent.

Historical narratives and photographic records of Manatee Spring illustrate that a high diversity of SAV (at least 10 species) once densely covered large areas of the spring bottom (unpublished data in files at District 2 office, DRP and various sources). At one time, the tape grasses *Vallisneria* and *Sagittaria,* and a fanwort, *Cabomba,* once dominated the entire Manatee spring run. In 1956, Manatee Springs was characterized as a healthy, hard mineral freshwater system containing both algal and SAV components (Whitford 1956). It is noteworthy that during that time a diverse assemblage of "attached" and "unattached" algae comprised more than 50 percent of the aquatic plant growth at Manatee Spring (Whitford 1956). In other words, a healthy Manatee Spring ecosystem should include a rich diversity of SAV balanced with a biologically diverse assemblage of algae and microscopic diatoms. Subsequent documentation of the SAV community at Manatee indicates that the spring ecosystem remained intact and healthy through 1975 (Rosenau et al. 1977; unpublished photographic records in District 2 files, DRP; Hinkle 2009).

The first major impact to Manatee's SAV occurred during the period from 1975-1985 when the park documented a significant shift in SAV cover in the spring and spring run from predominantly native SAV to SAV dominated by hydrilla (*Hydrilla verticillata*), a non-native accidently introduced from South America. Large scale restoration efforts, including intensive chemical and mechanical treatments, were employed in the Manatee Spring system from 1985-1998 in an attempt to control hydrilla and reset the SAV diversity back to historic conditions (Hinkle 2009). Unfortunately, there were unavoidable events that occurred simultaneously with the restoration efforts. The Suwannee River experienced major flooding, which caused extended brownouts of the spring run, and Florida manatees visited the spring in significantly higher numbers, which resulted in greatly elevated grazing pressure on the SAV. Both phenomena severely hampered restoration efforts and restricted the regrowth of native SAV in the spring run.

From 1990-2004, DRP staff monitored SAV semiannually within the spring-run stream (unpublished data in files at District 2 office, DRP), measuring vegetative cover along several transects spanning the spring run that were set up by DRP between the head spring and the Suwannee River. The earliest known SAV map for Manatee was produced in 1989 (Hinkle 2009).

In 2001, the park and the Florida Fish and Wildlife Conservation Commission (FWC) initiated a new experimental restoration technique to re-vegetate SAV in the

Manatee system (Smith and Mezich 2004). This novel technique used exclusion cages to isolate newly planted SAV from manatee grazing, with the idea that this would allow SAV roots ample space to grow undisturbed. Unfortunately, flooding of the Suwannee River in 2003 once again damaged all SAV in the spring run before the success of the technique could be evaluated. In the spring of 2003, SAV (limited to 3 species) covered only one percent of the entire Manatee Spring/spring-run bottom (Kurtz et al. 2003). Since the 2003 mapping, there have been no substantial positive changes to the SAV component at Manatee.

Water managers continue to debate the causes of the dramatic ecological shift at Manatee from the highly diverse, SAV/algae-dominated system of the 1960s to the minimally diverse, benthic algae monoculture prevalent today. Nevertheless, it should be apparent that the ecological health of the ecosystem is in marked decline (Harrington and Wang 2011; Copeland et al. 2011).

Scientists state that water quantity variables such as spring discharge velocity and water quality variables such as nitrate concentration are necessary parameters for understanding trends in the health of groundwater resources (Brown et al. 2008). Springs are supposed to be considered excellent indicators of changes in groundwater quantity and quality over time. Indeed, Florida's springs have proven to act as the proverbial "canary in the coal mine," giving us early warning about declines in health of the Floridan aquifer. The quality of spring water is extremely dependent on spring flow rates and groundwater levels, and it is very sensitive to changes in those parameters (Copeland et al. 2011; Wetland Solutions Inc. 2010). Even early researchers in the ecology of spring systems realized that the velocity of spring discharge is one of the most important factors in maintaining healthy, diverse spring ecosystems (Odum et al. 1953; Whitford 1956).

A recent statewide analysis of water quantity and quality variables compared groundwater and spring water parameters from 1991 to 2003 (Copeland et al. 2011). Specifically, during that period, analysis of rock-matrix and saline analytes indicated that the Floridan's freshwater "lens" had decreased significantly in volume and that significant saltwater encroachment had occurred throughout most of the state (Copeland et al. 2011). Coastal springs such as Manatee also experienced lateral saline encroachment (Marella and Berndt 2005; Hydrogeologic Inc. 2011). The major conclusion was that the drought of 1999-2001 had precipitated significant negative health trends in all spring systems in the state, including Manatee, because of lowered groundwater levels, significant saline encroachment, and simultaneous increases in groundwater use during one of Florida's worst droughts on record (Verdi et al. 2006).

In 1996, the FDEP initiated a formal statewide program for monitoring surface waters and groundwater, including those within the Lower Suwannee River Basin (Maddox et al. 1992; FDEP 2009). This Integrated Water Resource Monitoring Program (IWRMP) took a comprehensive watershed approach based on natural hydrologic units. The 52 hydrologic basins in Florida were placed on a 5-year rotating schedule, which allows water resource issues to be addressed at different geographic scales (Livingston 2003). In addition, the IWRMP assigned a water body

identification number (WBID) to each water body; the WBID for Manatee Spring is 3422R. This watershed approach provides a framework for implementing Total Maximum Daily Load (TMDL) requirements that will attempt to restore and protect water bodies that have been declared impaired (Clark and DeBusk 2008).

According to FDEP basin status and water quality reports for north Florida, several springs, including Manatee, as well as sections of the Lower Suwannee River Basin, all became potentially impaired water bodies in 2003 because of excessive nutrients, total coliform bacteria, high mercury levels, or low dissolved oxygen (FDEP 2001; FDEP 2003). Based on the Impaired Waters Rule (IWR), the EPA in 2003 verified that those water bodies were impaired, which meant that their surface water quality did not meet applicable state water quality standards as pursuant to the IWR in Chapter 62-303 Florida Administrative Code. This designation triggered a long chain of mandatory requirements that Florida would have to accomplish to achieve compliance with EPA regulations concerning polluted water bodies. For Manatee Springs, the compliance process started in 2008 with the assignment of a TMDL (Hallas and Magley 2008) and the initiation of a Basin Management Action Planning (BMAP). As of 2012, the Lower and Middle Suwannee River basins had no targeted BMAP requirements despite the fact that certain land uses in the region still contributed significant nutrient loads to the Floridan aquifer (Maddox et al. 1998; Copeland et al. 1999; Silvanima et al. 2008).

Natural Communities

This section of the management plan describes and assesses each of the natural communities found in the state park. It also describes the desired future condition (DFC) of each natural community and identifies the actions that will be required to bring the community to its desired future condition. Specific objectives and actions for natural community management, exotic species management, and imperiled species management [and population restoration] are discussed in the Resource Management Program section of this component.

The system of classifying natural communities employed in this plan was developed by the Florida Natural Areas Inventory (FNAI) in 2010. 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, and that areas that are similar with respect to those factors will tend to have natural communities with similar species compositions. Obvious differences in species composition can occur, however, despite similar physical conditions. In other instances, physical factors are substantially different, yet the species compositions are quite similar. For example, coastal strand and scrub--two communities with similar species compositions--generally have quite different climatic environments, and these necessitate different management programs. Some physical influences, such as fire frequency, may vary from FNAI's descriptions for certain natural communities in this plan.

When a natural community within a park reaches the desired future condition, it is considered to be in a "maintenance condition." Required actions for sustaining a community's maintenance condition may include; maintaining optimal fire return

intervals for fire dependent communities, ongoing control of non-native plant and animal species, maintaining natural hydrological functions (including historic water flows and water quality), preserving a community's biodiversity and vegetative structure, protecting viable populations of plant and animal species (including those that are imperiled or endemic), and preserving intact ecotones that link natural communities across the landscape.

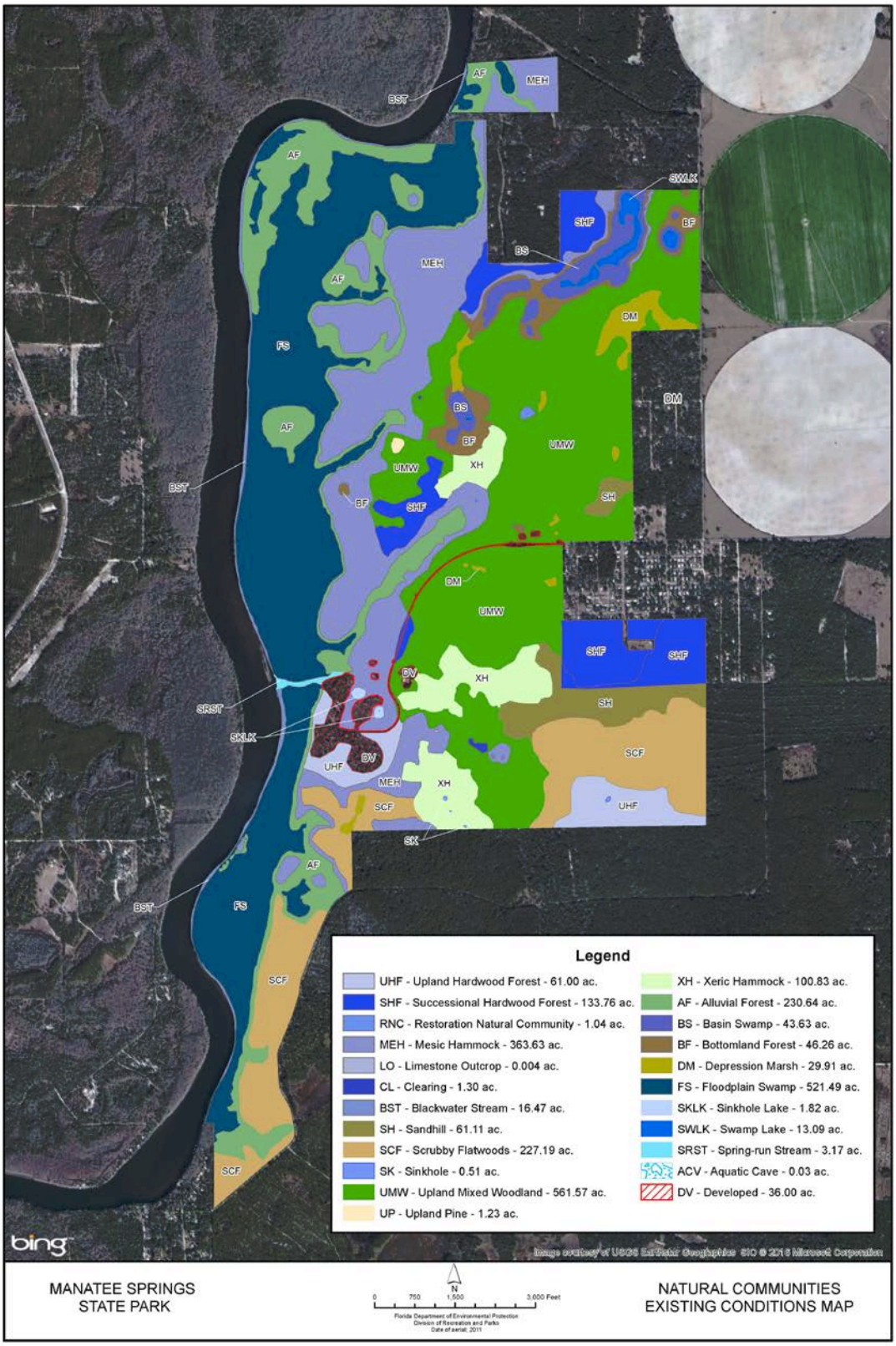
The park contains 19 distinct natural communities as well as 5 altered landcover types (see Natural Communities Map) A list of plants and animals known to occur in the park is contained in Addendum 5.

Limestone Outcrop

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, mosses, and smaller herbs typically grow on the limestone surface or in crevices. Characteristic species on north Florida outcrops 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.

Description and assessment: Only a few small limestone outcrops, all associated with sinkholes, are currently known to occur within the park. None are located on a public trail, two are close to a service road over the cave system, and one is located far from any trail or road. No exotic plants are present on the outcrops at this time. At least one imperiled plant, angle pod (*Gonolobus suberosus*), has been observed growing on the outcrops, and other rare or imperiled plant species may occur there as well. This community is in good condition.

General management measures: Management of limestone outcrops will mainly entail protection from disturbances such as human intrusion, feral hog rooting, and exotic plant invasion. The known outcrops in the park are within sinkholes that are relatively inaccessible to the public. If additional limestone outcrops are found, the park will take measures to prevent degradation by runoff and erosion, 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. Limestone outcrops discovered in the future will be mapped and surveyed for imperiled plant species.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Legend
UHF - Upland Hardwood Forest - 61.00 ac.
SHF - Successional Hardwood Forest - 133.76 ac.
RNC - Restoration Natural Community - 1.04 ac.
MEH - Mesic Hammock - 363.63 ac.
LO - Limestone Outcrop - 0.004 ac.
CL - Clearing - 1.30 ac.
BST - Blackwater Stream - 16.47 ac.
SH - Sandhill - 61.11 ac.
SCF - Scrubby Flatwoods - 227.19 ac.
SK - Sinkhole - 0.51 ac.
UMW - Upland Mixed Woodland - 561.57 ac.
UP - Upland Pine - 1.23 ac.
XH - Xeric Hammock - 100.83 ac.
AF - Alluvial Forest - 230.64 ac.
BS - Basin Swamp - 43.63 ac.
BF - Bottomland Forest - 46.26 ac.
DM - Depression Marsh - 29.91 ac.
FS - Floodplain Swamp - 521.49 ac.
SKLK - Sinkhole Lake - 1.82 ac.
SWLK - Swamp Lake - 13.09 ac.
SRST - Spring-run Stream - 3.17 ac.
ACV - Aquatic Cave - 0.03 ac.
DV - Developed - 36.00 ac.
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MANATEE SPRINGS
STATE PARK
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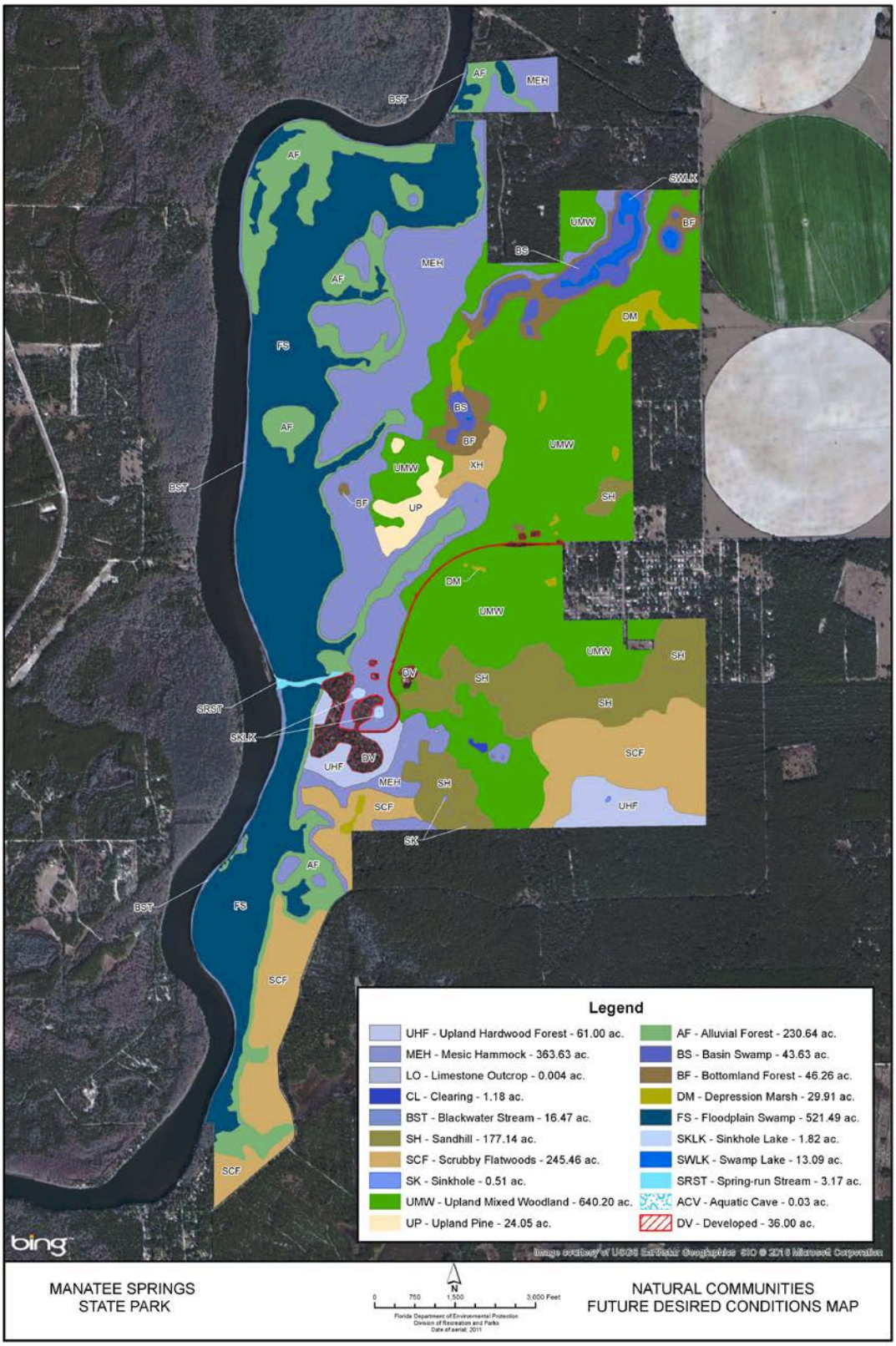
Florida Department of Environmental Protection
Division of Recreation and Parks
Date of aerial: 2011
NATURAL COMMUNITIES
EXISTING CONDITIONS MAP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Legend
UHF - Upland Hardwood Forest - 61.00 ac.
AF - Alluvial Forest - 230.64 ac.
MEH - Mesic Hammock - 363.63 ac.
BS - Basin Swamp - 43.63 ac.
LO - Limestone Outcrop - 0.004 ac.
BF - Bottomland Forest - 46.26 ac.
CL - Clearing - 1.18 ac.
DM - Depression Marsh - 29.91 ac.
BST - Blackwater Stream - 16.47 ac.
FS - Floodplain Swamp - 521.49 ac.
SH - Sandhill - 177.14 ac.
SKLK - Sinkhole Lake - 1.82 ac.
SCF - Scrubby Flatwoods - 245.46 ac.
SWLK - Swamp Lake - 13.09 ac.
SK - Sinkhole - 0.51 ac.
SRST - Spring-run Stream - 3.17 ac.
UMW - Upland Mixed Woodland - 640.20 ac.
ACV - Aquatic Cave - 0.03 ac.
UP - Upland Pine - 24.05 ac.
DV - Developed - 36.00 ac.
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MANATEE SPRINGS
STATE PARK
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3,000 Feet
NATURAL COMMUNITIES
FUTURE DESIRED CONDITIONS MAP

Mesic Hammock

Desired future condition: Mesic hammock is a well-developed evergreen hardwood and/or palm forest which can occur, with variation, through much of peninsular Florida. The often dense canopy will typically be dominated by live oak (*Quercus virginiana*) with cabbage palm (*Sabal palmetto*) mixed into the understory. Southern magnolia (*Magnolia grandiflora*) and pignut hickory (*Carya glabra*) can be common components in the subcanopy as well. The shrubby understory may be dense or open, tall or short, and will typically be composed of saw palmetto (*Serenoa repens*), beautyberry (*Callicarpa americana*), American holly (*Ilex opaca*), hog plum (*Ximenia americana*) and sparkleberry (*Vaccinium arboreum*). The groundcover may be sparse and patchy but generally contains panicgrasses (*Panicum spp.*), switchgrass (*Panicum virgatum*), sedges, as well as various ferns and forbs. Vines and epiphytes will be abundant on live oaks and cabbage palms and other subcanopy trees. Mesic hammocks will generally contain sandy soils with some organic materials mixed in, and there may have a thick layer of leaf litter at the surface. Mesic hammocks will rarely be inundated and are not considered to be fire-adapted communities; in most cases, they are naturally shielded from fire.

Description and assessment: Mesic hammock at Manatee Springs occurs primarily in the ecotone between wetland and upland natural communities. A typical example would be the strip of mesic hammock that separates upland mixed woodland from bottomland forest, alluvial forest, or floodplain swamp along the Suwannee River. Mesic hammock also occurs in isolated islands in the floodplain swamp associated with the Suwannee River and in small areas of natural river levee.

Dominant canopy species include laurel oak, water oak (*Quercus nigra*), southern magnolia, pignut hickory, and live oak. Common understory species may include saw palmetto, ranging in density from moderate to high, coastalplain staggerbush (*Lyonia fruticosa*), sparkleberry, highbush blueberry (*Vaccinium corymbosum*), American holly, wild olive (*Cartrema americana*) and horse sugar (*Symplocos tinctoria*). Very little cabbage palm is present. Groundcover is very sparse.

Areas of younger mesic hammock may be difficult to distinguish from successional hardwood forest that has developed because of fire exclusion and logging in the upland mixed woodland community. Canopy pines in the mesic hammock, however, are usually infrequent, and they typically are loblollies, not the remnant longleaf pine survivors that might be expected in fire-excluded upland mixed woodland or upland pine communities. Laurel oak, water oak, and sweetgum (*Liquidambar styraciflua*), generally 25-35 years in age, and dense to moderately dense saw palmetto are the dominant species in young mesic hammock. The mesic hammock at Manatee Springs is in good condition.

General management measures: Little active management of mesic hammock is required beyond control of feral hog populations and periodic surveys for and treatment of invasive exotic plants. Management measures will be minimal except for ensuring that prescribed fires in adjacent pyrogenic communities penetrate sufficiently to keep volunteer loblolly pine seedlings thinned to natural background levels.

Sandhill

Desired Future Condition: The dominant tree in north Florida sandhills will be longleaf pine (*Pinus palustris*). Herbaceous cover will be very dense (80 percent or greater) and low in stature (less than 3 feet in height). Native grasses will typically dominate the groundcover. Most of the plant diversity will be in the herbaceous layer, which may contain three-awns (*Aristida spp*.), pineywoods dropseed (*Sporobolus junceus*), lopsided Indian grass (*Sorghastrum secundum*), bluestems (*Andropogon spp*.) and little bluestem (*Schizachyrium scoparium*). In addition to characteristic groundcover species and longleaf pines, the sandhill community will contain scattered individual trees, clumps, or ridges of onsite oak species such as turkey oaks (*Quercus laevis*), sand post oak (*Quercus margaretta*), blue-jack oak (*Quercus incana*), and possibly myrtle oak (*Quercus myrtifolia*). In old-growth conditions, sand post oaks will commonly be 150-200 years old, and some turkey oaks will be more than 100 years old. The optimal fire return interval for this community is 2-3 years.

Description and assessment: Dominant canopy species in the Manatee Springs sandhill community include longleaf pine, turkey oak, sand post oak, and sand live oak (*Quercus geminata*), with occasional southern red oak (*Quercus falcate*) present. The understory consists of younger individuals of the same species, supplemented by a thick layer of myrtle oak. Sparkleberry (*Vaccinium arboreum*) and deerberry (*Vaccinium stamineum*) are representative shrubs, and saw palmetto (*Serenoa repens*) is very prevalent. The groundcover is very suppressed due to insufficient fire, and wiregrass and pineywoods dropseed are almost absent from the sparse herbaceous groundcover. Bracken fern is present. At Manatee Springs, the sandhill community often grades into upland mixed woodland or scrubby flatwoods. While the dominance of turkey oaks over southern red oaks typically defines the boundary between sandhill and adjacent upland pine or upland mixed woodland communities at Manatee Springs, this division is often indistinct and confusing due to the years of fire suppression before 2001 and the scarcity of wiregrass and other herbaceous species. The sandhill at Manatee Springs is in poor condition due to the encroachment of sand live oak and a history of insufficient fire.

General management measures: Off-site hardwoods, in particular sand live oak, dominate some of the sandhills that have experienced long-term fire exclusion. These areas do have many adult longleaf pines present, although some areas may need additional longleaf in the future. Hardwood reduction is needed to release suppressed herbaceous species, reduce competition with adult longleaf, and encourage continued longleaf pine recruitment. Along the management zone edges, selected sand live oaks will need to be mechanically removed and chemically treated. In the zone interiors, chemical or mechanical treatment of sand live oaks will enhance the effect of prescribed fire. Regular fire in a 2- to 3-year fire return interval is needed.

Scrubby Flatwoods

Desired future condition: The dominant tree species in north Florida will usually be longleaf pine (*Pinus palustris*). Sand pines (*Pinus clausa*) will be absent. A diverse shrubby understory will be characteristic, and often there will be scattered patches

of bare white sand. A scrub-type oak "canopy" will vary in height from 3 – 8 feet and there will be a variety of oak age classes/heights across the landscape. Dominant shrubs will include sand live oak (*Quercus geminata*), myrtle oak (*Quercus myrtifolia*), Chapman's oak (*Quercus chapmanii*), saw palmetto (*Serenoa repens*), rusty staggerbush (*Lyonia ferruginea*), and tarflower (*Bejaria racemosa*). Cover by herbaceous species will often be well below 40 percent. The Optimal Fire Return Interval for this community is regionally variable, but areas may be burned as frequently as every 3-5 years when burn prescriptions are designed to achieve a mosaic of burned and unburned areas.

Description and assessment: The largest areas of scrubby flatwoods community at Manatee Springs occur in the southeast part of the park and within the Mead-Scott tract to the southwest. In many areas of the park, the boundaries between scrubby flatwoods and other upland communities such as sandhill and upland pine can be difficult to distinguish. This is in part due to past fire suppression, logging, and other human impacts.

According to a revised description of scrubby flatwoods published by FNAI in 2010, the shrub layer of that community consists of one or more species of scrub oak as well as a variety of other shrubs that are also found in mesic flatwoods. Sand live oak, myrtle oak, and Chapman's oak are the 3 scrub oaks that occur at Manatee Springs. Scattered turkey oak also may be a minor component. Other shrub species common in the park's scrubby flatwoods include saw palmetto, rusty staggerbush (*Lyonia ferruginea*), and coastalplain staggerbush (*Lyonia fruiticosa*). Carolina indigo (*Indigofera caroliniana*) is also common, although this plant is not restricted just to scrub habitats. Longleaf pine is present. In some areas, loblolly pine (*Pinus taeda*) has invaded. Sand pine is not a component of the scrubby flatwoods at Manatee Springs.

Scrubby flatwoods that contain this mix of scrub oaks occur in the southeast part of the park in zones 3A and 3B and within zones 5A, 5B and 5D in the Mead-Scott tract to the southwest. There are other areas of the park that now fit the new FNAI description of scrubby flatwoods but only contain one or 2 species of scrub oak. On the eastern edge of zone 1B is an area dominated by myrtle oak with a longleaf pine canopy. This may be sandhill that is being invaded by scrub oaks. Another very fire-suppressed area in the northeastern part of zone 2A may actually be scrubby flatwoods, but it is currently mapped as xeric hammock. This area has a closed canopy of sand live oaks, with some laurel oaks interspersed, and an understory of palmetto that grades into a myrtle oak, sand live oak, and longleaf pine area.

Prior to becoming part of Manatee Springs State Park, the scrubby flatwoods in the Mead-Scott tract were cleared and planted with slash pines at two separate times in the 1970s. Most of the tract was cleared and site-prepped with windrows and bedding in 1976-1977. Over most of the site, windrows still alternate with 4 or more rows of pines planted on raised beds. The area has been burned several times and a small outbreak of pine beetles has opened the canopy. Longleaf pines are absent from the canopy.

In the park's southeastern area of scrubby flatwoods, the scrub oaks have reached canopy size in areas. Because of the relatively extreme conditions under which these oaks will ignite and burn, these areas have not burned completely in many years. In some areas, high fuel buildup in the scrubby flatwoods has contributed to the mortality of adult longleaf pines after prescribed burns. Mechanical treatment of fuel concentrations in these areas will facilitate prescribed fire, resulting in more complete combustion and perhaps protecting adult longleaf pines as well.

The condition of the scrubby flatwoods at Manatee Springs ranges from poor to good, depending on the success of prescribed fires at penetrating the taller scrub oaks and top-killing canopy oaks. Some areas are deficient in longleaf pines. The area in zone 2A needs further investigation to delineate the ecotone and to determine if this area is actually fire-suppressed scrubby flatwoods.

General management measures: Restoration of overgrown scrubby flatwoods to a more characteristic condition through prescribed fire alone has proven difficult at Manatee Springs due to the height of the scrub oaks and the limited conditions under which the zones will burn well. To speed up the restoration process, it will be necessary to mechanically treat overgrown sites to lower the fuel structure and open the closed canopy before initiating prescribed burns. Some areas may need plantings of longleaf pines. Windrows in the Mead-Scott zones should be removed and longleaf pines need to be replanted. The preferred fire return interval for the scrubby flatwoods at Manatee Springs is 3-5 years.

Sinkhole

Desired future condition: Sinkholes are cylindrical or conical depressions with limestone or sand walls. Unlike sinkhole lakes, they do not contain standing water for long periods. Depending upon the age of the sinkhole, the vegetation of sandy sinkholes may form a well-developed forest that includes southern magnolia (*Magnolia grandiflora*), sweetgum (*Liquidambar styraciflua*), wax myrtle (*Myrica cerifera*), grape vines (*Vitis spp*.), Virginia creeper (*Parthenocissus quinquefolia*), water oak (*Quercus nigra*), and pignut hickory (*Carya glabra*). Sinkholes with vertical limestone walls, however, may be covered by a variety of mosses, liverworts, ferns, and small herbs. Sinkholes will generally have a very moist microclimate due to seepage along the slopes and buffering provided by a lower elevation and a tree canopy. The desired future condition can be attained by limiting unnatural erosion and protecting the microclimate from disturbance.

Description and assessment: Sinkholes and depressions are numerous at Manatee Springs. They range in nature from shallow depressions to deep chimneys. Several sinkholes and depressions in the park are superimposed over the subterranean cave system through which groundwater flows to the head spring (see Aquatic Cave section below for additional information). The slope-sided sinkholes contain mature vegetation typical of the surrounding natural communities. In general, they do not contain exposed limestone. Some sinkholes remain dry year-round, while others may hold water for a period of time after heavy rainfall events. Most of the park's sinkholes are in excellent condition, although some are being impacted by feral hogs.

General management measures: Sinkhole management must emphasize protection of resources. Edges of sinkholes should be protected from disturbance, particularly that caused by feral hogs. Public access to sinkholes in general should be limited, and there should be no authorized access to the more sensitive sinkhole sites. Regular monitoring of sinkholes for the presence of invasive plants and animals will be necessary.

Upland Hardwood Forest

Desired future condition: The variant, dry upland hardwood forest, occurs at Manatee Springs. This is a drier, more evergreen forest that is dominated by laurel oak (*Quercus laurifolia*) but also includes live oak (*Quercus virginiana*), pignut hickory (*Carya glabra*), southern magnolia (*Magnolia grandiflora*), wild olive (*Catrema americana*) and sparkleberry (*Vaccinium arboreum*). This community can be difficult to distinguish from mesic hammock.

Description and assessment: Two forms of upland hardwood forest occur at Manatee Springs. The more mesic form occurs around the Magnolia 1 and 2 campgrounds. Pignut hickory, southern magnolia, basswood (*Tilia americana*), sweetgum (*Liquidambar styraciflua*), laurel oak, live oak and bluff oak (*Quercus austrina*) are present. The dry upland hardwood forest variant occurs at the southeast end of of the park, south of the scrubby flatwoods. Surveys in the mid-1800s described this community as scrub hammock with oak. It is currently in good condition.

General management measures: Additional campsites and an upgraded septic system were added to the Magnolia 1 campground in 2015. The resulting disturbed areas in the mesic variant of the upland hardwood forest need to be replanted with species originally found on the site. Plants need to be protected from foot traffic until they are well established. Little active management of the dry upland hardwood forest at the southeastern end of the park is required beyond control of feral hog populations and periodic surveys for and treatment of invasive exotic plants. Management measures will be minimal. Prescribed fires in adjacent pyrogenic communities will be allowed to naturally extinguish as they encounter this community.

Upland Mixed Woodland

Desired future condition: Dominant tree species will include longleaf pine (*Pinus palustris*), southern red oak (*Quercus falcata*), sand post oak (*Quercus margaretta*), and mockernut hickory (*Carya tomentosa*). Hardwood tree species will frequently be dominant or co-dominant with pines. Flowering dogwood (*Cornus florida*) may be present. Other subcanopy species may include sparkleberry (*Vaccinium arboreum*). Percent herbaceous cover will be comparable to sandhill and reach about 3-4 feet in height during spring and summer. In some areas, grasses and forbs may reach heights of 6-8 feet or more during the fall due to blooming of taller grass such as silver plumegrass (*Saccharum alopecuroides*). The groundcover of this community will contain extensive amounts of blackseed needlegrass (*Piptochaetium avenaceum*), some woodoats (*Chasmanthium laxum*), and virtually no wiregrass. Cherokee bean (*Erythrina herbacea*) and early blue violet (*Viola*

palmata) will be common. Florida spiney-pod (*Matelea floridana*) and Florida mountainmint (*Pycnanthemum floridanum*) will also be present. In old growth conditions, oaks and hickories are commonly 150-200 years old. The Optimal Fire Return Interval for this community is 2-4 years, depending on adjacent natural communities.

Description and assessment: The upland mixed woodland community often serves as a transition zone between upland pine or sandhill and adjacent upland hardwood forest or mesic hammock. It is similar to upland pine in that it is fire-adapted, has longleaf pine as the dominant pine species, and has a strong presence of southern red oak and mockernut hickory in the canopy, along with scattered sand post oaks. Unlike the upland pine community, however, upland mixed woodland typically lacks wiregrass as a dominant groundcover, and the oaks and hickories may be co-dominant with the longleaf pines. Due to a history of past logging at Manatee Springs there are parts of this community that currently are dominated by loblolly pine rather than longleaf pine.

The groundcover of this community at Manatee Springs often contains extensive amounts of blackseed needlegrass, some woodoats, and essentially no wiregrass. Cherokee bean and early blue violet are common. Florida spiney-pod and Florida mountainmint occur here too. While this community is beginning to recover from years of fire suppression, it still needs prescribed fire on the shorter end of the fire return interval and some additional offsite hardwood treatment in selected areas.

Since this is a transitional community, upland mixed woodland is quite susceptible to succession to upland hardwood forest when there is a lack of fire. Because of its richer soils, it has often been converted to agriculture. Fortunately, such agricultural conversion was uncommon at Manatee Springs, although in limited areas there were small agricultural fields that dating back to at least the 1850s. The park contains some very good examples of upland mixed woodland, despite years of long-term fire suppression. Fortunately, the past decade of fire management has begun to reveal the true extent and nature of this community in the park.

There are still parts of this natural community that are quite fire-suppressed or lack longleaf pines. These areas need off-site hardwood removal, continued fire, and planting of longleaf pines. In some cases, the transition between upland mixed woodland and what was probably sandhill, scrubby flatwoods, or mesic hammock has been blurred due to the lack of fire.

Analysis of historical aerial photographs of the Manatee Springs area reveals that a decades-long exclusion of fire from most of this community has encouraged a gradual transformation from relatively open woodland to dense forest dominated by invasive off-site hardwoods. Those hardwoods have shaded out most of the herbaceous species. Sites that have reverted to such an extent may be considered to be in poor condition, or they have been reclassified as successional hardwood forest (as defined by FNAI), with the desired future condition being upland mixed woodland (see the Altered Landcover Types section that follows this Natural Communities section).

Chemical treatment of dense stands of off-site hardwoods will be critical to preparing overgrown upland mixed woodland sites for prescribed burning in very fire-suppressed sites. This will allow herbaceous species to begin recovering. Initial girdling efforts have concentrated on hardwood-invaded sites that happen to be adjacent to fair-to-good condition upland mixed woodlands. The DRP needs to target additional upland mixed woodland remnants for restoration work. The condition of upland mixed woodland ranges from very good to poor.

General management measures: Restoration and improvement of the upland mixed woodland community will entail the reintroduction of frequent fire (2-4 year return interval), the removal of off-site hardwood species, and planting of longleaf pines in some areas. The DRP will need to conduct additional field surveys to verify the historic extent of this community. Documentation of the distribution of remnant species will be needed as well. Details about restoration or improvement activities planned for upland mixed woodland sites at Manatee Springs are contained in the Resource Management Program section of this plan in various Goals and Objectives listed under the heading: Natural Communities Management.

Upland Pine

Desired Future Condition: The dominant tree species will usually be longleaf pine (*Pinus palustris*). Herbaceous cover will be low growing and comparable to that in sandhills, but may have a higher density of understory shrubs and saplings. Mature hardwood trees will be scattered throughout, usually southern red oak (*Quercus falcata*), sand post oak (*Quercus margaretta*), mockernut hickory (*Carya tomentosa*) and flowering dogwood (*Cornus florida*). In old growth conditions, the oaks and hickories are commonly 150-200 years old. Wiregrass (*Aristida stricta* var. *beyrichiana*) will dominate the groundcover. Typical forbs will include narrowleaf silkgrass (*Pityopsis graminifolia*), bracken fern (*Pteridium aquilinum*), goldenrod (*Solidago* spp.), and squarehead (*Tetragonotheca helianthoides*). The Optimal Fire Return Interval for this community is 2-3 years.

Description and assessment: Upland pine typically functions as an ecotone between the sandhill community and upland mixed woodland. At Manatee Springs, it is likely that areas of upland pine occur in the matrix of upland mixed woodland at the park. However, these areas are not easily defined at this time. Broad expanses of characteristic upland pine species, particularly longleaf pine, southern red oak, and mockernut hickory, occur in the northern part of the park, but wiregrass is noticeably absent in these areas. Currently, much of this area is mapped as upland mixed woodland with a few areas mapped as upland pine. Both the communities are in a restoration phase at the park. Many areas still have off-site hardwoods such as laurel oak and sweetgum that need to be removed. Most of these areas also are dominated by loblolly pine (*Pinus taeda*) and lack longleaf pine. Evidence of human occupation by 19th century homesteaders in this habitat in several areas of the park is known from early maps and surveys. At the very least, the human occupation has resulted in the removal of longleaf pine for timber and the creation of some crop fields in the mid-1800s. With continued application of fire on a 2-4-year return interval, the difference between upland pine and upland mixed

woodland communities may become more apparent. The condition of this community in the park is difficult to determine but probably ranges from poor to fair.

General management measures: Upland pine areas will require additional hardwood reduction to release suppressed herbaceous species and encourage longleaf pine recruitment. This will require some chemical treatment of off-site hardwoods, primarily laurel oaks. Other than that, the continued frequent use of prescribed fire (2-4 year return interval) in upland pine zones will be essential to maintaining community structure and ecological integrity. Once the marginal upland pine sites have been restored to a reasonably good condition, areas of former upland pine that have transformed into successional hardwood forest will be targeted for restoration as well. Longleaf pine will be planted in areas where loblolly pine currently dominates. Details about restoration or improvement activities planned for upland pine sites at Manatee Springs are contained in the Resource Management Program section of the plan in various Goals and Objectives listed under the heading: Natural Communities Management.

Xeric Hammock

Desired Future Condition: Xeric hammock is considered a late successional stage of scrub or sandhill that generally occurs in small isolated patches on excessively well drained soils. Areas mapped as xeric hammock at Manatee Springs have a desired future condition of sandhill or scrubby flatwoods depending on the location. See those headings for a description of the desired future condition of those communities. Vegetation in the existing xeric hammock is typically dominated by sand live oak (*Quercus geminata*), which creates a low closed canopy that provides shady conditions. Other characteristic plant species may include Chapman's oak (*Quercus chapmanii*) and laurel oak (*Quercus laurifolia*). Slash pine (*Pinus elliottii*) and longleaf pine (*Pinus palustris)* may be minor components. Understory species will usually include saw palmetto (*Serenoa repens*), fetterbush (*Lyonia lucida*), myrtle oak (*Quercus myrtifolia*), yaupon holly (*Ilex vomitoria*), Hercules' club (*Zanthoxylum clava-herculis*), and wild olive (*Cartrema americana*). A sparse groundcover of wiregrass (*Aristida stricta var. beyrichiana*) and other herbaceous species may exist, but typically will be absent. A continuous leaf litter layer may be present. Overgrown scrub or sandhill in need of fire and/or mechanical treatment should not be confused with true xeric hammock.

Description and assessment: Xeric hammock occurs in only a limited area at Manatee Springs. Its canopy is dominated by sand live oak, laurel oak, pignut hickory (*Carya glabra*) and wild olive. Depending on the origin of the xeric hammock, other species such as sand post oak (*Quercus margaretta*), turkey oak (*Quercus laevis*), or Chapman's oak may also be present. Understory species may include of sparkleberry (*Vaccinium arboreum*), deerberry (*Vaccinium staminium*), rusty staggerbush (*Lyonia ferruginea*), and saw palmetto. Xeric hammock at Manatee seems to have developed in localized settings in zones 2A, 3C, and 3E where there has been a long period of fire exclusion, possibly combined with logging of longleaf pines.

In zone 2A, the effects of fire exclusion may have been enhanced by the fire shadow created by a basin swamp to the north. The xeric hammock at Manatee is at an intermediate stage in development. Examination of 1949 aerials shows habitat that appears to be several different natural communities. In zones 3C and 3E the 1940s aerial shows what looks like sandhill where xeric hammock occurs today. This area currently has a closed canopy of sand live oak with mature longleaf pines emerging above it. In the portion of 2A currently mapped as xeric hammock the aerial photo shows a signature that appears to be scrubby flatwoods. While these habitats may be xeric hammock today, the desired future condition will be the historic community type, in this case probably sandhill or scrubby flatwoods, depending on the zone. Its condition ranges from fair to good.

General management measures: District 2 biologists need to conduct more extensive evaluations of the xeric hammock in zone 2A in order to verify that the historic community was indeed scrubby flatwoods. A restoration plan for this area would be developed from the findings. Xeric hammock in zones 3C and 3E will need selective use of chemical and mechanical treatment combined with prescribed fire to return these areas to the desired future condition of sandhill. Fire from the surrounding natural communities should be encouraged to burn into the xeric hammock on a 2 to 4 year return interval and be allowed to extinguish on its own.

Alluvial Forest

Desired future condition: Alluvial forests are hardwood forests found in river floodplains on ridges or slight elevations above floodplain swamp. Generally, they are flooded for one to 4 months of the year during the growing season. Typical overstory trees will include overcup oak (*Quercus lyrata*), laurel oak (*Quercus laurifolia*), water hickory (*Carya aquatica*), American elm (*Ulmus americana*), and red maple (*Acer rubrum*). Understory species may include swamp dogwood (*Cornus foemina*), willow (*Salix spp.*), and American hornbeam (*Carpinus caroliniana*). Presence of groundcover will be variable. Netted chain fern (*Woodwardia areolata*) and other shade-tolerant herbaceous species may be present.

Description and assessment: At Manatee Springs, this community occurs as a narrow band of lowland roughly paralleling the Suwannee River. Topographic relief determines the community's frequency of inundation, which is the primary basis for distinguishing alluvial forest from floodplain swamp. Alluvial forests occur at slightly higher elevations than floodplain swamps and tend to flood annually. Floodplain swamps, on the other hand, are generally flooded for most of the year. In addition to the hardwood species mentioned above, some tupelo (*Nyssa spp.*) and bald cypress (*Taxodium distichum*) may be present in alluvial forests at Manatee. Butterweed (*Packera glabella*) is common.

There is a short causeway on Scenic Trail that crosses a narrow arm of the alluvial forest community northeast of the head spring. Although the causeway has a culvert or two, it may impede sheet flow drainage through the forest.

While selective logging likely occurred in the past, the alluvial forest in the park is currently in excellent condition. The primary threat is damage from feral hogs and invasive exotic plants.

General management measures: Alluvial forest requires little active management other than protection from excessive erosion and control of invasive exotic species, especially feral hogs and invasive exotic plants. Park staff will regularly scout the forest for any occurrences of Chinese tallowtree (*Sapium sebiferum*) or Japanese climbing fern (*Lygodium japonicum*) and will promptly treat any populations discovered. Park staff will also periodically monitor roads and trails that pass through alluvial forest, checking for signs of erosion or feral hog rooting. The DRP will evaluate the causeway that cuts through the alluvial forest near the head spring to determine whether additional culverts or lowering of existing culverts may be needed to improve sheet flow through the forest.

Basin Swamp

Desired future condition: Basin swamps are forested basin wetlands that are highly variable in size, shape, and species composition and will hold water most days of the year. While mixed species canopies are common, the dominant trees will be pond cypress (*Taxodium ascendens*) and swamp tupelo (*Nyssa sylvatica var. biflora*). Other canopy species may 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 may be distributed throughout or concentrated around the perimeter. Shrubs may 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.

Description and assessment: Basin swamps at Manatee Springs occur primarily at the north end of the park. They often are surrounded by a fringe of bottomland forest that grades into upland mixed woodland or upland pine as the elevation increases. One of the basin swamps surrounds the swamp lake at Shacklefoot Pond. Cypress trees are still dominant despite evidence of previous logging.

A long causeway at the north boundary of the park cuts through basin swamp and impacts Shacklefoot Pond. A solution to this significant habitat disruption should be sought. Possibilities include installing more culverts, or acquiring the parcel to the north that contains the isolated fragment of basin swamp and a fringe of uplands. The latter action would allow removal of the causeway and rerouting of the road around the swamp and into the uplands. For the most part, the basin swamps in the park are in very good condition. They would be in excellent condition if the causeway at the north end of Shacklefoot Pond were to be removed.

General management measures: Prescribed fires will be allowed to burn into the edges of basin swamps to maintain the natural ecotone between them and surrounding uplands. Removal of off-site loblolly pines may be necessary to improve the condition of some of the basin swamps. Restoration of the natural hydrological regime may require adding culverts or removing or modifying existing causeways or roads. Protecting basin swamps from the impacts of erosion, feral hogs, and invasive plants is another potential management need.

Bottomland Forest

Desired future condition: Bottomland forest is a fairly low-lying, mesic to hydric community prone to periodic flooding. It is typically found on terraces and levees in river floodplains and in shallow depressions. Vegetation will consist of a mature closed canopy of deciduous and evergreen trees. The overstory 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 spp*.) and various sedges (*Carex spp*.).

Description and assessment: At Manatee Springs, this community primarily occurs in fringes around basin swamps. In some cases, it occupies quite a narrow band. There may be disjunct areas in addition to the fringes as the uplands grade down to alluvial forest in the northern half of the park. Bottomland forest also appears to occur in broad shallow depressions within some areas of the uplands. Delineation of additional areas of this community between the uplands and the river and within the uplands themselves may be beneficial to the understanding of the mosaic of natural communities at Manatee Springs. The bottomland forests in the park are in good condition. Sweetgum, water oak, swamp chestnut oak, loblolly pine, and live oak are characteristic species for this community in the park.

Bottomland forests flood less frequently than alluvial forests (FNAI 2010). In some areas, bottomland forest may act as a transition zone between floodplain and upland community types. These transition zones may be too narrow to map depending on the relative slope of the terrain.

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. Removal of off-site loblolly pines may be necessary in some areas to improve the condition of the bottomland forests. Monitoring for signs of invasive exotic plant species and feral hogs will be ongoing.

Depression Marsh

Desired future condition: Depression marsh is characterized as an open vista wetland dominated by low, emergent herbaceous and shrub species. Trees, if present, will be few and will occur primarily in the deeper portions of the community. There will be little accumulation of dead grassy fuels due to frequent burning. One will often be able to see the soil surface through the vegetation when the community is not inundated. Dominant vegetation in the depression marsh will include maidencane (*Panicum hemitomon*), panic grasses (*Panicum spp*.), and possibly common buttonbush (*Cephalanthus occidentalis*). The optimal fire return interval for this community is 2-10 years depending on the fire frequency of adjacent communities.

Description and assessment: Depression marshes at Manatee Springs occur as small, scattered, isolated, and mainly herbaceous wetlands set in a forested matrix. These marshes are shallow and often do not fit FNAI's standard description in that they may not be rounded, often do not have concentric bands of marsh vegetation around them, and may lack deeper portions containing open water. Recurring drought and flood events from 1998 through 2012 have caused these marshes to experience large fluctuations in water level. Typically, however, the marshes remain dry throughout the year. Depression marshes are important as ephemeral wetlands for many amphibian and invertebrate species.

Invasion of the depression marshes by loblolly pine and buttonbush is countered by prescribed burning and natural flooding. However, adaptable invaders such as loblolly pine and water oak remain in some of the depression marshes despite the application of fire. Typically, these are older trees that became established when management policy was to exclude fire from the marshes. Reductions in the regional water table may lead to more frequent droughts and additional encoachment by hardwoods, eventually encouraging succession of the depression marshes to mesic hammock. The depression marshes at Manatee Springs are currently in fair condition.

General management measures: Depression marshes should be burned at the same time as adjacent fire-type natural communities. Maintenance of a natural ecotone is important, as is keeping the marshes free of invasive exotic species. Removal of well-established loblolly pines and oaks may require additional measures such as felling or herbiciding.

Floodplain Swamp

Desired future condition: Floodplain swamp in north Florida occurs in low-lying areas along streams and rivers. It is frequently or permanently flooded. Soils will consist of a mixture of sand, organics, and alluvial materials. The closed canopy will typically be dominated by bald cypress (*Taxodium distichum*), but commonly will include tupelo species (*Nyssa spp*.) as well as water hickory (*Carya aquatica*), red maple (*Acer rubrum*) and overcup oak (*Quercus lyrata*). Tree bases will typically be buttressed. The understory and groundcover will typically be sparse.

Description and assessment: Floodplain swamps at Manatee Springs occur adjacent to the Suwannee River and the Manatee spring run. Bald cypress and swamp tupelo are the dominant tree species. Both are adapted to long-term flooding, which is the expected condition in Suwannee River floodplain swamps except during droughts. As in the basin swamps, large cypress trees were logged out many years ago. Evidence of this appears in 1940 aerial photographs in which ditches are discernible as linear striations in the swampland. Apparently, felled trees were pulled to the river by oxen in the most direct line possible. Today, the only indications of past logging activities are occasional stumps or logs. Reforestation of the community has progressed such that complete recovery is likely. Floodplain swamp is relatively resilient, and little additional management will be necessary for it to recover from historical impacts. The floodplain swamp at Manatee is in very good condition.

General management measures: Floodplain swamps generally require little active management other than erosion protection and control of invasive exotic species. Park staff will continue to monitor river access points and visitor use areas within the floodplain swamp for erosion issues, and will mitigate impacts as needed. The swamps need to be monitored regularly for signs of invasive exotic plants and animals, including feral hogs.

Sinkhole Lake

Desired future condition: Sinkhole lakes are relatively permanent, typically deep lakes formed in depressions in a limestone base. These lakes characteristically contain clear water with a high mineral content. Vegetation may be completely absent from some sinkhole lakes, while in others the vegetative cover may range from a fringe of emergent species to complete coverage by floating plants. Typical plant species in north Florida will include smartweed (*Polygonum hydropiperoides*), duckweed (*Lemna spp*.), bladderwort (*Utricularia spp*.), and rushes (*Juncus spp*.). Important management goals include limiting disturbances that may cause unnatural erosion and sedimentation, and minimizing possible sources of pollution that might affect the connected aquifer system.

Description and assessment: The park contains several sinkhole lakes. Two of the most accessible are Catfish Hotel and Sue Sink, which are open to divers and connect to the park's extensive aquatic cave system. Catfish Hotel is accessible to all divers and is subject to considerable use. Friedman Sink usually has little to no water visible and is probably better classified as a sinkhole that leads to an aquatic cave. Friedman Sink is remote and divers must request permission from park management to enter it. Due to heavy usage, erosion control measures including access stairs are in place at Catfish Hotel. In general, the sinkhole lakes at Manatee Springs are in good condition.

General management measures: In the management of sinkhole lakes, emphasis must be on protection. The edges of sinkhole lakes need to be protected from impacts that could accelerate erosion and sedimentation. Increased erosion can cause a decline in water quality, especially if a karst window is present. Protection of the quality and quantity of groundwater and surface water feeding the sinkhole lakes is an additional management consideration.

Swamp Lake

Desired future condition: Swamp lake communities are characterized as shallow open-water zones, with or without floating or submerged aquatic plants, which are surrounded by basin swamp or floodplain swamp. Although water levels may fluctuate substantially, swamp lakes will typically be permanent water bodies, but they may become dry during extreme droughts. Water flow in a swamp lake will generally be non-existent to very slow-moving. Characteristic vegetation will include American white waterlily (*Nymphaea odorata*), American lotus (*Nelumbo lutea*), spatterdock (*Nuphar advena*), duckweed (*Lemna spp.*), coontail (*Ceratophyllum dermersum*), water-milfoil (*Heterophyllum spp.*), and bladderwort (*Utricularia spp.*). Emergent plants may also occur, but the community should be considered a marsh if emergents dominate the water body. Substrates will be variable and may be comprised of peat, sand, alluvial clay, or any combination of these. The water column will typically be highly tannic, with a moderate mineral content. An important management goal will be to minimize disturbances in adjacent uplands that may result in increased sedimentation.

Description and assessment: Shacklefoot Pond and Graveyard Pond in the northern part of the park are swamp lakes. Another swamp lake exists in zone 2A. The swamp lakes are presently in very good condition. An agricultural area just north and east of the park may pose a potential threat to the water quality of the swamp lakes, however. This area has several large, center-pivot irrigation systems. In the past, liquefied manure was applied to the fields through the irrigation system to produce forage. Today, cows graze the irrigated pastures.

General management measures: The shorelines of the swamp lakes may need protection from excessive uses that could accelerate erosion. Protection of the quality and quantity of waters contributing to the swamp lakes is another important management consideration. Currently the sources of potential impact are located outside the park boundary.

Blackwater Stream

Desired Future Condition: Blackwater streams can be 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 stained waters will be laden with tannins, particulates, and dissolved organic matter derived from drainage through adjacent swamps, resulting in sandy bottoms overlain by organic matter. Emergent and floating vegetation including golden club (*Orontium aquaticum*), smartweeds (*Polygonum spp.*), grasses, and sedges will sometimes occur, but they are often limited by steep banks and dramatic seasonal fluctuations in water levels. Minimizing disturbances and alterations and preserving adjacent natural communities will be important considerations during management.

Description and assessment: The Suwannee River, a typical blackwater stream, forms the western boundary of the park and provides about 3 miles of river frontage. The Suwannee is renowned worldwide, having both scenic and historic significance. The river is undammed except for a low sill dam where it leaves the source waters of the Okefenokee Swamp in Georgia. Nutrients are of particular

concern in the river since a significant increase in nitrate levels has been detected throughout the Suwannee River Basin. Maintenance of historic flows and levels in the river is another top concern. Despite these issues, the blackwater stream within the park is considered to be in fair to good condition.

Hydrilla (*Hydrilla verticillata*), a noxious exotic plant, is established in the Suwannee River. Fortunately, it does not flourish in the dark, tannin-stained waters as well as it does in clearer waters. The hydrilla in the Suwannee, however, is almost impossible to eradicate completely, and the possibility of it spreading into clear spring runs is a constant threat.

General management measures: The continuation of frequent water quality and quantity monitoring is a critical management priority. Monitoring will primarily be accomplished in cooperation with the FDEP and SRWMD. The continued monitoring and mitigation of riverbank erosion will remain important management activities as well.

Spring-Run Stream

Desired Future Condition: Spring-run streams are described as perennial water courses which derive most, if not all, of their water from limestone artesian openings to the underground aquifer. Spring waters will typically be cool, clear, and circumneutral to slightly alkaline. These factors allow for optimal penetration of sunlight and minimal environmental fluctuation, a combination which promotes plant and algal growth. However, 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 will concentrate around fallen trees and limbs and in slow moving pools. Typical vegetation will include eel grass (*Vallisneria americana*), arrowheads (*Sagittaria spp.*), southern naiad (*Najas guadalupensis*), and pondweeds (*Potamogeton spp.*).

Description and assessment: Manatee Spring, one of a relatively few first magnitude spring systems in Florida, is fed by the Floridan aquifer primarily through a single, large aquatic cave opening at the head spring. It discharges to a short spring-run stream which joins the Suwannee River about 1,250 feet to the west. When the Suwannee River is under extreme flood conditions, Manatee Spring and its spring-run stream can reverse flow and the cave system can act as an estavelle, with tannic surface water pushing into the Floridan aquifer.

In 1956, Manatee Spring was characterized as a healthy, hard-mineral freshwater system containing a rich and diverse complement of submerged aquatic vegetation (SAV) and algal species (Whitford 1956). Manatee's benthic ecosystem appeared to remain intact and healthy through at least 1975.

For many years, the non-native plant hydrilla (*Hydrilla verticillata*) severely impacted the Manatee spring-run stream. Hydrilla rapidly outcompeted and replaced native SAV as it expanded in abundance throughout the spring-run. Park staff, volunteers, and other state agencies expended considerable effort in removing hydrilla from Manatee Spring using manual, chemical, and mechanical

methods. In the past 10 years, several brownout events at the spring have negatively impacted the hydrilla and it is currently not present in the spring or spring run. Additional information about past hydrilla removal in the park is provided above in the Hydrology section.

Since the year 2000, the DRP has documented the nearly complete collapse of SAV in the Manatee spring-run. As of 2014, the spring run was dominated by a dense monoculture of nuisance benthic algae with very few remnants of native SAV. The Hydrology section above describes the deteriorating condition of the spring-run stream in the park and the various factors that may have contributed to its decline. Based on these factors, plus recently declining flows, the Manatee spring-run stream is considered to be in poor condition.

General management measures: Management of complex aquatic systems is a difficult task. Many of the variables that affect the Manatee spring-run stream originate outside the park within the Manatee-Fanning Springshed. For that reason, management considerations must necessarily extend beyond the park boundary. Protection of groundwater sources within the Manatee Springshed is a top priority.

The DRP will continue to cooperate with the cave diving community and coordinate the numerous research projects associated with the river, Manatee Spring, and its springshed. Additionally, DRP staff will document and track water clarity at select karst features in the park as a rapid response technique for identifying significant changes that might be occurring in this natural community. Staff will monitor and mitigate any storm water runoff or other contamination threats occurring on slopes above the springs and in communities adjacent to the springs. Monitoring of the spring-run stream for impacts from invasive plant and animals will also be necessary.

The DRP will continue to work with appropriate state and federal agencies such as the FDEP, SRWMD, FFS, and USFWS in seeking ways to restore the ecological health of the park's spring system. Priority management efforts should include restoration of natural shoreline contours (i.e., Manatee Springs Shoreline Restoration Project), reestablishment of native SAV in the spring-run stream, protection of water quality, maintenance of historic spring flows that allow continued manatee access to this critical warm-water refuge, and the upgrade of septic systems in the park to advanced treatment technology.

<u>Subterranean Cave – Terrestrial and Aquatic</u>
Desired future condition: Caves are characterized as cavities below the ground surface in karst areas. A cave system may contain portions classified as terrestrial cave and portions classified as aquatic cave. The latter vary from shallow pools highly susceptible to disturbance to systems that are more stable and totally submerged. Because all caves develop under aquatic conditions, terrestrial caves can be considered as essentially dry aquatic caves. Near a cave entrance, the vegetation may be typical of the surrounding natural community. Within the cave, illumination levels and therefore vegetation densities drop rapidly. Mosses, algae, and liverworts may be present. However, plant life may be absent or limited to a

few inconspicuous species of fungi that grow on guano or other organic debris. Cave systems are extremely fragile. Desired future management will include maintenance of systems protected from alterations that may affect light penetration, air circulation, or microclimate, or increase pollution in aquatic environments.

Aquatic Cave

Description and assessment: The Manatee Springs aquatic cave system is one of the longest in Florida and has been extensively explored, with more than six miles of passages mapped to date. The Manatee head spring, Catfish Hotel, Sue Sink and Friedman Sink all provide access for certified cave divers to the aquatic cave system. Generally speaking, Manatee Springs' cave system extends southeasterly from the head spring well beyond the park boundary. It is now known that some sinkholes east of the park within the City of Chiefland are directly connected to the Manatee cave system (Karst Environmental Services 2009). Several other surface depressions and sinkholes occur along the known path of the system.

The Manatee Springs aquatic cave system appears to be in fair to good condition, depending on the level of use by cave and cavern SCUBA divers. Much of the information available to DRP biologists about the recreational use of these caves and impacts associated with that use is derived from communications with volunteer cave divers. The National Speleological Society Cave Diving Section is an active volunteer group at the park and is a consistent source of data, but as of 2014, a formal assessment of the overall health of the Manatee cave system had not taken place. In general, however, it is known that narrower passages experience higher levels of damage, whether from equipment scraping walls, divers disturbing the clay or silt substrate, or from exhaled air bubbles dislodging fauna clinging to cave surfaces. Damage to the clay or silt layers may persist for long periods of time. This detracts from the natural beauty of the caves and may have unknown consequences for troglobites.

The Manatee Springs cave system harbors a number of rare troglobite species that exist only within aquatic caves. These include the pallid cave crayfish (*Procambarus pallidus*), the Florida cave amphipod (*Crangonyx grandimanus*), and Hobbs' cave amphipod (*Crangonyx hobbsi*) (Lynch 1984; Franz et al. 1994). Very little is known about the population dynamics or ecology of these organisms, although their populations can vary greatly over time and space.

General management measures: Periodic monitoring of the aquatic caves by cave divers will allow park staff to track changes in the caves and assess impacts, particularly at the Manatee head spring and Catfish Hotel Sink. Research dives throughout the cave system will provide DRP staff with detailed information about cave conditions. Monitoring for signs of erosion on slopes above the sinkhole lakes will also be necessary, and the park will need to mitigate problem areas promptly to prevent movement of silt into the aquatic caves.

Altered Landcover Types

Clearing

Desired Future Condition: There are no current plans to convert the entire clearing, which is located in an area south of the shop, to its original natural community. It has been in a cleared condition since at least 1949. It will continue to be used by the park, but with a reduced footprint.

Description and assessment: The cleared area has bare soil and is used by the park to store brush for burning. The footprint of the area should be reduced, if possible, to allow native vegetation to recolonize the edges. Prior to 2001, a variety of debris including concrete had been deposited in this area. By 2010, most of this material had been removed and disposed of, but a small amount of concrete remains.

General management measures: Park staff will keep the area free of invasive plant species (FLEPPC Category I and II species). No equipment should be parked or stored in the clearing as it is very close to the underground aquatic cave system and any fluid leaks could quickly access conduits that lead directly to the head spring. The remaining concrete should be removed and disposed of properly.

Developed

Desired Future Condition: Except for portions of the head spring area, there are no current plans to convert any of the developed areas in the park back to their original natural community. At the head spring, achieving the desired future condition will entail removal of some concrete reinforcement structures and subsequent restoration of the original shoreline contour and natural community to the extent possible. Management will strive to minimize the effects that the remaining developed areas have on adjacent natural areas in the park.

Description and assessment: Manatee Springs State Park contains various developed areas including a ranger station, an administrative office, two residences, a main swimming area at the head spring with a children's swimming area nearby, a bathroom and concession building at the head spring, concrete reinforcement around the head spring, a canoe launch, a playground, pavilions, two full service campgrounds, two youth camps, a shop, a former residence site adjacent to the shop, a paved park drive, and two boat ramps located at the north and south ends of the park. For a complete list of facilities refer to the Land Use Component.

General management measures: The primary focus of resource management in developed areas will be to remove all priority invasive exotic plants (FLEPPC Category I and II species). Other management measures will include maintenance of proper storm water and waste water management facilities and the designing of future development so that it is compatible with prescribed fire management in adjacent natural areas. Standard septic systems in the park should be upgraded to advanced treatment technology, with a high emphasis placed on improving system performance and efficiency. Removal of concrete reinforcement structures at the head spring and restoration of natural shoreline will be in accordance with the

engineering plan outlined in the Manatee Springs State Park Springhead Shoreline Restoration Study (Jones Edmunds 2008).

Restoration Natural Community

Desired future condition: The park contains a small area of restoration natural community that is embedded within a larger expanse of upland mixed woodland. The desired future condition is upland mixed woodland and it should be burned with the surrounding natural community.

General management measures: Longleaf pines should be planted in this area. Regular fire is important.

Spoil Area

Desired future condition: The only spoil area in the park, Red Dome, is located in zone 2Cs. The desired future condition for the site is upland mixed woodland. Apparently, the site had traditionally been used to mine or store red clay until there was a need for it locally.

Description and assessment: The site has a layer of bare reddish soil. Native vegetation is beginning to recolonize the area. Fire creeps into the site when the surrounding community is burned.

General management measures: The site needs further evaluation to determine if the red soil is spoil or an exposed deposit of red clay and what impacts it might have on the ability of the area to be restored to upland mixed woodland. It should continue to be burned as part of the surrounding upland mixed woodland community.

Successional Hardwood Forest

Desired future condition: The long-range plan for former upland mixed woodland, upland pine and sandhill areas that are now overgrown with off-site hardwoods is to restore them to the natural communities that originally existed there. Substantial effort will be required to restore these communities to a satisfactory level. The desired future condition, after the initial phase of hardwood treatment and prescribed fire, will be a pine community (as defined by FNAI) that contains an assortment of representative species such as longleaf pine, southern red oak, and mockernut hickory. It will have an increasingly diverse, herbaceous groundcover of native species and most of the invading off-site hardwoods (e.g., laurel oak) will have been eliminated from the restoration area. Many of these areas will need additional plantings of longleaf pine once the invading hardwoods have been removed (see the Desired Future Conditions Map in the Natural Resource Management, Natural Community Restoration section of this plan). The areas may also need restoration of groundcover species.

Description and assessment: Humans have had a significant historical and archaeological influence on Manatee Springs. The most prominent recent influences have been logging of longleaf pines and fire suppression. In some areas, longleaf pines are obscured within forests that have a mixed canopy dominated by laurel

oak, sand live oak and live oak. These species may be intermixed with southern red oak, sand post oak, or turkey oak. The amount and diversity of remnant native groundcover in these areas is unknown at this time. However, similar areas in the park have responded well to a combination of chemical treatment of off-site hardwoods and prescribed fire.

Analysis of historical aerial photographs and surveyor's notes from the 1840s reveals that pinelands once occupied many of the successional hardwood sites at Manatee. Fortunately, minimal land clearing for agriculture occurred at Manatee Springs in the past, thus many of the native groundcover species may still be present in a suppressed state. Application of prescribed fire and removal of off-site hardwoods should help in the recovery of the native groundcover.

Zones 2A, 2B, 3D, 3G, and 3H have areas mapped as successional hardwood forest. All these zones have remnant longleaf pines in a matrix of off-site hardwoods and desirable hardwoods. In zone 2A, the successional hardwood forest is adjacent to upland mixed woodland that is in fair condition.

General management measures: All zones containing successional hardwood forest (2A, 2B, 3D, 3G, and 3H as shown in the Existing Natural Communities Map), require a combination of restoration actions. Areas that still contain longleaf pines need to be mapped, and off-site hardwood species such as laurel oak, sweet gum, live oak, and sand live oak need chemical treatment. Some road edges may need to have trees mechanically removed for safety reasons, followed by the application of prescribed fire. Zones in which chemical treatment is used should be burned very soon after the hardwoods are dead. The first prescribed fire should follow within six months of tree mortality. The fire return interval should be relatively short so that large volumes of fuel do not accumulate. During the initial phase of restoration, the fire return interval should be 2 years. Later in the restoration process, the fire return interval will fall within the range listed for the target natural community.

After the first cycle of prescribed fire, restoration areas may need to be evaluated to determine whether they will need longleaf pine plantings. Two prescribed fire cycles will probably be needed before managers can determine how much groundcover restoration will be necessary. Off-site hardwood treatments will likely continue over several years.

Imperiled Species

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

Perhaps the most significant imperiled species at Manatee Springs State Park is the spring's namesake, the West Indian manatee. Manatee sightings in the spring run and in nearby sections of the Suwannee River have steadily increased over the past

several decades. The increase is especially noticeable during the colder winter months when the mammals often congregate either in the spring run or in the river at the mouth of the run. During the winter months, manatees are present in small numbers within or near the spring run on most days. As many as 10 to 20 manatees may use the warm waters of the spring run during periods of colder weather. Manatee Springs, and Fanning Springs to the north, are both important warm water refugia for the population of manatees that uses the Suwannee River in winter months (Taylor 2006). Park staff and volunteers currently record manatee sightings within or adjacent to the park on a daily basis.

While manatees are protected by law wherever they occur, manatees seeking refuge within the park are afforded the added benefit of enforcement of manatee protection laws by park staff and volunteers. Harassment or inadvertent disturbance of manatees by park visitors is discouraged, and visitors are given the opportunity to learn about manatee protection through educational kiosks and informal discussions with park staff. In 1992, the spring run was closed to motorized vessels to protect manatees and help preserve the spring-run community. The year-round prohibition of motorized boat traffic in the spring run adds another dimension of protection, preventing possible conflicts between boats and visiting manatees. Additional protective measures may include closure of the spring run to all watercraft during cold weather events from December 1 through March 31 to help reduce the chances of disturbing manatees within this critical warm water refuge. Canoes and kayaks would still be able to launch at the park's boat dock on the Suwannee or from the boat ramps located at the north and south ends of the park.

The head spring may be closed to scuba diving during cold weather events to reduce the possibility that the presence of divers would discourage manatees from entering the head spring. Air bubbles discharged from scuba equipment may disturb manatees (FWC 2012). Scuba divers would still be able to enter the spring system at an adjacent sinkhole known as Catfish Hotel. Both scuba divers and swimmers are asked to maintain a minimum 50-foot distance from manatees year-round within the swimming area. Division staff will work with the USFWS and FWC to assess the need for additional protective measures for manatees, such as seasonal restrictions for certain recreational uses.

In addition to the spring and spring run, the park has jurisdiction over sovereign submerged lands of the Suwannee River within 400 feet of the park boundary. This authority may be exercised to enforce park rules within that area to provide additional protection for manatees in the vicinity of the park boundary. Due to the increased use of the spring run and adjacent portions of the Suwannee River by manatees, No Entry and Idle Speed No Wake Zones were established in 2003. These are located at the mouth of the spring run and along the edge of the Suwannee River.

Another imperiled species that occurs within the Suwannee River adjacent to Manatee Springs is the Gulf sturgeon (*Acipenser oxyrinchus desotoi*), a federally threatened subspecies of the Atlantic sturgeon. At certain times of the year,

sturgeon are readily apparent in the park as they spontaneously leap from the water during their journey to and from spawning grounds in the upper Suwannee River. Interpretive materials at the park inform visitors about the life history of the Gulf sturgeon.

The Manatee Springs cave system contains three imperiled invertebrate species, the Alachua light-fleeing cave crayfish (*Procambarus lucifugus*), the North Florida spider cave crayfish (*Troglocambarus maclanei*), and the Hobbs' cave amphipod (*Crangonyx hobbsi*). While individual animals inhabiting the larger caves within the park may be subject to impacts from cave divers, these 3 species are probably widespread within areas of the Floridan aquifer that are beyond the reach of normal cave exploration. Perhaps of greater concern for these troglobitic species is the influence of groundwater quality and quantity.

To protect sensitive cave fauna, effective management of the cave systems must include regular assessments of both natural and human impacts. Research divers at Manatee regularly monitor public cave diving activities to determine if they have any negative influence on the caves. Education of the cave diving community about the vulnerability of cave fauna to human disturbance, whether deliberate or incidental, will be an essential element of cave protection. In addition, any genuine effort to preserve the cave system and its inhabitants must include long-term protection of the water sources of Manatee Springs, particularly within the spring recharge area.

The imperiled King's hairstreak (*Satyrium kingi*) was recently discovered in the park. It is found in mesic hammock and feeds on sweetleaf (*Simplocos tinctoria*). This occurence of the species is a new record for Levy County.

Other imperiled animal species in the park include the gopher tortoise (*Gopherus polyphemus*), short-tailed snake (*Lampropeltis extenuata*) and Sherman's fox squirrel (*Sciurus niger shermani*), all inhabitants of xeric fire-maintained uplands. These and other sandhill or upland pine species in the park have endured periods of fire suppression and extensive alteration of natural communities. There are also historical records of eastern indigo snakes (*Drymarchon couperi*) in the park, although none have been observed recently. All these species would benefit from increased application of prescribed fire and additional restoration of the sandhill, upland pine, and upland mixed woodland natural communities.

The Suwannee cooter (*Pseudemys concinna suwanniensis*) and Suwannee alligator snapping turtle (*Macrochelys suwanniensis*) inhabit both the spring-run stream and blackwater river communities. Like the gopher tortoise, the Suwannee cooter and Suwannee alligator snapping turtle were historically harvested for meat. All are currently protected from harvest, and possession is prohibited without a permit from the FFWCC. Recent regulation changes have also prohibited the sale of all freshwater turtles taken from the wild.

In June 2010, the North American Freshwater Turtle Research Group (NAFTRG) began a long-term monitoring project on the freshwater turtles of Manatee Springs

State Park. The Suwannee cooter is one of the most abundant species in the study. During the monitoring, which occurs at least twice a year, the turtles are marked, measured and released.

Recent genetic and morphological studies have resulted in a split of the alligator snapping turtle into three species, with each species restricted to separate river systems (Thomas et al. 2014). The Suwannee River drainage population is named the Suwannee alligator snapping turtle (*Macrochelys suwanniensis*). The resulting dramatic change in range of the species has affected its listing status with FWC and FNAI.

According to anecdotal accounts, a population of Florida scrub-jays (*Aphelocoma coerulescens)* long ago occupied the scrubby flatwoods area south of the park drive (Younker 1991). There have been no recent confirmed sightings of scrub-jays in the vicinity, but park personnel monitor the scrubby flatwoods habitats, and limited call surveys were conducted at the park in 2014. A remnant population does survive further south in Levy County near Cedar Key Scrub State Reserve. The scrubby flatwoods will be managed with prescribed fire and mechanical treatments to maintain it in a suitable condition for scrub-jays and other species native to scrubby flatwoods.

Seven imperiled plant species have been recorded in the park. In general, these require minimal management other than protection from recreational or operational impacts. A floristic study that was completed in 1999 vouchered several of the imperiled species (Gulledge 1999). The two orchid species were documented by staff after completion of the floristic study. At the present time, human activities do not appear to have affected imperiled plant species within the park. To safeguard populations of imperiled plants from possible future development in the park, however, staff will regularly survey and map those populations. Proper natural systems management, including the use of prescribed fire and the maintenance of natural hydroperiods in wetland areas, should suffice to preserve the imperiled plant species.

Table 2 contains a list of all known imperiled species within the park and identifies their status as defined by various entities. It also identifies the types of management actions that are currently being taken 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 following the table. Explanations for federal and state status as well as FNAI global and state rank are provided in Addendum 6.

Table 2: Imperiled Species Inventory						
Common and Scientific Name	**Imperiled Species Status**				**Management Actions**	**Monitoring Level**
	FWC	**USFWS**	**FDACS**	**FNAI**		
PLANTS						
Florida jointtail grass *Coelorachis tuberculosa*			LT	G3,S3	4,9	Tier 1
Angularfruit milkvine *Gonolobus suberosus*			LT		1	Tier 1
Cardinal flower *Lobelia cardinalis*			LT		4,9	Tier 1
Florida milkvine *Matelea floridana*			LE	G2,S2	1	Tier 1
Giant orchid *Pteroglossaspis ecristata*			LT	G2G3, S2	1	Tier 1
Florida mountainmint *Pycnanthemum floridanum*			LT	G3,S3	1	Tier 1
Threebirds orchid *Triphora trianthophoros*			LT			Tier 1
INVERTEBRATES						
Hobbs' cave amphipod *Crangonyx hobbsi*				G2G3,S2S3	4,9,10	Tier 1
American sand-burrowing mayfly *Dolania americana*				G4,S1S2	4,9	Tier 1
Umber shadowfly *Neurocordulia obsoleta*				G5,S2	4,9	Tier 1

Table 2: Imperiled Species Inventory						
Common and Scientific Name	**Imperiled Species Status**				**Management Actions**	**Monitoring Level**
	FWC	**USFWS**	**FDACS**	**FNAI**		
Alachua light-fleeing cave crayfish *Procambarus lucifugus*				G2G3,S2S3	4,9,10	Tier 1
King's hairstreak *Satyrium kingi*				G3G4, S2	2, 4	Tier 1
North Florida spider cave crayfish *Troglocambarus maclanei*				G2,S2	4,9,10	Tier 1
FISH						
Gulf sturgeon *Acipenser oxyrinchus desotoi*	FT	LT		G3T2,S2	4,9	Tier 1
REPTILES						
American alligator *Alligator mississippiensis*	FT(S/A)	SAT		G5,S4	10,13	Tier 1
Eastern indigo snake *Drymarchon couperi*	FT	LT		G3, S3	1,6,10,13	Tier 1
Gopher tortoise *Gopherus polyphemus*	ST	C		G3,S3	1,6,13	Tier 1
Short-tailed snake *Lampropeltis extenuata*	ST			G3,S3	1,6	Tier 1
Alligator snapping turtle *Macrochelys suwanniensis*	SSC			G1G2, S1S2	4,9,10	Tier 3

Table 2: Imperiled Species Inventory						
Common and Scientific Name	**Imperiled Species Status**				**Management Actions**	**Monitoring Level**
	FWC	**USFWS**	**FDACS**	**FNAI**		
Suwannee cooter *Pseudemys concinna suwanniensis*	SSC			G5T3,S3	4,9,10	Tier 3
BIRDS						
Florida scrub-jay *Aphelocoma coerulescens*	FT	LT		G2,S2	1	Tier 1
Limpkin *Aramus guarauna*	SSC			G5,S3	4,9	Tier 1
Little blue heron *Egretta caerulea*	SSC			G5,S4	4,9	Tier 1
Snowy egret *Egretta thula*	SSC			G5,S3	4,9	Tier 1
Tricolored heron *Egretta tricolor*	SSC			G5,S4	4,9	Tier 1
White ibis *Eudocimus albus*	SSC			G5,S4	4,9	Tier 1
Wood stork *Mycteria americana*	FE	LE		G4,S2	4,9	Tier 1
MAMMALS						
Rafinesque's big-eared bat *Corynorhinus rafinesquii*				G3G4,S2	10,13	Tier 1
Sherman's fox squirrel *Sciurus niger shermani*	SSC			G5T3,S3	1,6	Tier 1
West Indian manatee *Trichechus manatus*	FE	LE		G2,S2	4,9,10,13	Tier 2
Florida black bear *Ursus americanus floridanus*				G5T2,S2	10,13	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.

Detailed management goals, objectives and actions for imperiled species in this park are discussed in the Resource Management Program section of this component and the Implementation Component of this plan.

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 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, 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.

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

Manatee Springs State Park is fortunate in that it has very few invasive exotic plants. Given the low numbers of exotics and the relatively isolated location of Manatee Springs, it is possible that staff could eliminate all of the invasive plants within the park boundaries.

Since the last management plan update, the park has treated 210 acres of invasive exotic plants. The species of greatest concern within the park are Japanese climbing fern (*Lygodium japonicum*), cogongrass (*Imperata cylindrica*), and Chinese tallowtree (*Sapium sebiferum*).

It is particularly important that Manatee Springs adopt preventative measures to keep exotics from entering the park inadvertently. Those measures should include developing and putting into practice guidelines for inspecting equipment that enters the park to ensure that mowers, logging equipment, and other types of equipment are clean and free of soil, plant material, and exotics. Any fill or limerock used in the park should be derived from an exotics free site. Park staff should be aware of the locations of any exotics in the park and not spread them inadvertently when disking fire lines or mowing, or in the case of climbing fern, carry propagules on vehicles or clothing.

It is also important that staff survey the park regularly for the presence of invasive exotic plants, particularly areas that are less frequently visited. Regular surveys will enable identification of new infestations before they have a chance to spread and cover larger areas. Newly discovered infestations of exotics should be treated promptly so that the plants do not have a chance to spread.

The park should also continue its program of public outreach and education about invasive exotic plants. This may help encourage neighbors to remove exotics from their properties close to the park.

The most significant exotic animal at Manatee Springs is the feral hog. Since adoption of the previous management plan, at least 310 feral hogs have been removed from the park. Feral hogs are damaging and killing adult and young longleaf pines, destroying native groundcover, and sometimes damaging sinkholes in the park. The severity of their impact is increasing, and control efforts should be increased proportionately.

The grass carp is an invasive exotic species present in the Suwannee River and the Manatee spring-run stream. The carp are removed when opportunity arises. Nuisance animals that are removed occasionally by park staff include nine-banded

armadillos and raccoons. Occasionally, feral dogs and cats or other companion animals appear in the park and are removed as needed.

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. In 2010, the disease was discovered in Levy County and at Manatee Springs State Park. Since that time, many of the adult red bays in the park have died. The beetle (and laurel wilt) has now spread throughout most of Florida and into many of the neighboring states. At Manatee Springs, although most of the adult red bays have been top-killed, the trees continue to resprout from their roots. It may be that members of the Lauraceae family will continue to survive in shrub form as the remnant tree root systems continue to resprout. At this point, much remains unknown about the long-term impacts of this disease on red bays and other Lauraceae. The park should continue to restrict the movement of firewood into and out of the park and educate visitors about the issue.

Table 3 contains a list of the Florida Exotic Pest Plant Council (FLEPPC) Category I and II invasive exotic plant species found within the park (FLEPPC 2015). The table also identifies relative distribution for each species and the management zones in which they are known to occur. An explanation of the codes is provided following the table. For an inventory of all exotic species found within the park, see Addendum 5.

Table 3: Inventory of FLEPPC Category I and II Exotic Plant Species

Common and Scientific Name	FLEPPC Category	Distribution	Management Zone (s)
PLANTS			
Mimosa *Albizia julibrissin*	I	2	MS-1A
Camphor-tree *Cinnamomum camphora*	I	2	MS-1E
Cogongrass *Imperata cylindrica*	I	2	MS-1C
		3	MS-1D
Lantana *Lantana camara*	I	2	MS-5A
Japanese climbing fern *Lygodium japonicum*	I	2	MS-2D
Water-lettuce *Pistia stratiotes*	I	3	MS-3F
Chinese tallowtree *Sapium sebiferum*	I	2	MS-1B, MS-3G, MS-3H

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.

Special Natural Features

With an average flow of 189 cfs, Manatee Spring is one of the larger first magnitude springs in Florida. The main spring is approximately 30 feet deep and has a circumference of nearly 100 feet. The water temperature is approximately 72 degrees Fahrenheit year-round. Because of the quality and volume of its flow and its appealing natural setting, the spring has been designated a National Natural Landmark by the United States Department of the Interior (DOI).

The aquatic cave system associated with Manatee Spring extends to the northeast and southeast of the main boil and reaches depths of 90 feet. In addition to Manatee Spring, 3 sinkholes permit entry into the cave complex. The largest of these is Catfish Hotel, a sinkhole 40 feet deep and 125 feet in circumference. Somewhat farther away is Sue Sink, and beyond that is Friedman Sink. In 1994, a world record dive was completed that covered a distance of 11,074 feet within the cave system, beginning at Friedman Sink (Jablonski 1995). To date, divers have mapped more than 33,000 feet of passage in the Manatee Springs cave complex. Additional information about the Manatee Spring system is described above in the Hydrology section.

Cultural Resources

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). State law 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. Addendum 7 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, and the Secretary of Interior's definitions for the various preservation treatments (restoration, rehabilitation, stabilization, and preservation). For the purposes of this plan, significant archaeological site, significant structure, and significant landscape means those cultural resources listed or eligible for listing in the National Register of Historic

Places. The terms archaeological site, historic structure, or historic landscape refer to all resources that will become 50 years old during the term of this plan.

Condition Assessment

Evaluating the condition of cultural resources is accomplished using a three-part evaluation scale, expressed as good, fair, and poor. These terms describe the present condition, rather than comparing what exists to the ideal 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.

Level of Significance

Applying the criteria for listing in the National Register of Historic Places involves the use of contexts as well as an evaluation of integrity of the site. A cultural resource's significance derives from its historical, architectural, ethnographic, or archaeological context. Evaluation of cultural resources will result in a designation of NRL (National Register or National Landmark Listed or located in an NR district), NR (National Register eligible), NE (not evaluated), or NS (not significant) as indicated in the table at the end of this section.

There are no criteria for determining the significance of collections or archival material. Usually, significance of a collection is based on what or whom it may represent. For instance, a collection of furniture from a single family and a particular era in connection with a significant historic site would be considered highly significant. In the same way, a high-quality collection of artifacts from a significant archaeological site would be of important significance. A large herbarium collected from a specific park over many decades could be valuable to resource management efforts. Archival records are most significant as a research source. Any records depicting critical events in the park's history, including construction and resource management efforts, would all be significant.

The following is a summary of the FMSF inventory for Manatee Springs State Park. This inventory contains an evaluation of significance of the sites.

<u>Prehistoric and Historic Archaeological Sites</u>
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.

Description: Manatee Springs has 21 archaeological sites and 2 resource groups recorded with the FMSF. Because it contains a first magnitude spring and borders the Suwannee River, an important transportation corridor and productive resource, the Manatee Springs area has long been occupied by humans.

Archaeological sites within the park belong primarily to three broad eras: (1) the pre-Colombian era, (2) early period of European contact and (3) the frontier period of European settlement in Florida during the 1800s. Very little information is available for many of the archaeological sites, either because they do not contain diagnostic artifacts or because they have not yet been studied.

When William Bartram visited the area in 1774, he described Seminoles living at a village called Talahasochte near what is now Clay Landing (Bartram 1928). Earlier native peoples inhabited the area around the head spring as well as other areas along the river.

Bullen and Goggin studied several Native American sites (LV32 and LV37) in the park during the 1950s (Bullen, 1953). They found evidence of human habitation from several periods including the Archaic, Deptford and Weeden Island periods. One site appeared to have been inhabited intermittently for more than 1,000 years. At least two, and probably three, village sites covering multiple eras and two possible mounds (LV112 and LV139) are located within the park. A number of sites represent isolated finds (LV626) or low density lithic scatters (LV33 and LV624), or have sparse information provided by the site recorders (LV85 and LV86). This makes it very difficult to interpret them. Several sites have not been excavated, but were recorded based on local informants' long-term knowledge of past conditions and artifact occurrences (LV776 and LV777).

Site excavations in the 1950s indicate that the native peoples' diet consisted of animals and plants that still occur in the area today. Artifacts found in one site show that the inhabitants' diet included deer, black bear, possum, striped skunk, rabbit, coot, wild turkey, box turtle, gopher tortoise, sea turtle, alligator, various fishes, freshwater mussels, oysters, and others. Charred remains of pignut hickory nuts indicate that these were also consumed.

The period of territorial European settlement at Manatee Springs began in the early 1800s. The area was surveyed as early as 1829. The General Land Office (GLO) Early Records are available from the Land Boundary Information System (LABINS 2003). The survey of 1849 by surveyor A. H. Jones shows settlers' homesteads and fields (Verrill 1976). Several of these homestead properties were granted to men who had served in the Florida Indian Wars (Park Ranger Andy Moody, pers. comm.).

The Bryant and Hardee families were listed in the 1867 census of Levy County (Verrill 1976). The locations of their historic homesteads (LV754, LV755, and LV757) within what is now Manatee Springs State Park has been determined by park ranger Andy Moody and recorded with the FMSF. In addition, Ranger Moody has found and recorded the location of an agricultural field used by Bryant (LV820)

and a clay pit (LV812) used for chinking the chimney at the Hardee Homestead. He is also the discoverer of the Shackleford Homestead (LV756) and the Military Homesteader Trail (LV819).

An interesting resource group, also discovered by Andy Moody, is LV693 (Fat Lighter Survey Markers). These consist of fat lighter posts carved and used to mark surveyed sections and quarter sections Knetsch (2006). They may date from the homesteader period in the 1800s when the park was originally surveyed.

Mock Field (LV892) is on property homesteaded by Redden Mock beginning about 1870 (Andy Moody, pers. comm.). The field is visible but somewhat overgrown in a 1940 aerial. The homesite has not been found but is thought to be within the park boundary. Descendants of the family believe Redden Mock and his wife are buried on the property along with some of their children. The location of the gravesites on the property is unknown.

The rich natural resources of Manatee Springs and its prime location along the Suwannee River make it likely that there are other historic and prehistoric sites remaining to be discovered in the park.

Six archaeological surveys and monitoring projects have been conducted in the park and submitted to the FMSF (Hughes 2004; Moody 1998, 2003; Roberson 2005a, b; Smith and Price 2012). These surveys covered specific areas within the park and did not constitute a comprehensive archaeological survey. A predictive model for the park was also completed in 2012 (Collins et al.) If level 1 surveys occur at the park in the future, they should focus on high sensitivity areas identified by the predictive model.

Condition Assessment: All the archaeological sites except LV112 are currently in good condition. The eastern slope of LV112 was disturbed by heavy equipment at some point in its history and a woods road currently passes close by the site, so its condition is only fair. At least two sites in the park have been looted in the past. Sites LV37 (Old Clay Landing) and LV777 (Usher Landing) should be checked regularly for evidence of looting. The portion of LV37 on private property adjacent to the park has been looted in recent years. Site LV112 in the southern part of the park is located close to a woods road that may also serve as a firebreak. The road/firebreak at LV112 should be moved farther away from the site to better protect it from disturbance. LV32, LV85, and LV86 are located in areas that receive heavy use from day visitors or campers. While these sites are in good condition, intensive recreational development has the potential to affect them negatively. LV776, which is adjacent to a public road, could be impacted by any repaving or road widening projects that take place near the site.

General Management Measures: Park management will develop and implement procedures for regular monitoring of all the cultural sites. Those sites that have been looted in the past should receive more frequent visitation to ensure that no further looting occurs. Any disturbances should be documented. As the park continues its prescribed fire and ecological restoration programs, more cultural sites

may become visible. Park staff should check zones periodically for evidence of new archaeological sites so that they can be recorded promptly with the FMSF and protected from ground disturbance and looting. The firebreak/woods road near the mound at LV112 should be rerouted a sufficient distance from the mound to protect it from inadvertent damage that might occur during routine road or firebreak maintenance.

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.

Description: Manatee Springs State Park has seven historic structures recorded with the Florida Master Site File. They were all build between 1955 and 1967 to serve the needs of the park.

Condition Assessment: The condition of the historic structures is mostly fair. The condition of the Concession/Bath Bldg. (LV896) is poor. It should be upgraded or replaced. None of these buildings are currently slated for demolition. All need ongoing maintenance.

Recent repairs to the park manager's residence include a new roof, replacement of interior water lines, and removal of asbestos on electrical lines. Pending repairs include brickwork repair and an electrical upgrade. The assistant park manager's residence needs a new roof, an electrical upgrade, and tile replacement. The concessionaire building needs a new roof and new decking for the picnic deck. Repairs to the concession building are the responsibility of the current concessionaire. Septic systems at the manager's and assistant manager's residences need upgrading.

General Management Measures: Periodic maintenance should be a continual endeavor to keep the structures from deteriorating. New roofs and the other repairs outlined above are needed to bring the structures to good condition.

Collections

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

Description: Manatee Springs does not have a collection and no collection materials are currently deemed appropriate for the park. However, in the future it may be desirable to consider archiving some significant park operations materials to be maintained by the park for future reference.

Condition Assessment: The park does not maintain any collections.

General Management Measures: Park staff should prepare a brief statement of collections indicating that no collection items are deemed appropriate for the park.

Detailed management goals, objectives, and actions for the management of cultural resources in this park are discussed in the Cultural Resource Management Program section of this component. Table 4 contains the name, reference number, culture or period, and brief description of all the cultural sites within the park that are listed in the Florida Master Site File. The table also summarizes each site's level of significance, existing condition, and recommended management treatment. An explanation of the codes is provided following the table.

Table 4. Cultural Sites Listed in the Florida Master Site File

Site Name and FMSF #	Culture/Period	Description	Significance	Condition	Treatment
LV32 Manatee Springs	Historic/Prehistoric	Archaeological Site	NE	G	P
LV33 New Clay Landing	Prehistoric	Archaeological Site	NE	G	P
LV37 Old Clay Landing	Prehistoric	Archaeological Site	NE	G	P
LV85 Manatee Springs A	Unknown	Archaeological Site	NE	G	P
LV86 Manatee Springs B	Unknown	Archaeological Site	NE	G	P
LV112 No Name	Prehistoric	Archaeological Site	NE	F	P
LV139 Shacklefoot Pond Mound	Prehistoric	Archaeological Site	NE	G	P
LV624 Magnolia Campground	Prehistoric	Archaeological Site	NS	G	P
LV626 Manatee Springs State Park Isolated Find	Prehistoric	Archaeological Site	NE	G	P
LV754 Bryant Homestead	19th Century	Archaeological Site	NE	G	P
LV755 Bryant Homestead 2	19th Century	Archaeological Site	NE	G	P

Table 4. Cultural Sites Listed in the Florida Master Site File					
Site Name and FMSF #	**Culture/Period**	**Description**	**Significance**	**Condition**	**Treatment**
LV756 Shackleford Homestead	19th Century	Archaeological Site	NE	G	P
LV757 Hardee Homestead	19th Century	Archaeological Site	NE	G	P
LV776 Roberson	Prehistoric	Archaeological Site	NE	G	P
LV777 Usher Landing	Prehistoric	Archaeological Site	NE	G	P
LV785 Springside	Early to Mid-20th Century	Archaeological Site	NE	G	P
LV812 Hardee Clay Chinking Pit	19th Century	Archaeological Site	NE	G	P
LV817 Manatee Springs S.P. Magnolia 1 Bathroom Survey	Prehistoric Historic Unidentified	Archaeological Site	NE	G	P
LV819 Military Homesteader Trail	1839 or earlier	Resource Group	NE	G	P
LV820 Bryant Agricultural Field	1850 or earlier	Archaeological Site	NE	G	P
LV825 Manatee Springs Flat	Unknown	Archaeological Site	NE	G	P
LV892 Mock Field	Late 19th & early 20th Century	Archaeological Site	NE	G	P
LV893 Fat Lighter Survey Markers	Early 19th Century	Resource Group	NE	G	P
LV896 Concession/Bath Building #053003	1961	Historic Structure	NE	P	RH

Table 4. Cultural Sites Listed in the Florida Master Site File					
Site Name and FMSF #	**Culture/Period**	**Description**	**Significance**	**Condition**	**Treatment**
LV897 Assistant Manager Residence Bldg. #53007	1961	Historic Structure	NE	F	RH
LV898 Park Manager Residence Bldg. #053004	1961	Historic Structure	NE	F	RH
LV899 Picnic Pavilion Bldg. # 53006	1955	Historic Structure	NE	F	RH
LV900 Garage Utility Bldg. # 053010	1961	Historic Structure	NE	G	RH
LV901 Shop Bldg. #053012	1965	Historic Structure	NE	F	RH
LV902Magnolia 2 Bathhouse Bldg. # 053015	1967	Historic Structure	NE	F	RH

Significance:

NRL	National Register listed
NR eligible	National Register
NE	Not Evaluated
NS	Not Significant

Condition

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

Recommended Treatment:

RS	Restoration
RH	Rehabilitation
ST	Stabilization
P	Preservation
R	Removal
N/A	Not Applicable

Resource Management Program

Management Goals, Objectives and Actions

Measurable objectives and actions have been identified for each of the DRP's management goals for Manatee 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 10-year management plan to serve as the basic statement of policy and future direction for each park, several 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 longer-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.

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.

Goals, objectives, and actions identified in this management plan will serve as the basis for developing annual work plans for the park. The 10-year management plan is based on existing conditions at the time of plan development. Annual work plans provide flexibility needed to adapt to future conditions as changes occur during the 10-year management planning cycle. As the park's annual work plans are implemented through the 10-year cycle, it may become necessary to adjust the management plan's priority schedule and cost estimates to reflect new conditions.

Natural Resource Management

Hydrological Management

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 has been impaired prior to acquisition to one degree or another. Florida's native habitats are precisely adapted to natural drainage patterns and seasonal water level fluctuations, and variations in these factors frequently determine the types of natural communities that occur on a

particular site. Even minor changes to natural hydrology can result in the loss of plant and animal species from a landscape. Restoring state park lands to original natural conditions often depends on returning natural hydrological processes and conditions to the park. This is done primarily by filling or plugging ditches, removing obstructions to surface water "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 in hydrological research and monitoring programs.
Action 2	Continue to monitor surface and groundwater quality at Manatee Spring and track water quality changes.
Action 3	Continue to monitor all onsite sewage treatment and disposal systems (OSTDSs) in the park for evidence of detrimental impacts to water quality in the aquatic cave system.
Action 4	Continue to monitor land use or zoning changes in the region and offer comments as appropriate.
Action 5	Continue to cooperate with the SRWMD in monitoring Manatee Spring for compliance with established MFLs in order to ensure maintenance of historic flows.
Action 6	Perform dye trace studies within the Manatee springshed to further understand karst connections and determine groundwater sources for the spring and for other karst features in the park.

Three significant hydrological features in the park include the first magnitude Manatee Spring, its associated aquatic cave system, and the Suwannee River. The aquatic cave system at Manatee is world famous and has been extensively mapped by the cave diving community. Numerous research and monitoring efforts by the SRWMD, FDEP, USGS, and experts in the cave diving community have produced an abundance of information documenting the Manatee system (see details in the Hydrology section above).

Since 1997, multiple factors, including non-native submerged aquatic vegetation (SAV), extreme drought, saltwater encroachment, and increased groundwater consumption, have combined to cause a rapid deterioration in ecological health of Manatee Spring. Regulatory agencies have determined that the waters of Manatee Spring are impaired because of high levels of nitrogen and mercury and low levels of oxygen. SAV, once dominant in the spring and spring run, now covers only small sections of the spring bottom, with the remaining area either bare or blanketed with nuisance filamentous algae. Mitigation of onsite sewage treatment and disposal systems (OSTDSs) and storm water runoff in the park, restoration of the spring ecosystem, and protection of the Manatee Springshed should remain top priorities for the DRP. Although the water quantity and quality issues at Manatee Spring are complex, improvements are still achievable. The following hydrological assessment actions are 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 Suwannee 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. District staff will continue to monitor Environmental Resource Permit and Water Use Permit requests for the region in order to provide timely and constructive comments that 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. One activity worthy of DRP support is continued brownout monitoring and clarity tracking in the head spring as part of the documentation of ecological responses to decreased spring discharge, Suwannee River flooding, and tidal fluctuations.

The advanced treatment provided by the OSTDSs that were installed at the Hickory and Magnolia Campgrounds appears to have largely mitigated nutrient contamination of the groundwater within the aquatic cave system. The DRP should continue to support continuous water quality monitoring of the aquatic cave system to ensure that the park's OSTDSs do not cause detrimental impacts. A long-term goal of the DRP should be to replace all in-ground septic systems in the park with a modern wastewater treatment facility located well away from significant karst features.

Even though the Manatee/Fanning Springshed has already been delineated, there are still gaps in our understanding about the proximal sources of groundwater flow from the Floridan aquifer to the Manatee head spring. In order for water managers to be able to protect water quality and potentially restore spring flows to their historic levels, they will need to know the extent of the springshed. To facilitate that process, the DRP should seek expertise and funding opportunities for dye trace studies to determine the groundwater sources for the spring and karst systems in the park. Previous dye trace studies in the region (e.g., delineation of the Chiefland Sink connection to Manatee Spring) have provided park management with invaluable information about the various sources of spring water and the timing of surface water/groundwater interactions that potentially affect spring water quality.

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 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 operations or large consumptive use permits in the Suwannee Basin or Manatee Springshed for significant changes that may adversely affect park resources.

The DRP will continue to work closely with the SRWMD to ensure that MFLs developed for the Lower Suwannee River, including Manatee Springs, are monitored conscientiously 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 3.17 acres of spring-run stream, 33,000 feet of aquatic cave passages, and 7 acres of floodplain swamp, alluvial forest, and basin swamp natural communities.

Action 1	Continue to coordinate with agencies responsible for the protection and improvement of hydrological resources within the Manatee Springshed.
Action 2	Examine the feasibility of conducting experimental plantings of submerged aquatic vegetation in the spring and spring-run stream.
Action 3	Annually survey the spring-run stream for submerged aquatic vegetation (SAV).
Action 4	Seek necessary approvals and funding opportunities to implement the Manatee Springs Shoreline Restoration Project.
Action 5	Pursue outreach opportunities and develop programming to educate the public about anthropogenic impacts to the Manatee/Fanning Springshed.
Action 6	Maintain semi-regular monitoring of historic locations within the Manatee cave system to track physical and biological changes.
Action 7	Continue to coordinate with and assist FDEP, SRWMD, and independent researchers in the monitoring of water quality and quantity in open-water karst features in the park.
Action 8	Seek funding to upgrade all remaining park septic systems to advanced treatment technology.
Action 9	Determine if the culverts on the Scenic Trail and along the north boundary of the park are adequate in size, number, and height above grade to allow necessary water flow between wetlands.

Research has already indicated that the 3.17-acre spring-run stream within Manatee Springs State Park is experiencing major anthropogenic impacts because of increased nutrients, reductions in groundwater flow, and a near collapse of the submerged aquatic vegetation. At this time, it is unknown if these changes are permanent in nature, but they have been occurring for at least the past 10 years.

Also, there are several sensitive karst features in the immediate area of the Manatee head spring, namely Catfish Hotel, Sue Sink, and Friedman Sink, which deserve close attention since they are situated near known sources of storm water runoff and areas with a history of leaching from OSTDSs. However, every karst feature in the park is critical in that each one could conceivably funnel runoff directly into the 33,000-foot aquatic cave system and degrade the hydrological condition and function of the system. In that regard, the DRP will investigate best management options to continue to improve public access to the park's 2 most

popular visitor access points, Manatee head spring and Catfish Hotel Sink, while limiting access to other more sensitive karst areas. The following hydrological restoration actions are recommended for the park.

DRP staff will continue to coordinate with and assist FDEP, SRWMD, and independent researchers in monitoring water quality and quantity in the spring system and in numerous park monitoring wells as well as other open-water karst features within the park. DRP staff will seek to increase the frequency of monitoring if changes in water quality or abnormal fluctuations in discharge are noted.

Restoration of the Manatee Springs ecosystem is critically important for maintaining the site as a warm water refugium for the federally endangered West Indian manatee. In that respect, DRP staff over the next 10 years will examine the feasibility of conducting experimental plantings of key species of SAV within Manatee Spring and its spring-run stream to replenish stocks that have severely declined since 2000.

The FDEP has historically funded several projects at Manatee that were closely tied to restoring natural shoreline features around the perimeter of the spring and spring-run stream. The DRP should implement the Manatee Spring Shoreline Restoration Project that has been designed to remove hardened bulkhead structures around the spring perimeter and restore the natural contours and slopes along the existing altered shoreline. This project is integral to spring ecosystem restoration and will help stabilize areas of soil erosion along the bank that have gradually undermined the structure at main public access points.

Although the DRP has made significant progress in rectifying key erosion issues at Manatee, additional boardwalks, stairs, and parking area improvements may still be needed in trouble spots. Parking lot and service road runoff will be diverted away from sensitive karst features and into surrounding woodlands as much as possible to encourage natural infiltration. Water bars, broad-based dips, or other best management practices may be used strategically to slow down moving water and to minimize erosion during strong storm events.

DRP staff will regularly monitor areas of the park that are prone to erosion, including the more sensitive karst features such as Sue Sink, to ensure that they are not negatively affected by storm water contamination. Unfortunately, in some areas such as near Hickory Camping Loop, very little soil overlies the often-exposed limestone bedrock, and engineered storm water retention will continue to be challenging. Human-related disturbances such as unauthorized foot traffic around sensitive features will also exacerbate soil erosion.

As of 2014, several OSTDSs associated with residences and administrative offices on park property had still not been upgraded to advanced treatment technology. Given that the entire park is underlain by unconfined Floridan aquifer and the most vulnerable portion of the Manatee aquatic cave system, the DRP should make it a top priority to upgrade all remaining septic systems to advanced treatment.

Two areas in the park have culverts that need evaluation. In zone 2A, Scenic Trail crosses a low area of alluvial forest. The culvert in this area may be restricting water flow to some degree because it is placed slightly above grade. The second area in need of evaluation is at the north end of the park in zone 1F where the park boundary crosses a basin swamp. A berm was constructed many years ago to faciliate access to this area. Staff should determine if additional culverts are needed and if existing culverts are on correct grade. A potential long-range solution would be to acquire the undeveloped property north of the basin swamp so that the park road could be placed outside the wetland, allowing for basin swamp restoration.

Park staff will continue to identify and eliminate visitor access to unauthorized trails that breach floodplain wetlands or sensitive karst features. In addition, the park will continue to remove feral hogs from wetlands and significant karst openings in an effort to decrease the amount of soil disturbance they cause there.

***Objective C:* Monitor impacts of visitor use on the aquatic cave system.**

Action 1 Continue to monitor cave diving activities to determine the relationship between intensity of visitor use and ecological health of the aquatic cave system.

Action 2 Seek the expertise of cave experts in instituting a semi-annual monitoring program for tracking troglobite populations and diver impacts within the Manatee aquatic cave system.

District 2 and park staff will continue to coordinate with cave experts in monitoring disturbance issues, and will pursue the initiation of semiannual cave assessments. Cave assessment sites should include the Manatee head spring and Catfish Hotel entry points, two entrances that endure higher levels of recreational use than the rest of the system. The DRP will work with an existing Springs Management Team that has already provided numerous recommendations regarding use and management of the Manatee cave system. The team consists of certified cave divers from the National Speleological Society Cave Diving Section as well as professionals with relevant expertise in aquatic cave biology and representatives from FDEP. The DRP will investigate all reports of vandalism discovered within the cave system.

With assistance from the Springs Management Team, the DRP will continue to develop and implement baseline survey and monitoring programs that assess biological and physical conditions in the Manatee cave system. DRP staff will work closely with the team to establish standardized photo points in certain passages and rooms that are popular with cave divers and to monitor the points on a regular basis to track cave conditions. In order to protect sensitive cave fauna, assessments of the cave system must consider both natural and human impacts. If necessary, the DRP will modify public access and establish science-based carrying capacities at the primary and secondary dive access points to the cave system. Hydrologic events will also be monitored to determine possible side effects on troglobite populations within the cave system.

The park will continue to use a diver check-in system to track daily cave use. Unauthorized access to the cave system by non-cave certified divers will be prevented for resource as well as safety concerns. The DRP will consult with cave diving organizations when making decisions about cave access.

DRP staff will coordinate with members of the National Speleological Society Cave Diving Section and the North Florida Springs Alliance in developing interpretive programs to educate cave divers about cave preservation and proper cave-diving etiquette. One objective should be the adoption of a series of guidelines for cave divers that identify detrimental activities within cave systems that should be forbidden or discouraged.

Natural Communities Management

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 community improvements. Following are the natural community management objectives and actions recommended for Manatee Springs 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 wildlife species. A large number of Florida's imperiled species of plants and animals are dependent on periodic fire for their continued existence. Fire-dependent natural communities gradually accumulate flammable vegetation; therefore, prescribed fire reduces wildfire hazards by reducing these wild land fuels.

All prescribed 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.

Objective A: Within 10 years, have 1,107 acres of the park maintained within the optimum fire return interval.

Action 1	Develop/update an annual burn plan.
Action 2	Manage fire-dependent communities by burning between 285 - 515 acres annually.

Table 5 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 5: Prescribed Fire Management		
Natural Community	**Acres**	**Optimal Fire Return Interval (Years)**
Upland Mixed Woodland	562	2 - 4
Scrubby Flatwoods	218	3 - 5
Sandhill	61	2 - 3
Successional Hardwood Forest	133	2 - 3
Depression Marsh	30	2 - 10
Xeric Hammock	101	2 - 4
Upland Pine	1	2 - 3
Restoration Natural Community	1	2 - 4
Annual Target Acreage	278 - 520	

Prescribed fire is planned for each burn zone at the appropriate return 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. Each annual burn plan is developed to support and implement the broader objectives and actions outlined in this 10-year management plan.

Six fire-dependent natural community types occur within the park: sandhill, upland mixed woodland, scrubby flatwoods, xeric hammock, upland pine, and depression marsh. Other natural communities may also be affected to some extent by fire, particularly when they border a fire-maintained community type. Successional hardwood forest is an altered landcover type within the park that has a desired future condition of either upland mixed woodland, upland pine, or sandhill, depending on location. A fire return interval of 2 to 3 years is recommended for these areas. The park contains a small area of restoration natural community that is imbedded within a larger expanse of upland mixed woodland; it should be burned with the surrounding natural community. The xeric hammock natural community in the park is likely derived from advanced successional scrubby flatwoods and sandhill. The recommended fire return interval is 2 to 4 years so that it can be burned with adjacent fire type communities until full restoration to sandhill or scrubby flatwoods is attained. The annual targeted burn acreage for the park is 278 to 520 acres.

The eastern half of the park is dominated by upland mixed woodland, a rare natural community which typically has both longleaf pine and hardwood species as co-dominants in the canopy. Upland mixed woodland occurs on richer soils than sandhill, and typically has a much richer groundcover. However, upland mixed woodland can quickly become dominated by off-site hardwoods in the absence of fire. Restoration of a natural fire regime to the park's upland mixed woodlands is a high priority.

The scrubby flatwoods community occurs mainly in the southern end of the park. Previous attempts to burn this community have met with varying degrees of

success; however, recent mowing of parts of the scrubby flatwoods has allowed increased penetration by prescribed fires. Additional hardwood removal and mowing will likely be necessary to continue reestablishment of a natural fire regime.

Many species of wildlife and plants within the park are dependent on periodic fires to maintain their natural habitats. Species such as the gopher tortoise have suffered due to past land uses and lack of adequate fire in much of the upland mixed woodland and sandhill areas. As prescribed fire in these areas becomes more frequent, conditions should improve for gopher tortoises and all the species that shelter within gopher tortoise burrows. Other species such as the Sherman's fox squirrel and eastern indigo snake are very rare in the park or absent. Rehabilitation of the fire dependent natural communities will improve conditions for these imperiled species as well. There are many imperiled plant species associated with the upland mixed woodland natural community. Additional imperiled plant species may be discovered during the course of restoration efforts as the groundcover is burned and the canopy opens up.

Park staff will coordinate with local FFS staff in development of a plan that addresses wildfire suppression within the park boundaries. The wildfire suppression plan may contain an element regarding rehabilitation of fire plow lines or other similar impacts of fire suppression.

In order to track fire management activities, the DRP maintains a statewide burn database. The database allows staff to track various aspects of each park's fire management program including individual burn zone histories and fire return intervals, staff training and experience, backlog, etc. The database is also used for burn planning which allows the DRP to document fire management goals and objectives on an annual basis. Each quarter, the database is updated and 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.

Following are the natural community/habitat restoration and maintenance actions recommended to create the desired future conditions in the upland mixed woodland, upland pine, sandhill, scrubby flatwoods, depression marsh, and xeric hammock communities (see Desired Future Conditions Map).

Objective B: Conduct habitat/natural community restoration activities on 68 acres of upland mixed woodland, upland pine, and sandhill natural communities.

Action 1	Develop a restoration plan.
Action 2	Begin to implement the restoration plan.
Action 3	Conduct hardwood treatments, prescribed burns, groundcover restoration, and longleaf pine plantings as identified in the restoration plan.

Successional hardwood forest occurs in zones 1F, 2A, 2B, 3D, 3G, and 3H. All of the successional hardwood areas have off-site or overly dense hardwood species mixed in with longleaf pines and desirable hardwoods such as southern red oak, turkey oak, sand post oak, and mockernut hickory. Invading hardwood species include sand live oak, live oak, laurel oak, and sweet gum. In some areas, the groundcover is either very suppressed or possibly absent.

The density of offsite or invading hardwood species needs to be reduced while preserving desirable hardwoods and longleaf pines. All hardwood treatments need initial follow-up with prescribed fire within 6 months. Thereafter fire should occur on the shorter end of the fire return interval during the early years of the restoration activities. Longleaf pines will need to be planted in some of the restoration areas. At this time, it is not known if it will be necessary to plant groundcover species. DRP biologists will develop a plan for restoration actions.

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 C: Conduct natural community/habitat improvement activities on 250 acres of upland mixed woodland and upland pine natural communities.

Action 1	Continue habitat improvement activities in the upland mixed woodland/upland pine communities in zones 1B, 1C, 1D, and 2A including chemical treatment of offsite hardwoods and planting longleaf pines as needed.
Action 2	Evaluate zones 1E, 1F, 2B, and 3D and develop and implement a plan to chemically or mechanically remove selected offsite species. Follow up with prescribed fire as soon as the hardwoods are dead, or within 6 months.

Action 3 Monitor habitat improvement sites for native groundcover recovery, longleaf pine seedling survival, and reappearance of invasive hardwoods.

Action 4 Plant longleaf pines in areas that lack sufficient numbers.

Action 5 Continue to work with other agencies to develop more detailed soils descriptions relative to natural communities found in the park.

The upland mixed woodland and upland pine communities are the highest priority for a habitat improvement project at Manatee Springs. An initial community restoration treatment has already been completed in zones 1B, 1D, and part of 1C. Natural community improvement actions are now needed. These zones contain upland pine and upland mixed woodland natural communities with intact, diverse, native groundcover. Treatment of offsite hardwoods in the zones occurred in 2005, and the park subsequently burned the zones several times. Follow-up treatment of remaining offsite hardwoods is needed. The park also needs to plant longleaf pines, particularly where offsite loblolly pines now dominate. It may also be necessary to remove some loblolly pines from these areas. Because of years of fire suppression, the true boundary between upland pine and upland mixed woodland can be difficult to determine. The different community types in the zones will become more clearly delineated as restoration progresses.

Additional selective chemical and mechanical treatment of offsite hardwoods such as laurel oak, sweet gum, sand live oak and live oak is needed in in zones 1C, 1E, 1F, 2A, 2B, and 3D to continue restoration of the upland mixed woodland and upland pine communities.

Prescribed fire is an extremely important maintenance and restoration activity for these zones. During the active phase of habitat improvement, the zones should be burned on the shorter end of the fire return interval. After the initial hardwood treatment, zones should be burned within 6 months of treatment, preferably during the winter so that heavy fuel loads do not accumulate and resprouting hardwoods are killed. Once zones have been burned several times after hardwood treatments, the prescribed fire emphasis should be on growing season burns to aid in the control of hardwood sprouts and encourage diversification of groundcover species.

Chemical and mechanical retreatment of hardwood sprouts, particularly where they have a tendency to create fire shadows, will also be a critical part of the maintenance aspect of this habitat improvement project. Monitoring requirements for the project will include checking for the reappearance of hardwood sprouts, tracking the survival of longleaf pine tubelings, and observing the natural regeneration and recovery of the groundcover. In some areas, it may be necessary to replant some groundcover species. This will be determined after evaluating the responses of the upland mixed woodland and upland pine communities to hardwood treatments and fire.

Objective D: Conduct natural community/habitat improvement activities on 55 acres of sandhill natural community.

Action 1	Chemically and mechanically treat selected invasive hardwoods such as sand live oak, laurel oak, live oak, and sweetgum.
Action 2	Burn treated areas in the winter within 6 months after the treatments. Continue to burn these areas on the shorter end of the fire return interval during initial stages of restoration so that large fuel loads do not accumulate.
Action 3	Monitor the recovery of native groundcover species and determine if areas need supplemental plantings of native groundcover. Plant native groundcover if necessary.
Action 4	Plant longleaf pines as needed.

Some areas of sandhill in zones 3C and 3H are suppressed by encroaching laurel oaks and other offsite hardwoods due to infrequent fire. These areas need selective treatment of offsite hardwoods including either chemical or mechanical methods followed by more frequent fire. Groundcover species recovery should be monitored after hardwood treatment and fire. It may be necessary to plant additional longleaf pines and/or native groundcover.

Objective E: Conduct natural community/habitat improvement activities on 107 acres of scrubby flatwoods natural community.

Action 1	Mechanically treat scrubby flatwoods in zones 3A and 3B.
Action 2	Follow mechanical treatment with prescribed fire within 6 months of the treatment.
Action 3	Evaluate methods to improve the scrubby flatwoods in the Meade Scott tract, including the potential removal of windrows and offsite hardwoods.

The scrubby flatwoods in zones 3A and 3B are overgrown with scrubby oak species, which makes the zone very difficult to burn except under extreme conditions. Mechanical treatment is needed to reduce the stature of scrub oaks and enhance the ability to use fire effectively in the zones and return this community to good condition. Mowing/mechanical treatment should be followed by burning within 6 months. Longleaf pines will be planted in areas that respond well to the treatment. DRP staff will monitor longleaf pine survival. After the mowing and initial prescribed burn treatments, the fire return interval for the scrubby flatwoods at Manatee should be 3 to 5 years (unless scrub-jays recolonize the area, in which case the return interval should be adjusted to fit their ecological needs). The scrubby flatwoods in the Mead-Scott tract (zones 5A and 5B) may also need removal of offsite hardwoods and windrows to improve the effects of prescribed fire.

Objective F: Conduct natural community/habitat improvement activities on 18 acres of depression marsh natural community.

Action 1 Remove loblolly pines encroaching on depression marshes.

Loblolly pines are invading depression marshes in zones 1D and 1F. In many cases, they have reached a size where prescribed fires will no longer kill them. Water uptake by the invading pines is modifying the natural hydrology of the marshes. The loblolly pines should be felled to prevent further growth. Treatment should be followed by prescribed fire within 6 months.

Objective G: Conduct natural community/habitat improvement activities on 30 acres of xeric hammock natural community.

Action 1 Evaluate the xeric hammock in zone 2A to determine its original natural community.

Action 2 Evaluate xeric hammock in zone 3C and 3E for selective offsite hardwood treatment.

Action 3 Develop guidelines for restoring xeric hammock to the original natural community where appropriate.

Several areas of xeric hammock occur in the park. Some zones, including 3C and 3E, are indicative of years of fire suppression in a mix of sandhill and upland pine. Other areas that appear to be xeric hammock (part of zone 2A) are less clear in their origin.

In zones 3C and 3E, laurel oak, sand live oak, and other offsite species have encroached into the sandhill habitat in the absence of fire. These areas need selective treatment of offsite hardwoods to allow fire to more effectively penetrate the zone.

Zone 2A needs further evaluation of the xeric hammock before any actions are taken. Aerial photos from the 1930s indicate the habitat appears to be scrubby flatwoods. Guidelines for restoration of this area should be developed, if appropriate, after further evaluation of the zone.

Imperiled Species Management

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

The DRP strives to maintain and restore viable populations of imperiled plant and animal species primarily by implementing effective management of natural systems. Single species management 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 park values.

In the preparation of this management plan, DRP staff consulted with staff of the FWC's Imperiled Species Management 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 have an impact on imperiled species at 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.

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

Action 1 Continue to inventory the park to update imperiled species lists.

Objective B: Monitor and document 8 selected imperiled animal species in the park.

Action 1 Develop monitoring protocols for 4 selected imperiled animal species, including 3 troglobite species and the Sherman's fox squirrel.

Action 2 Implement monitoring protocols for 8 imperiled animal species, including those listed in Action 1 above and the Suwannee cooter, alligator snapping turtle, Florida scrub-jay and West Indian manatee.

As described in Hydrological Management Objective C, Action 3, DRP staff will work with research divers and the North Florida Springs Alliance to develop and implement monitoring protocols for the Hobbs' cave amphipod, Alachua light-fleeing cave crayfish, and North Florida spider cave crayfish. A protocol will also be developed to record observations of Sherman's fox squirrels and other significant species within or near the park.

The park will continue to assist the North American Freshwater Research Group with survey and monitoring of freshwater turtles in the park, particularly the Suwannee cooter and alligator snapping turtle. Daily monitoring of manatees within the spring run and adjacent Suwannee River will continue. This will allow the park to document seasonal use patterns and continue providing onsite enforcement of manatee protection measures. Data will continue to be shared with other agencies involved in manatee conservation. Staff will also continue to monitor for any signs of Florida scrub-jays within the park, and will inform FWC of any positive survey results.

Objective C: Monitor and document 2 selected imperiled plant species in the park.

Action 1	Develop monitoring protocols for 2 selected imperiled plant species, including Florida milkvine and Florida mountainmint.
Action 2	Implement monitoring protocols for the 2 imperiled plant species listed in Action 1 above.

Florida milkvine and Florida mountainmint are fire-adapted species native to upland mixed woodland, a rare natural community in north Florida. These plant species will be monitored to document their responses during ongoing restoration efforts in the upland mixed woodlands at Manatee. Monitoring protocols will be developed and implemented using GPS technology to document locations and to estimate population numbers.

Exotic Species Management

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 greatest ecological damage. Removal techniques may include mechanical treatment, herbicides, or biocontrol agents.

Objective A: Annually treat 1.5 acres of exotic plant species in the park.

Action 1	Annually develop/update the exotic plant management work plan.
Action 2	Implement the annual work plan by treating 1.5 acres in the park annually and continue maintenance and follow-up treatments as needed.

Manatee Springs State Park is fortunate to have very few acres infested with invasive exotic plants. It is possible that staff could completely eradicate invasive exotic plants from the park. All known infestations should be treated every year.

Objective B: Prevent the introduction and spread of invasive exotic plants into the park.

Action 1 Develop and adopt preventative measures to avoid the introduction and spread of invasive exotic plants into the park.

Invasive exotic plants are often introduced or spread to natural areas on equipment, in fill dirt or mulch, and in ornamental plantings. The park should develop and implement a protocol to inspect equipment and fill dirt and ensure that any equipment or materials entering the park is free of exotics.

Objective C: Survey the entire park for invasive exotics at least 2 times over 10 years.

Action 1 Develop and implement a method to survey the entire park for invasive exotic plants 2 times over the course of 10 years.

In parks such as Manatee Springs where few invasive exotic plants occur, early detection of exotics through vigilant surveying becomes especially important. Park surveys should be conducted with the goal of finding any new infestations quickly so that they can be treated promptly.

Objective D: Implement control measures on 2 exotic animal species in the park.

Action 1 Continue to remove feral hogs from the park.
Action 2 Develop and implement a plan to remove grass carp from the park.

The feral hog rooting that has caused observable damage to native groundcover species and pine trees in the park is increasing. The park should evaluate its current methods of controlling hogs and implement additional methods to increase the number of hogs removed. Efforts should focus on finding methods that capture the entire sounder.

Cultural Resource Management

Cultural resources are individually unique, and collectively, very challenging for the public land manager whose goal is to preserve and protect them in perpetuity. The DRP will implement the following goals, objectives, and actions, as funding becomes available, to preserve the cultural resources found in Manatee Springs State Park.

Goal: Protect, preserve 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 historical 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 National Register of Historic Places must be submitted to the FDOS, Division of Historical Resources (DHR) for review and comment prior to undertaking the proposed project. Recommendations may include, but are not limited to concurrence with the project as submitted, pre-testing of the project site by a certified archaeological monitor, cultural resource assessment survey by a qualified professional archaeologist, and 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. Florida law further requires that 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 23 of 23 recorded cultural resources in the park.

Action 1 Complete 23 assessments/evaluations of archaeological sites.

Park staff should be familiar with the location of and potential threats to the cultural resources within the park. As part of the assessment process, the park should have records for each site in the park, a plan to visit the sites regularly to check for looting or other damage, and a methodology to record the condition and any changes to the sites.

Park staff will develop and implement a protocol to monitor Manatee Springs' archaeological sites. Frequency of visitation should be based in part on existing threats to the site such as looting, fire line maintenance, and feral hog activity.

No HSRs are recommended for the 3 unrecorded historic structures in the park. No stabilization of historic or archaeological sites is needed at this time.

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

Action 1 Ensure all known sites are recorded or updated in the Florida Master Site File.

Action 2 Conduct Level 1 archaeological survey for at least one priority area identified by the predictive model or other previous studies.

Park staff will record the 3 historic structures identified in the Cultural Resources Historic Structures section with the FMSF. Any additional archaeological sites identified within the park will be recorded with the FMSF as well.

The predictive model for Manatee Springs State Park has identified 42 percent of the park as within high sensitivity areas for archaeological sites. If any significant ground disturbance is planned for these areas, a Level 1 survey should be conducted before disturbance begins. Alternatively, if funding is available, a Level 1 survey could be conducted in high sensitivity areas of the park that have not been previously surveyed. Additional knowledge of early homestead sites as well as Native American sites will increase our understanding of both the cultural and natural resources of the park.

Objective C: Bring 23 of 23 recorded cultural resources into good condition.

Action 1 Design and implement regular monitoring programs for all cultural sites in the park.

Action 2 Create and implement a cyclical maintenance program for each cultural resource.

The park should monitor all cultural resources on a regular basis. If a protocol and schedule does not yet exist, park staff will develop and implement one. Staff will develop and implement a maintenance protocol for the historic structures so that their condition does not deteriorate. No restoration is needed for any of the park's archaeological resources at this time.

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. 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 re-establish old-growth characteristics to the degree practicable, with the exception of those communities specifically managed as early successional.

A timber assessment was conducted for Manatee Springs State Park by the FFS in August 2013 (see Addendum 8, Timber Management Assessment).

According to the FFS forester, management zones MS-5A, MS-5B, and MS-5D contain offsite planted slash pines that are 38 years old. The area was site-prepped at the time of planting and the windrows that remain throughout the area contain merchantable offsite hardwoods.

The pines do not need to be thinned at this time. Future restoration will require removal of windrows and slash pines before planting of longleaf pines. Prior to restoration, a timber harvest plan will be finalized which might include patch clear-cuts of slash pine and windrow removal before planting of longleaf pines.

Arthropod Control Plan

Manatee Springs has a current mosquito management plan.

All DRP lands are designated as “environmentally sensitive and biologically highly productive” in accordance with Ch. 388 and Ch. 388.4111 Florida Statutes. If a local mosquito control district proposes a treatment plan, the DRP works with the local mosquito control district to achieve consensus. By policy of DEP since 1987, aerial adulticiding is not allowed, but larviciding and ground adulticiding (truck spraying in public use areas) is typically allowed. 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.

Additional Considerations

DRP has management authority over a 400-foot zone from the edge of mean high water along the Suwannee River where it passes alongside the park. Where emergent wetland vegetation exists, the zone extends waterward 400 feet beyond the vegetation. Within this zone, the park staff may enforce DRP regulations. All wildlife within this zone, with the exception of fish, is protected from harvest, as stated in the Imperiled Species section, above. In addition, pre-cut timber harvesting (dead head logging) is prohibited within this zone.

Resource Management Schedule

A priority schedule for conducting all management activities that is based on the purposes for which these lands were acquired, and to enhance the resource values, is located in the Implementation Component of this management plan.

Land Management Review

Section 259.036, Florida Statutes, established land management review teams to determine whether conservation, preservation, and recreation lands titled in the name of the Board of Trustees are being managed for the purposes for which they were acquired and in accordance with their approved land management plans. The DRP considered recommendations of the land management review team and updated this plan accordingly.

Manatee Springs State Park was subject to a land management review on November 7, 2013. The review team made the following determinations:

- The land is being managed for the purpose for which it was acquired.
- The actual management practices, including public access, complied with the management plan for this site.

LAND USE COMPONENT

Introduction

Land use planning and park development decisions for the state park system are based on the dual responsibilities of the Florida Department of Environmental Protection (DEP), Division of Recreation and Parks (DRP). These responsibilities are to preserve representative examples of original natural Florida and its cultural resources, and to provide outdoor recreation opportunities for Florida's citizens and visitors.

The general planning and design process begins with an analysis of the natural and cultural resources of the unit, and then proceeds through the creation of a conceptual land use plan that culminates in the actual design and construction of park facilities. Input to the plan is provided by experts in environmental sciences, cultural resources, park operation and management. Additional input is received through public workshops, and through environmental and recreational-user groups. With this approach, the DRP objective is to provide quality development for resource-based recreation throughout the state with a high level of sensitivity to the natural and cultural resources at each park.

This component of the unit plan includes a brief inventory of the external conditions and the recreational potential of the unit. Existing uses, facilities, special conditions on use, and specific areas within the park that will be given special protection, are identified. The land use component then summarizes the current conceptual land use plan for the park, identifying the existing or proposed activities suited to the resource base of the park. Any new facilities needed to support the proposed activities are expressed in general terms.

External Conditions

An assessment of the conditions that exist beyond the boundaries of the unit can identify any special development problems or opportunities that exist because of the unit's unique setting or environment. This also provides an opportunity to deal systematically with various planning issues such as location, regional demographics, adjacent land uses and park interaction with other facilities. Manatee Springs State Park is located within Levy County on the border of Dixie County about 16 miles west of Trenton and 7 miles west of Chiefland, 13 miles south of Fanning Springs in the north central part of the state. Approximately 96,000 people live within 30 miles of the park (U.S. Census 2010).

According to the U.S. Census Data (2013), approximately 21 percent of residents in Levy County and 15 percent in Dixie County identify as black, Hispanic or Latino, or another minority group. Nearly half of residents in Levy County (48 percent) and Dixie (46 percent) can be described as youth or seniors (U.S. Census 2010). 63 percent of the population in Levy County and 65 percent in Dixie County are of working age (16 to 65) (U.S. Census Bureau

2010). Levy County's per capita personal income was $29,002 in 2013. Dixie County ranked 64th statewide in per capita personal income at $23,333 (below the statewide average of $41,497) (U.S. Bureau of Economic Analysis 2013).

The table below identifies significant resource-based recreation opportunities within 15 miles of Manatee Springs State Park.

Table 6. Resource-Based Recreational Opportunities Near Manatee Springs State Park

Name	Biking	Hiking	Swim / Beach Access	Boating / Paddling	Fishing	Wildlife Viewing	Overnight Stay	Hunting	Equestrian Facilities
Fanning Springs State Park (FDEP)		✓	✓	✓	✓	✓	✓		
Lower Suwannee National Wildlife Refuge (USFWS)					✓	✓		✓	
Andrews Wildlife Management Area (FWC)		✓		✓	✓			✓	
Devil's Hammock Wildlife Management Area (FWC)		✓		✓	✓			✓	
Log Landing Conservation Area (SRWMD)	✓	✓				✓		✓	✓
Hart Springs Park (Gilchrist County)		✓	✓			✓			

The park is located in the North Central Vacation Region, which includes Alachua, Bradford, Columbia, Dixie, Gadsden, Gilchrist, Hamilton, Jefferson, Lafayette, Leon, Levy, Madison, Suwanee, Taylor, Union, and Wakulla counties (Visit Florida 2013). According to the 2013 Florida Visitor Survey, approximately 2 percent of domestic visitors to Florida visited this region. Roughly 95 percent visitors to the region traveled to the North Central Region for leisure purposes. The top activities for domestic visitors were visiting friends or relatives and shopping. Summer was the most popular travel season, but visitation was generally spread throughout the year. Most visitors traveled by non-air (85 percent), reporting an average of 3 nights and spending an average of $79 per person per day (Visit Florida 2013).

Florida's Statewide Comprehensive Outdoor Recreation Plan (SCORP) indicates that participation rates in this region for freshwater beach activities, saltwater boat fishing, saltwater and freshwater boat ramp use, freshwater fishing, canoeing/kayaking, visiting archaeological and historic sites, wildlife viewing, picnicking, hiking, camping, off-highway vehicle riding, horseback riding, and hunting are higher than the state average with demand for additional facilities increasing through 2020 (FDEP 2013).

Existing Use of Adjacent Lands

The Suwannee River is the park's west boundary and is also the Dixie-Levy County line. Land in Dixie County is zoned for recreation. A parcel to the southwest is identified for conservation purposes. In Levy County, surrounding properties are used for agriculture and rural residential development. Most of the adjacent property to Manatee Springs State Park consists of low density residential development. A Golf Course and Country Club and a trailer park are located directly east of the state park entrance. The Suwannee River forms the western boundary of the park. The public land directly south of the park boundaries is the Mead-Scott tract, which is owned by the Suwannee River Water Management District but leased and managed by the DRP. The Big Bend Wildlife Management Area lies to the north and south of the park. Currently, the area protects wildlife habitats and serves public outdoor recreation purposes. Prescribed burning, timber management, habitat restoration, and invasive exotic species maintenance and control are all conducted throughout the property.

Planned Use of Adjacent Lands

Levy and Dixie County lie within Florida's Nature Coast, which also includes Wakulla, Jefferson, Taylor, Citrus, Hernando, and Pasco counties. In 2010, the region had a population of approximately 900,000 people (U.S. Census 2010). The Nature Coast is distinguished by the abundance of outdoor recreational opportunities and scenic beauty. A majority of the coastal area is designated for conservation (NCFRPC 2010). Historically, North Central Florida is one of the least populous regions in the state and has experienced some of the lowest absolute growth in Florida. In 2010, Dixie, Levy, and the six adjacent counties had a population over 820,000 people, of which Dixie and Levy made up 57,201 of that total (U.S. Census 2010). The regional population makes up only 4% of the state's population in 2010.

Residential and commercial development in the City of Chiefland continues to grow proportionately to the region's moderate population growth. In 2016, a private RV campground was developed in Chiefland. Potential impacts from future development include declines in local surface and subsurface water quality, an increase in local traffic, and loss of any remnant natural areas that are not in public ownership. The Suwannee River Watershed has experienced water quality decline as a result of septic waste systems, however, local government conversions to central package and sewer systems will improve

water quality. Dominant land uses along the river are silvicultural and agricultural. The Suwannee River Water Management District (SRWMD) is working in cooperation with the Natural Resource Conservation Service (NRCS) to provide incentives and easements to private agricultural landowners to encourage low impact agricultural and silvicultural practices. Incentives will be focused on the vulnerable high recharge karst landscapes in the Fanning and Manatee springshed (SRWMD 2015).

Land in Dixie County is designated as environmentally sensitive, requiring special planning and treatment regarding land development. Designation as environmentally sensitive land is not a preservation designation, but requires a higher standard of mitigation and protection for proposed land uses as the county's natural areas are deemed regionally significant. For Dixie County, the sensitive natural resources of regional interest are the surrounding springshed and adjacent Suwannee River Corridor. Dixie County has also delineated land along the river within a Category 1 Storm Surge boundary. Adjacent lands in Levy County are identified for agricultural and rural residential future use. Land is focused on agriculture and development for accessory and supportive uses to the agricultural industry are permitted. Resource-based recreation, conservation, and very low rural density development are included in this category.

Florida Greenways and Trails System (FGTS)

The Florida Greenways and Trails System (FGTS) is made up of existing, planned and conceptual non-motorized trails and ecological greenways that form a connected, integrated statewide network. The FGTS serves as a green infrastructure plan for Florida, tying together the greenways and trails plans and planning activities of communities, agencies and non-profit organizations throughout Florida. Trails include paddling, hiking, biking, multi-use and equestrian trails. The Office of Greenways and Trails maintains a priority trails map and gap analysis for the FGTS to focus attention and resources on closing key gaps in the system.

In some cases, existing or planned priority trails run through or are adjacent to state parks, or they may be in close proximity and can be connected by a spur trail. State parks can often serve as trailheads, points-of-interest, and offer amenities such as camping, showers and laundry, providing valuable services for trail users while increasing state park visitation.

Nature Coast State Trail is a 32-mile paved trail providing opportunities for biking, hiking, birding, picnicking and equestrian use running near Fanning Springs. The Suwannee River Wilderness Trail follows the river offering paddling and five river camps along the way.

Property Analysis

Effective planning requires a thorough understanding of the unit's natural and cultural resources. This section describes the resource characteristics and existing uses of the property. The unit's recreation resource elements are examined to identify the opportunities and constraints they present for recreational development. Past and present uses are assessed for their effects on the property, compatibility with the site, and relation to the unit's classification.

Recreational Resource Elements

This section assesses the park's recreational resource elements, those physical qualities that, either singly or in certain combinations, can support various resource-based recreation activities. Breaking down the property into such elements provides a means for measuring the property's capability to support potential recreational activities. This process also analyzes the existing spatial factors that either favor or limit the provision of each activity.

Land Area

Within Manatee Springs State Park's 2,455 acres, exists an array of Florida's native natural communities. These natural communities include bottomland forest, floodplain forest, floodplain swamp and sinkholes. These communities are particularly sensitive to recreation activities. The sinkhole community is an excellent feature for interpretation, but the steep slopes associated with this community must be protected from inappropriate use. Most of the present development in the park is concentrated in areas around Manatee Springs, occupied by mesic hammock, successional hardwood forest, and xeric hammock. These natural land areas provide scenic and shaded locations for numerous recreational activities.

Water Area

The two most important water features of the unit are Manatee Springs, a first magnitude spring, and the Suwannee River. Recreational activities are centered on the developed swimming area in the spring, boating, and fishing activities along the spring run and the Suwannee River. SCUBA diving is permitted in the Manatee Headspring as well as Catfish Hotel Sink and Friedman Sink. A boardwalk along the 1,250-linear foot spring run provides visitor access through the floodplain area to the east shoreline of the Suwannee River.

Shoreline

The total shoreline of the run flowing from Manatee Springs totals 2,500 linear feet and is a significant recreational resource for the park. The shoreline of the Suwannee River within the park boundary totals another 18,200 linear feet and is primarily accessed by motor boat or paddling.

Natural Scenery
Manatee Springs, the spring run, and the Suwannee River are the primary visual resources of the park. The boardwalk along the spring run provides access to the run and the river as well as the adjacent floodplain swamp for nature study and observation. Hardwood forest and xeric hammock communities that house the existing recreational development also provide scenic attractions.

Significant Habitat
The waters of this unit are an important resource for the endangered Florida Manatee. The upland communities are critical for the various species identified in the resource component of this plan.

Natural Features
The outstanding natural features of the park are the main spring, the adjacent sinkholes, and extensive subterranean aquatic cave system. Interpretation of this area's karst topography is an important aspect of the visitor experience at the park. Based on water quality and flow volume as well as aesthetic value, the spring has been designated a National Natural Landmark by the United States Department of the Interior.

Archaeological and Historic Features
The Florida Master Site File lists seven sites located within the park. As the site of a first magnitude spring and bordering the historically important transportation corridor of the Suwannee River, Manatee Springs State Park is likely to contain additional archaeological and historic sites. The park's historic resources provide important opportunities for interpreting the cultural inheritance of the park and surrounding region.

Assessment of Use

All legal boundaries, significant natural features, structures, facilities, roads and trails existing in the unit are delineated on the base map (see Base Map). Specific uses made of the unit are briefly described in the following sections.

Past Uses
Artifacts found at Manatee Springs indicate that the site was occupied by humans as early as 9,000 years ago. Early accounts of the spring site were documented by William Bartram. Throughout the colonial period, the spring run and river supported a mill. Turpentine and logging later became prominent uses on the surrounding property that is now contained within the park. Fishermen dwellings were located on the spring run for easy access to the Suwannee River. Small orchards were planted near these former home sites. Following the timbering and fishing eras, much of the land surrounding Manatee Springs State Park was in private ownership and, prior to state acquisition of the park in the 1940s, it was used as a private hunting tract.

Future Land Use and Zoning

The DRP works with local governments to establish designations that provide both consistency between comprehensive plans and zoning codes and allow typical state park uses and facilities necessary for the provision of resource-based recreation.

The current future land use designation for the park property is natural reservation, which is designated for conservation purposes for land managed by federal, state, or local government. Park facilities, agricultural activities, forestry uses, and passive recreation are allowed within the district. There are no expected conflicts between the future land use or zoning designations and typical state park land uses.

Current Recreational Use and Visitor Programs

Resource-based outdoor recreation in Florida continually increases in popularity. The growth of Florida's resident and tourist populations brings increasing pressure for access that is more widespread and for denser levels of public use in the natural areas available to the public. Consequently, one of the greatest challenges for public land management today is the balancing of reasonable levels of public access with the need to preserve and enhance the natural and cultural resources of the protected landscapes.

Manatee Springs State Park recorded 154,701 visitors in FY 2013/2014. By DRP estimates, the FY 2013/2014 visitors contributed $11,925,946 in direct economic impact, the equivalent of adding 167 jobs to the local economy (FDEP 2014). Manatee Springs State Park is part of the Great Florida Birding and Wildlife Trail.

Other Uses

Clay Landing boat ramp located within the northern part of the park is located on an easement from the Trustees to Levy County, and managed by Levy County for recreation.

Protected Zones

A protected zone is an area of high sensitivity or outstanding character from which most types of development are excluded as a protective measure. Generally, facilities requiring extensive land alteration or resulting in intensive resource use, such as parking lots, camping areas, shops or maintenance areas, are not permitted in protected zones. Facilities with minimal resource impacts, such as trails, interpretive signs and boardwalks are generally allowed. All decisions involving the use of protected zones are made on a case-by-case basis after careful site planning and analysis.

At Manatee Springs State Park, all wetlands and floodplain have been designated as protected zones. Specific community types found within the park's protected zones include: sandhill, alluvial forest, bottomland forest, floodplain swamp, depression marsh, basin swamp, swamp lake, blackwater stream and spring-run stream.

Existing Facilities

The primary use area of Manatee Springs State Park provides access to the park's primary special natural feature – Manatee Spring and spring-run. A boardwalk and hardscape extend parallel along the south bank of the spring run, with designated water entry points. Adjacent to the walkway is a combined restroom-concession building, which features a patio for seating and picnicking. Two medium picnic shelters and a playground are located in the tree-canopied upland area directly south of the spring access. A trail and boardwalk wrap around the east side of the springhead for access to the north bank of the spring run, where a shallow-water swimming area is located. An additional recreational and interpretive asset to the park is a boardwalk between the Springhead Day Use Area and Suwannee River. The boardwalk leads to a covered overlook and boat docks for visitor and concession use. Two camping areas, Hickory and Magnolia, include 85 standard facility sites throughout three loops. The park additionally offers one primitive group camp northeast of the support area. Approximately 9 miles of hiking trails extend throughout the park. Boat ramps are available for motorized vessels at Usher Landing, on the south end of the park, and Clay Landing, on the north end of the park. Paddlers can launch from a designated non-motorized ramp on the spring run. Support facilities, including the entrance station, residences, shop, and volunteer camping sites, are located east and northeast of the Springhead Day Use Area (see Base Map).

Recreation Facilities

Springhead Day Use Area
Walkway/Swimming Access
Paddling launch

Suwannee River Access
Boardwalk (800 feet)
Floating boat docks

Usher and Clay Landings
Boat ramps (2)

Support Facilities

Entrance station
Staff residences (3)
Shop
Volunteer campsites (4)

Hickory and Magnolia Camping Loops
Standard Facility Campsites (85)
Bathhouses (3)
Dump station

Group Camp Area
Outdoor shower
Potable water
Portable toilet

Hiking/Nature Trails
Scenic Trail (9.1 miles)

Catfish Hotel & Friedman Sinkholes
Access steps
Interpretive kiosks (2)

NW 130th AVE

SUWANNEE RIVER

CHIKI HUT

110th AVE

RESIDENCE

SHED

OFFICE

ENTRANCE STATION

NW 115 CT

INSET

BOAT RAMP

PICNIC PAVILION

NW 102 PL

Legend

- Park Boundary
- Camping Sites
- Hiking Trail
- Hiking/Biking Trail
- Walkways
- County Road
- Park Road Paved
- Park Road Stabilized
- Park Road Unstabilized
- Structures
- Parking Lots

INSET

VOLUNTEER SITES

PLAYGROUNDS

CONCESSION

CANOE/KAYAK LAUNCH

DOCK

CAMPFIRE CIRCLE

PICNIC PAVILION

RESIDENCE

GROUP CAMPS & RESTROOMS

STORAGE & SHOP AREA

BATH HOUSE

CAMP SITES

PET WALK

SINK TRAIL LOOP

MANATEE SPRINGS STATE PARK

N

0 500 1,000 2,000 Feet

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

BASE MAP

Conceptual Land Use Plan

The following narrative represents the current conceptual land use proposal for this park. The conceptual land use plan is the long-term, optimal development plan for the park, based on current conditions and knowledge of the park's resources, landscape and social setting (see Conceptual Land Use Plan). The conceptual land use plan is modified or amended, as new information becomes available regarding the park's natural and cultural resources or trends in recreational uses, in order to adapt to changing conditions. Additionally, the acquisition of new parkland may provide opportunities for alternative or expanded land uses. The DRP develops a detailed development plan for the park and a site plan for specific facilities based on this conceptual land use plan, as funding becomes available.

During the development of the conceptual land use plan, the DRP assessed the potential impact of proposed uses or development on the park resources and applied that analysis to determine the future physical plan of the park as well as the scale and character of proposed development. Potential resource impacts are also identified and assessed as part of the site planning process once funding is available for facility development. At that stage, design elements (such as existing topography and vegetation, sewage disposal and stormwater management) and design constraints (such as imperiled species or cultural site locations) are investigated in greater detail. Municipal sewer connections, advanced wastewater treatment or best available technology systems are applied for on-site sewage disposal. Creation of impervious surfaces is minimized to the greatest extent feasible to limit the need for stormwater management systems, and all facilities are designed and constructed using best management practices to limit and avoid resource impacts. Federal, state and local permit and regulatory requirements are addressed during facility development. This includes the design of all new park facilities consistent with the universal access requirements of the Americans with Disabilities Act (ADA). After new facilities are constructed, park staff monitors conditions to ensure that impacts remain within acceptable levels.

Potential Uses

Public Access and Recreational Opportunities

Goal: Provide public access and recreational opportunities in the park.

The existing recreational activities and programs of this state park are appropriate to the natural and cultural resources contained in the park and should be continued. [New and/or improved] activities and programs are also recommended and discussed below.

***Objective: Maintain the park's current recreational carrying capacity of 2,345 users per day*.**

The park consistently maintains a high rate of visitation throughout the year. Visitor activities are most popularly swimming and snorkeling over the main

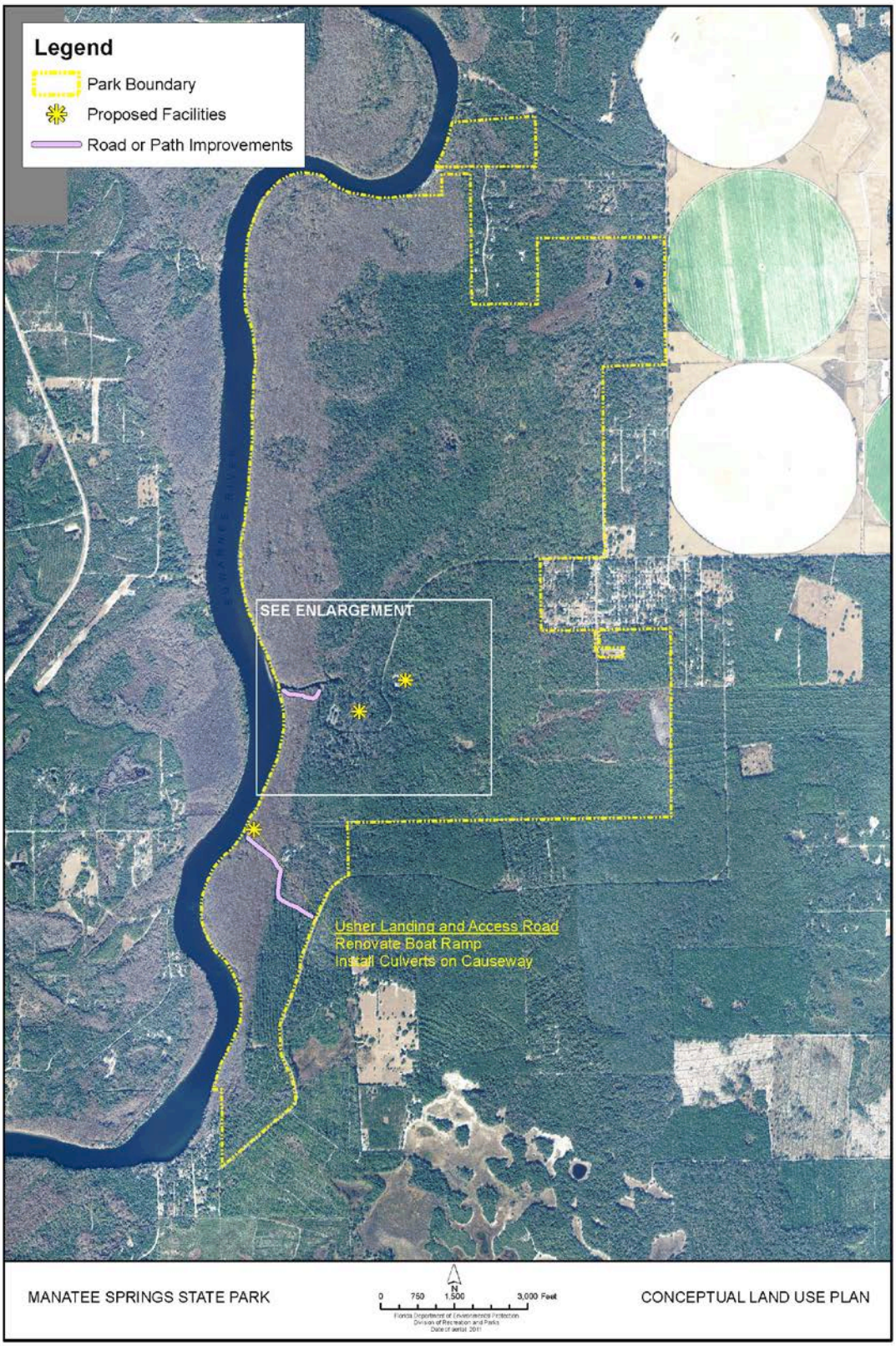
spring and throughout the spring run from the Springhead Day Use Area. SCUBA diving is also popular in the main springhead and Catfish Hotel and Friedman sinkholes. Many visitors enjoy picnicking and hiking in the park's upland areas. Boaters frequently arrive by way of the floating dock on the Suwannee River or launch on the Suwannee River from Usher Landing. Paddlers also access the Suwannee River by a launch on the spring run. The park additionally maintains a high capacity for overnight visitors in the three standard facility camping loops and one group camp.

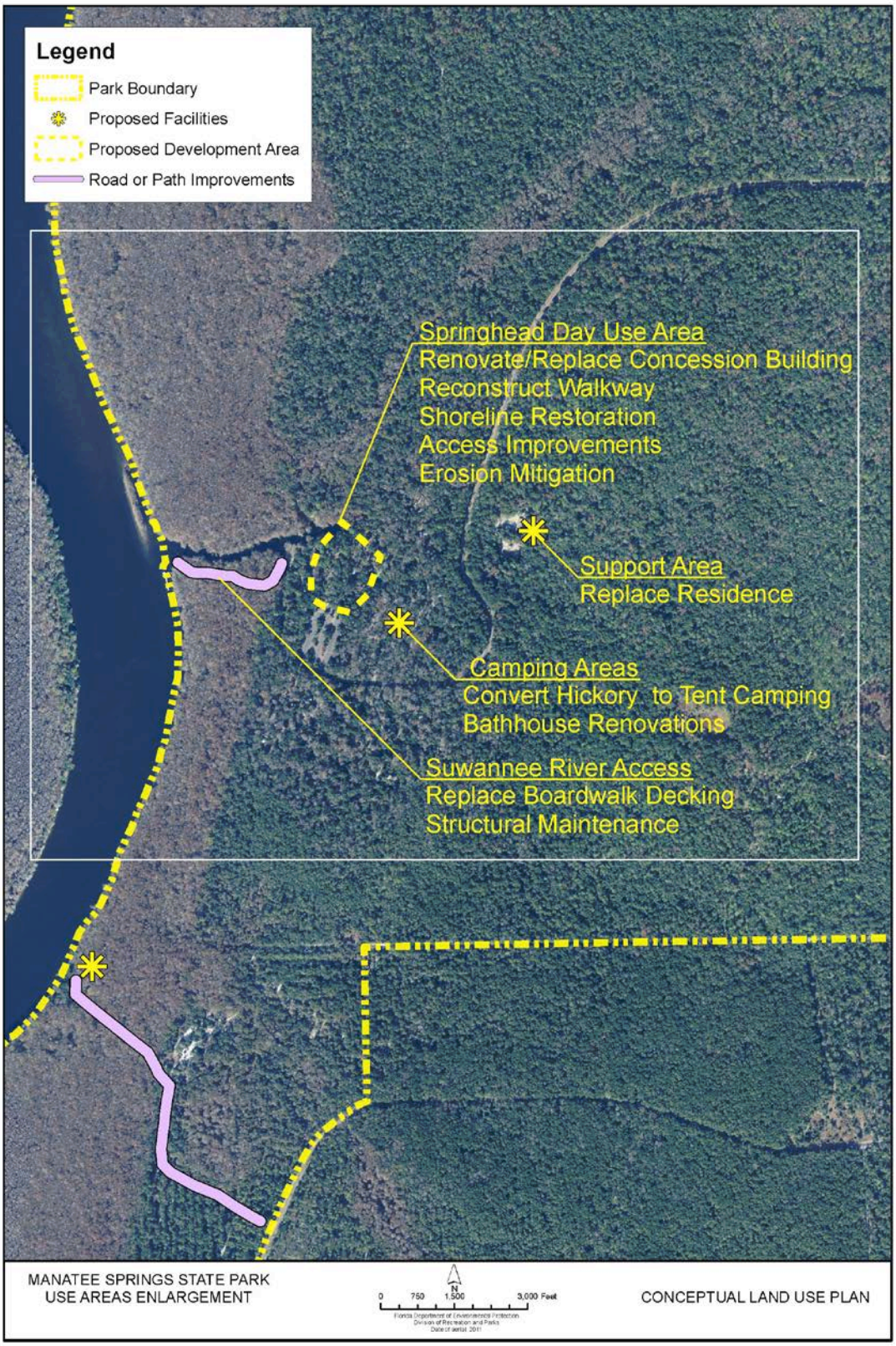
Objective: Expand the park's recreational carrying capacity by 0 users per day.

All proposed facility improvements for this ten-year planning period are intended to maintain existing levels of service and improve the quality of the visitor experience. New use areas or recreational opportunities are not proposed at this time.

Objective: Continue to provide the current repertoire of 12 interpretive, educational and recreational programs on a regular basis.

The Birding Walk is an interpretive program to introduce visitors to bird watching. Camping 101 is an educational workshop to teach camping skills to current and prospective campers. During manatee season, Manatee Q & A, is a roving interpretive program on manatees. Active interpretation is provided by park staff at the headspring and on the Suwannee River docks where manatees can be viewed. A staffed interpretive table at the Springhead Day Use Area regularly provides information on the park's natural and cultural resources. The Natural Community Restoration Interpretive Program is a hands-on field program, allowing visitors to work in the field with DRP staff to learn about natural community restoration. Similarly, the Prescribed Fire Interpretive Program introduces visitors to principles of fire ecology and prescribed burning. The Nature Photography Walk is a guided walk to provide education on techniques of nature photography. The North Trail Wagon Ride is a ranger-guided interpretive tram ride around the 2.2-mile loop of the North Trail, focusing on natural communities of the North Trail Area of the park. The North Trail Walk-n-Talk is a ranger guided walk around the 2.2-mile loop of the North Trail, also educating visitors on natural communities along the North Trail. The Spring System Walk is a guided tour of the headspring and spring run, with interpretation of the park's karst geology. Build a Manatee is an artistic craft program for children to learn about the species. The Scavenger Hunt is a family-oriented activity centered around the Springhead Day Use Area. Offered by the concession, guided paddling and boat tours are lead along the Suwannee River to interpret the park's extensive floodplain swamp and alluvial forest communities.


Legend
Park Boundary
Proposed Facilities
Road or Path Improvements
SEE ENLARGEMENT
Usher Landing and Access Road
Renovate Boat Ramp
Install Culverts on Causeway
MANATEE SPRINGS STATE PARK
N
0 750 1,500 3,000 Feet
CONCEPTUAL LAND USE PLAN


Legend
Park Boundary
Proposed Facilities
Proposed Development Area
Road or Path Improvements
Springhead Day Use Area
Renovate/Replace Concession Building
Reconstruct Walkway
Shoreline Restoration
Access Improvements
Erosion Mitigation
Support Area
Replace Residence
Camping Areas
Convert Hickory to Tent Camping
Bathhouse Renovations
Suwannee River Access
Replace Boardwalk Decking
Structural Maintenance
MANATEE SPRINGS STATE PARK
USE AREAS ENLARGEMENT
N
0 750 1,500 3,000 Feet
CONCEPTUAL LAND USE PLAN

Objective: Develop 1 new interpretive, educational and recreational program.

The park offers significant opportunities for interpretation and outreach. In order to coordinate and focus interpretive programming at the park, development of an interpretive master plan is recommended. One additional visitor program should be developed. Program topics could include an expanded spring hydrology and ecosystems program that informs residents about the underlying karst geology of the entire park, and biota of springs and sinks, using an interpretive parkwide walk that traces the mapped cave system from the surface. Such a program would expand passive recreational activities and contribute to the opportunities for wildlife viewing and nature study that are offered at the park.

Proposed Facilities

Capital Facilities and Infrastructure

Goal: Develop and maintain the capital facilities and infrastructure necessary to implement the recommendations of the management plan.

The existing facilities of this state park are appropriate to the natural and cultural resources contained in the park and should be maintained. New construction, as discussed further below, is recommended to improve the quality and safety of the recreational opportunities, to improve the protection of park resources, and to streamline the efficiency of park operations. The following is a summary of improved and renovated facilities needed to implement the conceptual land use plan for Manatee Springs State Park:

Objective: Maintain all public and support facilities in the park.

All capital facilities, trails and roads within the park will be kept in proper condition through the daily or regular work of park staff and/or contracted help.

Objective: Improve/repair 5 existing facilities and a .5-mile road.

Major repair projects for park facilities may be accomplished within the ten-year term of this management plan, if funding is made available. These include the modification of existing park facilities to bring them into compliance with the Americans with Disabilities Act (a top priority for all facilities maintained by DRP). The following discussions of other recommended improvements and repairs are organized by use area within the park.

Springhead Day Use Area

Restrooms and Concession Building
Repairs, renovations, or replacement of the day use restroom-concession building are recommended. The restrooms are significantly aged and do not

meet the level of service required for the use area's high visitor volume. The concession building annex is in fair condition, but should be upgraded to better accommodate concessionaire and visitor use. Paved walkways along the spring run and adjacent to the restroom-concession building require upgrades for ADA compliance. If the building is replaced, structure should retain approximately the same footprint area and additional setback from the spring run should be considered.

Spring Run Walkway and Swimming Access
Walls and walkways along the south bank of the spring run need repair/renovation due to erosion and structural degradation. Design elements should prioritize protection and restoration of the spring run's sensitive resources and facilitate safe water access. Previous engineering studies (Jones Edmunds and Associates 2007) have been conducted for reconstruction of the walkway and restoration of the natural shoreline along the spring run.

Shallow-water swimming access, located on the north bank of the spring run, is eroded and requires access and safety improvements. Accessibility and safety improvements at this site are recommended, potentially including installation of mobi-mat. Restoration of cypress and aquatic vegetation at this site is recommended, which will mitigate erosion and enhance the appearance of the viewshed. An alternative shallow-water access point on the south bank of the spring run should be evaluated during implementation of the walkway reconstruction.

Suwannee River Access
As a significant recreational and interpretive asset of the park, maintenance of the Suwannee River Boardwalk's support structure and decking should be prioritized. Decking on the boardwalk will require replacement within this ten-year planning period.

Camping Areas

Hickory Loop
The Hickory loop of the park's campground requires modification to address ongoing erosion and runoff into the Manatee Springshed. As a sensitive karst area, large vehicular traffic for RVs and camper trailers risk impacts to spring conduits and the adjacent sinkhole features, Sue Sink and Catfish Hotel. To reduce impacts to the karst area, conversion of the 20-site Hickory Loop to tent-only is recommended. Conversion to tent-only camping would allow vegetative buffers between sites to regenerate and provide a unique recreational opportunity for Florida's Central West Region. Replacement of the bathhouse in the Hickory Loop and connection to Levy County sewer are recommended.

Magnolia Loops
Replacement of the bathhouse in Magnolia Loop 2 and connection to Levy County sewer are recommended for the next ten-year planning period.

Group Camp
The group camp is currently served by a portable toilet. This amenity should be replaced with a small permanent restroom.

Usher Landing
The road that leads to Usher Landing is a low-profile causeway that traverses approximately a half-mile of floodplain swamp and alluvial forest. The causeway interrupts the natural hydrology of these communities and during high-water events, the causeway becomes impassable for visitors. Mitigation of hydrological impediment and washouts by installation of additional culverts is recommended. Segments of other roads leading to the causeway, located between the park's south boundary and the landing, may require installation of low water crossings. At Usher Landing, the paved boat ramp has subsided and fractured. Replacement of the boat ramp with improved accessibility is recommended.

Support Facilities
The park manager's residence has aged significantly and is considered in poor condition. Renovation or replacement of the park manager's residence is recommended. The volunteer campsites located adjacent to the residence should be relocated to the cleared site of a former residence trailer.

Facilities Development

Preliminary cost estimates for these recommended facilities and improvements are provided in the Ten-Year Implementation Schedule and Cost Estimates (Table 7) located in the Implementation Component of this plan. These cost estimates are based on the most cost-effective construction standards available at this time. The preliminary estimates are provided to assist DRP in budgeting future park improvements, and may be revised as more information is collected through the planning and design processes. New facilities and improvements to existing facilities recommended by the plan include:

Springhead Day Use Area
Upgrade restrooms and concession building
Replace spring run walkway and swimming access

Suwannee River Access
Replace boardwalk decking

Camping Areas
Hickory Loop
Convert to tent camping
Replace bathhouse

Magnolia Loops
Replace bathhouse

Group Camp
Construct small permanent restroom

Usher Landing
Install culverts and low water crossings on access roads
Replace paved boat ramp

Support Facilities
Renovate or replace park manager's residence

Parkwide
Connect restrooms/bathhouses to Levy County sewer

Recreational Carrying Capacity

Carrying capacity is an estimate of the number of users a recreation resource or facility can accommodate and still provide a high quality recreational experience and preserve the natural values of the site. The carrying capacity of a unit is determined by identifying the land and water requirements for each recreation activity at the unit, and then applying these requirements to the unit's land and water base. Next, guidelines are applied which estimate the physical capacity of the unit's natural communities to withstand recreational uses without significant degradation. This analysis identifies a range within which the carrying capacity most appropriate to the specific activity, the activity site and the unit's classification is selected (see Table 7).

The recreational carrying capacity for this park is a preliminary estimate of the number of users the unit could accommodate after the current conceptual development program has been implemented. When developed, the proposed new facilities would approximately increase the unit's carrying capacity as shown in Table 7.

Table 7. Recreational Carrying Capacity

Activity/Facility	Existing Capacity*		Proposed Additional Capacity		Estimated Recreational Capacity	
	One Time	Daily	One Time	Daily	One Time	Daily
Springhead Day Use Area						
Swimming/Snorkeling	50	200			50	200
Open Water/Cavern Diving	18	36			18	36
Paddling (River)	20	40			20	40
Picnicking	100	200			100	200
Suwannee River Access						
Boardwalk	40	800			40	800
Boat Docking	5	20			5	20
Catfish Hotel Sink						
Cave Diving	4	24			4	24
Cavern Diving	18	36			18	36
Friedman Sink						
Cave Diving	4	24			4	24
Hiking Trails						
	25	100			25	100
Camping Areas						
Hickory and Magnolia Loops	85	680			85	680
Group Camp	35	35			35	35
Usher Landing						
Boating	30	150			30	150
TOTAL	**434**	**2345**	**0**	**0**	**434**	**2345**

*Existing capacity revised from approved plan according to DRP guidelines.

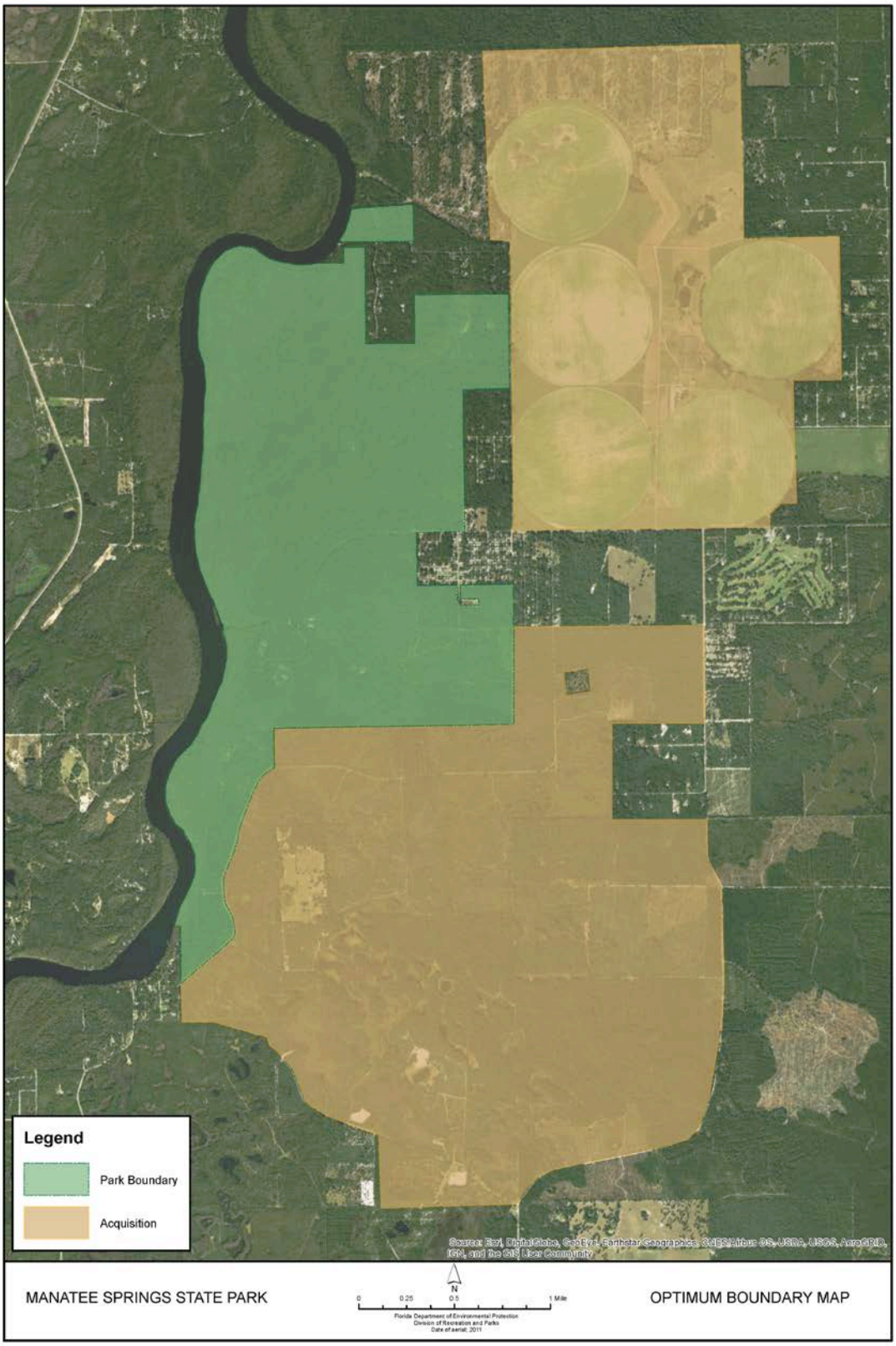
Optimum Boundary

The optimum boundary map reflects lands considered desirable for direct management by the DRP as part of the state park. These parcels may include public or privately-owned land that would improve the continuity of existing parklands, provide the most efficient boundary configuration, improve access to the park, provide additional natural and cultural resource protection or allow for future expansion of recreational activities. Parklands that are potentially surplus to the management needs of DRP are also identified. As additional needs are identified through park use, development, and research, and as land use changes on adjacent property, modification of the park's optimum boundary may be necessary.

Identification of parcels on the optimum boundary map is intended solely for planning purposes. It is not to be used in connection with any regulatory purposes. Any party or governmental entity should not use a property's identification on the optimum boundary map to reduce or restrict the lawful rights of private landowners. Identification on the map does not empower or suggest that any government entity should impose additional or more restrictive environmental land use or zoning regulations. Identification should not be used as the basis for permit denial or the imposition of permit conditions.

Approximately 3,900 acres southeast of the park are recommended for addition to the park to enhance management and resource conservation. A known conduit of the spring system extends between the headspring in the park and the recommended lands. These lands also contain wetlands that are hydrologically linked to the spring and Suwannee River. Agricultural fields adjacent to the park's northeast boundary are also recommended for inclusion within the park's optimum boundary. The cleared landscape of this agricultural area has high potential for longleaf pine restoration and would provide water quality protection for a large portion of the Manatee Springs recharge area. Acquisition of this area would additionally connect Manatee Springs State Park to the south boundary of the FWC Andrews Wildlife Management Area.

Incorporating submerged resources, the park boundary should be extended to an area of the Suwannee River within a 50-foot radius of the existing park boundary at the terminus of the spring-run stream. Management of this site would facilitate operation of the park's boat docks and protection of manatees. At this time, no lands are considered surplus to the needs of the park.


Legend
Park Boundary
Acquisition
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community
MANATEE SPRINGS STATE PARK
N
0 0.25 0.5 1 Mile
Florida Department of Environmental Protection
Division of Recreation and Parks
Date of aerial: 2011
OPTIMUM BOUNDARY MAP

IMPLEMENTATION COMPONENT

The resource management and land use components of this management plan provide a thorough inventory of the park's natural, cultural and recreational resources. They outline the park's management needs and problems, and recommend both short and long-term objectives and actions to meet those needs. The implementation component addresses the administrative goal for the park and reports on the Division of Recreation and Parks (DRP) progress toward achieving resource management, operational and capital improvement goals and objectives since approval of the previous management plan for this park. This component also compiles the management goals, objectives and actions expressed in the separate parts of this management plan for easy review. Estimated costs for the ten-year period of this plan are provided for each action and objective, and the costs are summarized under standard categories of land management activities.

MANAGEMENT PROGRESS

Since the approval of the last management plan for Manatee Springs State Park in 2004, significant work has been accomplished and progress made towards meeting the DRP's management objectives for the park. These accomplishments fall within four of the five general categories that encompass the mission of the park and the DRP.

Park Administration and Operations

- Consolidation of Fanning Springs State Park and Manatee Springs State Park administrative positions into one position has streamlined administrative functions and reduced budget expenditures.
- Since 2009, more than 48,000 volunteer hours have been contributed to assist the park with maintenance, visitor services, administration, interpretation, protection and resource management activities.
- The Manatee/Fanning Springs Ambassador, an educational outreach coordinator, was funded by FDEP Springs Initiative funded ($17,000/year) from 2003-2010.
- From 2007-2011, FWC and FDEP provided funds for a coordinator to facilitate the Manatee and Fanning Springs Working Group.

Resource Management

Natural Resources

- The park burned 3,878 acres and 97% of fire type acreage is in rotation.
- Treated 305 acres of invasive exotic plants.
- Removed 358 feral hogs.
- Surveyed all management zones of the park for invasive exotic plants.
- Tracked all prescribed fire, mechanical treatment, and invasive-exotic plant treatment and surveys in a statewide database.
- Planted 143 acres of longleaf pine trees.
- Planted 6.25 acres of wiregrass.
- Treated 40 acres of off-site hardwoods.
- Initiated a contract to mow 143 acres of scrubby flatwoods.

- King's hairstreak (*Satyrium kingi*), an imperiled species of skipper, was documented within the park.
- The North American Freshwater Turtle Research Group (NAFTRG) initiated a long-term monitoring project of fresh water turtles in the park with FPS support.
- Ongoing surveys of the aquatic cave system have provided more accurate data and new exploration mapped more than 2,529 additional feet of the cave system.
- Since 1998, park and district staff and volunteers have cooperated with FWC and USFWS to document manatee sightings at the park.
- From 2000-2007, FDEP conducted eco-summary studies to monitor water quality and several ecological health parameters of Manatee Springs.
- From 2001 to present, SRWMD and USGS have monitored daily spring discharge at a permanent satellite telemetry station at Manatee Springs.
- Minimum Flows and Levels were established for Manatee Springs.
- In 2005, FDEP Springs Initiative funded Florida Geological Survey to conduct a bathymetric study of Manatee Springs and its spring-run stream.
- In 2006, FDEP Florida Geological Survey funded and implemented a geophysical study to further delineate and understand the Manatee Springshed.
- In 2008, FDEP Springs Initiative funded an ecosystem level study at 12 major Florida Springs including Manatee.
- From 2009 to present, park staff have monitored daily spring water clarity in Manatee Springs.
- In 2010, FDEP conducted rapid periphyton surveys (RPS) to monitor and characterize algae loads at Manatee Springs.

Cultural Resources

- Completed a predictive model for the park in 2011.
- Submitted 10 new sites to the FMSF.
- In addition to documenting many of the park's new cultural sites, park staff provided historic information to aid interpretation and development of new interpretive signs.

Recreation and Visitor Services

- Constructed an RV pull-off area on the entrance road to improve traffic flow into the park.
- Improved access to the children's beach and controlled erosion through planting of native vegetation.
- Added sidewalks to connect the parking area to the concessionaire building.
- Developed interpretive signs about the aquatic cave system at Sue Sink and other areas.
- In 2009, FDEP Springs Initiative funded a reprint of "Let's Protect Manatee Springs" brochure.

Park Facilities

- Exterior of concession building was renovated with a new roof and stucco siding.
- Road to paddling launch was rerouted and landscaped to reduce runoff into the spring run.
- Magnolia 2 Campground bathhouse and waterfront bathhouse septic systems were converted to aerobic treatment and the drainfield was relocated away from cave system conduits.
- Magnolia 1 Campground loop was renovated with a new sewer system, bathhouse, waterless urinals and site power and sewer hookups.
- Installed a new roof on APM residence and interior renovations to PM residence.
- Upgraded electric panel at the shop.
- In 2006, FDEP Springs Initiative funded Manatee Springs Basin road signs.
- In 2007, FDEP Springs Initiative funded visitor area erosion stabilization.
- In 2008, FDEP Springs Initiative funded a Manatee Spring shoreline restoration engineering study.

MANAGEMENT PLAN IMPLEMENTATION

This management plan is written for a timeframe of ten years, as required by Section 253.034, Florida Statutes. The Ten-Year Implementation Schedule and Cost Estimates (Table 8) summarizes the management goals, objectives and actions that are recommended for implementation over this period, and beyond. Measures are identified for assessing progress toward completing each objective and action. A time frame for completing each objective and action is provided. Preliminary cost estimates for each action are provided and the estimated total costs to complete each objective are computed. Finally, all costs are consolidated under the following five standard land management categories: Resource Management, Administration and Support, Capital Improvements, Recreation Visitor Services and Law Enforcement.

Many of the actions identified in the plan can be implemented using existing staff and funding. However, a number of continuing activities and new activities with measurable quantity targets and projected completion dates are identified that cannot be completed during the life of this plan unless additional resources for these purposes are provided. The plan's recommended actions, time frames and cost estimates will guide the DRP's planning and budgeting activities over the period of this plan. It must be noted that these recommendations are based on the information that exists at the time the plan was prepared. A high degree of adaptability and flexibility must be built into this process to ensure that the DRP can adjust to changes in the availability of funds, improved understanding of the park's natural and cultural resources, and changes in statewide land management issues, priorities and policies.

Statewide priorities for all aspects of land management are evaluated each year as part of the process for developing the DRP's annual legislative budget requests. When preparing these annual requests, the DRP considers the needs and priorities

of the entire state park system and the projected availability of funding from all sources during the upcoming fiscal year. In addition to annual legislative appropriations, the DRP pursues supplemental sources of funds and staff resources wherever possible, including grants, volunteers and partnerships with other entities. The DRP's ability to accomplish the specific actions identified in the plan will be determined largely by the availability of funds and staff for these purposes, which may vary from year to year. Consequently, the target schedules and estimated costs identified in Table 8 may need to be adjusted during the ten-year management planning cycle.

Table 8
Manatee Springs State Park Ten-Year Implementation Schedule and Cost Estimates

NOTE: THE DIVISION'S ABILITY TO COMPLETE THE OBJECTIVES OUTLINED BY THE MANAGEMENT PLAN IS CONTINGENT ON THE AVAILABILITY OF FUNDING AND OTHER RESOURCES FOR THESE PURPOSES.

Goal I: Provide administrative support for all park functions.		**Measure**	**Planning Period**	**Estimated Manpower and Expense Cost* (10-years)**
Objective A	**Continue day-to-day administrative support at current levels.**	Administrative support ongoing	C	**$128,905**
Objective B	**Expand administrative support as new lands are acquired, new facilities are developed, or as other needs arise.**	Administrative support expanded	C	**$170,200**
Goal II: Protect water quality and quantity in the park, restore hydrology to the extent feasible, and maintain the restored condition.		**Measure**	**Planning Period**	**Estimated Manpower and Expense Cost* (10-years)**
Objective A	**Conduct/obtain an assessment of the park's hydrological needs.**	Assessment conducted	C	**$44,000**
Action 1	Continue to cooperate with other agencies and independent researchers in hydrological research and monitoring programs.		C	$3,500
Action 2	Continue to monitor surface and groundwater quality at Manatee Springs and track water quality changes.		C	$1,000
Action 3	Continue to monitor all onsite sewage treatment and disposal systems (OSTDS) in the park for evidence of detrimental impacts to water quality in the aquatic cave system.		C	$5,500
Action 4	Continue to monitor land use or zoning changes in the region and offer comments as appropriate.		C	$2,000
Action 5	Continue to cooperate with the SRWMD in monitoring Manatee Spring for compliance with established MFLs in order to ensure maintenance of historic flows.		C	$2,000
Action 6	Perform dye trace studies within the Manatee springshed to further understand karst connections and determine groundwater sources for the spring and for other karst features in the park.		UFN	$30,000

* 2015 Dollars
ST = actions within 2 years
LT = actions within 10 years
C = long term or short term actions that are continuous or cyclical
UFN = currently unfunded need

NOTE: THE DIVISION'S ABILITY TO COMPLETE THE OBJECTIVES OUTLINED BY THE MANAGEMENT PLAN IS CONTINGENT ON THE AVAILABILITY OF FUNDING AND OTHER RESOURCES FOR THESE PURPOSES.				
Objective B	**Restore natural hydrological conditions and function to approximately 3.17 acres of spring-run stream, 26,000 feet of aquatic cave passages, and 7 acres of floodplain swamp, alluvial forest and basin swamp natural communities.**	# Acres restored or with restoration underway	LT	**$269,400**
Action 1	Continue to coordinate with agencies responsible for the protection and improvement of hydrological resources within the Manatee springshed.		C	$5,000
Action 2	Examine the feasibility of conducting experimental plantings of submerged aquatic vegetation in the spring and spring-run stream.		LT	$900
Action 3	Annually survey the spring-run stream for submerged aqautic vegetation.		C	$2,500
Action 4	Seek necessary approvals and funding opportunities to implement the Manatee Springs Shoreline Restoration Project.		UFN	$4,000
Action 5	Pursue outreach opportunities and develop programming to educate the public about anthropogenic impacts to the Manatee/Fanning springshed.		LT	$1,000
Action 6	Maintain semi-regular monitoring of historic locations within the Manatee cave system to track physical and biological changes.		C	$2,000
Action 7	Continue to coordinate with and assist FDEP, SRWMD and independent researchers in the monitoring of water quality and quantity in open water karst features in the park.		C	$2,000
Action 8	Seek funding to upgrade all remaining park septic systems to advanced treatment technology.		UFN	$250,000
Action 9	Determine if the culverts on the Scenic Trail and along the north boundary of the park are adequate in size, number and height above grad to allow necessary water flow between wetlands.		LT	$2,000
Objective C	**Monitor impacts of visitor use on the aquatic cave system.**		LT	**$2,400**
Action 1	Continue to monitor cave diving activities to determine the relationship between intensity of visitor use and ecological health of the aquatic cave system.		C	**$2,000**
Action 2	Seek the expertise of cave experts in instituting a semi-annual monitoring program for tracking troglobite populations and diver impacts within the Manatee aquatic cave system.		LT	$400

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Goal III: Restore and maintain the natural communities/habitats of the park.		**Measure**	**Planning Period**	**Estimated Manpower and Expense Cost* (10-years)**
Objective A	**Within 10 years have 1,107 acres of the park maintained within optimal fire return interval.**	# Acres within fire return interval target	LT	**$71,350**
Action 1	Develop/update annual burn plan.	Plan updated	C	$16,000
Action 2	Manage fire-dependent communities for ecosystem function, structure and processes by burning between 285 - 515 acres annually, as identified by the annual burn plan.	Average # acres burned annually	C	$55,350
Objective B	**Conduct habitat/natural community restoration activities on 68 acres of upland mixed woodland, upland pine and sandhill natural communities.**	# Acres restored or with restoration underway	LT	**$22,600**
Action 1	Develop a site specific restoration plan.	Plan developed/updated	ST	$1,600
Action 2	Implement the restoration plan.	# Acres with restoration underway	ST	$1,000
Action 3	Conduct hardwood treatments, prescribed burns, groundcover restoration and longleaf pine plantings as identified in the restoration plan.		LT	$20,000
Objective C	**Conduct natural community/habitat improvement activities on 250 acres of upland mixed woodland and upland pine natural communities.**	# Acres improved or with improvements underway	LT	**$65,000**
Action 1	Continue habitat improvement activities in the upland mixed woodland/upland pine communities in zones 1B, 1D, 1C and 2A.		ST	**$5,000**
Action 2	Evaluate zones 1E, 1F, 2B and 3D and develop and implement a plan to chemically or mechanically remove selected off-site hardwoods. Follow-up with prescribed fire as soon as the hardwoods are dead, or within 6 months.		LT	**$25,000**
Action 3	Monitor habitat improvement sites for native groundcover recovery, longleaf pine seedling survival, and reappearance of invasive hardwoods.		LT	**$5,000**
Action 4	Plant longleaf pines in areas that lack sufficient numbers.		LT	**$28,000**
Action 5	Continue to work with other agencies to develop more detailed soils descriptions relative to natural communities found in the park		LT	$2,000

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Objective D	**Conduct natural community/habitat improvement activities on 55 acres of sandhill natural community.**		LT	$13,500
Action 1	Chemically and mechanically treat selected invasive hardwoods such as sand live oak, laurel oak and sweetgum.		LT	$5,500
Action 2	Burn treated areas in the winter within 6 months after the treatments. Continue to burn these areas on the shorter end of the fire return interval during initial stages of restoration so that large fuel loads do not accumulate.		LT	$2,000
Action 3	Monitor the recovery of native groundcover species and determine if areas need supplemental plantings of native groundcover.		LT	$1,000
Action 4	Plant longleaf pines as needed.		LT	$5,000
Objective E	**Conduct natural community/habitat improvement activities on 107 acres of scrubby flatwoods natural community.**		LT	**$42,000**
Action 1	Mechanically treat scrubby flatwoods in zones 3A and 3B.			$35,000
Action 2	Follow mechanical treatment with prescribed fire within 6 months of the treatment.			$6,000
Action 3	Evaluate methods to improve the scrubby flatwoods in the Meade Scott tract, including the potential removal of windrows and off-site hardwoods.			$1,000
Objective F	**Conduct natural community/habitat improvement activities on 18 acres of depression marsh natural community.**		ST	**$638**
Action 1	Remove loblolly pines that are encroaching on depression marshes.		ST	$638
Objective G	**Conduct natural community/habitat improvement activities on 18 acres of xeric hammock natural community.**		ST	**$9,000**
Action 1	Evaluate the xeric hammock in zone 2A to determine its orginal natural community.		ST	$2,000
Action 2	Evaluate xeric hammock in zone 3C and 3E for selective off-site hardwood treatment.		ST	$4,000
Action 3	Develop guidelines for restoring xeric hammock to the original natural community where appropriate.		LT	$3,000

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Table 8
Manatee Springs State Park Ten-Year Implementation Schedule and Cost Estimates

NOTE: THE DIVISION'S ABILITY TO COMPLETE THE OBJECTIVES OUTLINED BY THE MANAGEMENT PLAN IS CONTINGENT ON THE AVAILABILITY OF FUNDING AND OTHER RESOURCES FOR THESE PURPOSES.

Goal IV: Maintain, improve or restore imperiled species populations and habitats in the park.		**Measure**	**Planning Period**	**Estimated Manpower and Expense Cost* (10-years)**
Objective A	**Update baseline imperiled species occurrence inventory lists for plants and animals.**	List updated	C	**$2,000**
Action 1	Continue to inventory the park to update imperiled species lists.	Inventory continuing	C	**$2,000**
Objective B	**Monitor and document 8 selected imperiled animal species in the park.**	# Species monitored	C	**$5,700**
Action 1	Develop monitoring protocols for 4 selected imperiled animal species including 3 troglobite species and the Sherman's fox squirrel.	# Protocols developed	LT	$2,500
Action 2	Implement monitoring protocols for 8 imperiled animal species including those listed in Action 1 above and the Suwannee cooter, alligator snapping turtle, Florida scrub jay, and West Indian manatee.	# Species monitored	LT	$3,200
Objective C	**Monitor and document 2 selected imperiled plant species in the park.**	# Species monitored	LT	**$1,400**
Action 1	Develop monitoring protocols for 2 selected imperiled plant species including Florida milkvine and Florida mountainmint.	# Protocols developed	ST	$600
Action 2	Implement monitoring protocols for the 2 imperiled plant species listed in Action 1 above.	# Species monitored	LT	$800

Goal V: Remove exotic and invasive plants and animals from the park and conduct needed maintenance-control.		**Measure**	**Planning Period**	**Estimated Manpower and Expense Cost* (10-years)**
Objective A	**Annually treat 1.5 acres of exotic plant species in the park.**	# Acres treated	C	**$28,902**
Action 1	Annually develop/update exotic plant management work plan.	Plan developed/updated	C	$16,000
Action 2	Implement annual work plan by treating 1.5 acres in park annually, and continuing maintenance and follow-up treatments, as needed.	Plan implemented		$12,902
Objective B	**Prevent the introduction and spread of invasive exotic plants into the park.**	# Species for which control measures implemented	C	**$1,600**
Action 1	Develop and adopt preventative measures to avoid the introduction and spread of invasive exotic plants into the park.	Measures adopted	C	**$1,600**

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Objective C	**Survey the entire park for invasive exotics at least 2 times over 10 years.**	Survey completed	ST	**$12,740**
Action 1	Develop and implement a method to survey the entire park for invasive exotic plants 2 times over the cource of 10 years.	Survey method implemented	ST	$12,740
Objective D	**Implement control measures on 2 exotic animal species in the park.**	Measures implemented	LT	**$27,000**
Action 1	Continue to remove feral hogs from the park.	Removal continuing	C	$25,000
Action 2	Develop and implement a plan to remove grass carp from the park.	Removal continuing	LT	$2,000
Goal VI: Protect, preserve and maintain the cultural resources of the park.		**Measure**	**Planning Period**	**Estimated Manpower and Expense Cost* (10-years)**
Objective A	**Assess and evaluate 23 of 23 recorded cultural resources in the park.**	Documentation complete	LT	**$500**
Action 1	Complete 23 assessments/evaluations of archaeological sites. Prioritize preservation and stabilization projects.	Assessments complete	LT, ST	$500
Objective B	**Compile reliable documentation for all recorded historic and archaeological sites.**	Documentation complete	LT	**$23,580**
Action 1	Ensure all known sites are recorded or updated in the Florida Master Site File.	# Sites recorded or updated	ST	$1,600
Action 2	Conduct Level 1 archaeological survey for at least 1 priority area identified by the predictive model or other previous studies.	Survey completed	UFN	$22,000
Objective C	**Bring 23 of 23 recorded cultural resources into good condition.**	# Sites in good condition	ST	**$67,400**
Action 1	Design and implement regular monitoring programs for all cultural sites.	# Sites monitored	ST	$400
Action 2	Create and implement a cyclical maintenance program for each cultural resource.	Programs implemented	ST	$67,000

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Goal VII: Provide public access and recreational opportunities in the park.		**Measure**	**Planning Period**	**Estimated Manpower and Expense Cost* (10-years)**
Objective A	**Maintain the park's current recreational carrying capacity of 2,345 users per day.**	# Recreation/visitor	C	**$800,000**
Objective C	**Continue to provide the current repertoire of 12 interpretive, educational and recreational programs on a regular basis.**	# Interpretive/education programs	C	**$370,000**
Objective D	**Develop 1 new interpretive, educational and recreational program.**	# Interpretive/education programs	ST or LT	**$1,700**
Action 1	Develop and implement Interpretive Master Plan.	Plan implemented	LT	$500
Action 2	Develop and implement an expanded springs interpretive program	Programs implemented	ST or LT	$1,200
Goal VIII: Develop and maintain the capital facilities and infrastructure necessary to meet the goals and objectives of this management plan.		**Measure**	**Planning Period**	**Estimated Manpower and Expense Cost* (10-years)**
Objective A	**Maintain all public and support facilities in the park.**	Facilities maintained	C	**$435,000**
Objective B	**Continue to implement the park's transition plan to ensure facilities are accessible in accordance with the American with Disabilities Act of 1990.**	Plan implemented	ST or LT	**$42,000**
Objective C	**Improve and/or repair 5 existing facilities and a .5-mile road as identified in the Land Use Component.**	# Facilities/Miles of Trail/Miles of Road	UFN	**$4,500,000**

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Table 8
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Summary of Estimated Costs

Management Categories		Total Estimated Manpower and Expense Cost* (10-years)
Resource Management		**$44,010**
Administration and Support		**$298,000**
Capital Improvements		**4,977,000**
Recreation Visitor Services		**$1,171,700**
Law Enforcement Activities[1]		**n.a.**
	1Law enforcement activities in Florida State Parks are conducted by the FWC Division of Law Enforcement and by local law enforcement agencies.	

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Addendum 1—Acquisition History

LAND ACQUISITION HISTORY REPORT

Park Name	Manatee Springs State Park
Date Updated	12/15/2016
County	Levy County, Florida
Trustees Lease Number	Original is Lease No. 2324; the current Lease No. 3634
Current Park Size	2455.69 acres
Purpose of Acquisition	The State of Florida acquired Manatee Springs State Park to establish and develop public park and recreation in Manatee Springs on Suwannee River in Levy County, Florida.

Acquisition History

Parcel Name or Parcel DM-ID	Date Acquired	Initial Seller	Initial Purchaser	Size in acres	Instrument Type
DMID 4416	9/28/1967	The Trustees of the internal Improvement Fund of the State of Florida	The Florida Board of Parks and Historic Memorials	1141.644	Deed
DMID4415	6/19/1973	The Cummer Company	The Board of Trustees of the Internal Improvement Trust Fund of the State of Florida	283.457	Warranty Deed
DMID 366068	11/2/1951	Levy County Land Company and The M & M Turpentine, Co.	State of Florida for the use and benefit of the Florida Board of Parks and Historic Memorials	156.124	Warranty Deed
DMID 366069	10/10/1956	The M & M Turpentine, Co.	The State of Florida for the use and benefit of the Florida Board of Parks and Hsitoric Memorials	161.947	Indenture
DMID 366066	4/16/1955	The M & M Turpentine, Co.	The State of Florida for the use and benefit of the Florida Board of Parks and Hsitoric Memorials	82.416	Indenture
DMID 365414	6/21/1960	White Construction Company, inc.	The Florida Board of Parks and Historic Memorials	80.853	Deed
DMID366067	10/14/1953	The M & M Turpentine, Co.	The State of Florida for the use and benefit of the Florida Board of Parks and Hsitoric Memorials	80.037	Indenture
DMID366064	6/16/1952	Lucy A. Gregory and her husband Leo Gregory	The State of Florida for the use and benefit of the Florida Board of Parks and Hsitoric Memorials	78.977	Warranty Deed
DMID 312218	10/26/2000	Springside at Manatee Ltd.	Board of Trustees of the Internal Improvement Trust Fund of the State of Florida	70.816	Warranty Deed
DMID 366061	10/24/1960	Luther W. Drummond	The Board of Trustees of the Internal Improvement Trust Fund of the State of Florida	41.365	Deed

Management Lease

Parcel Name or Lease Number	Date Leased	Initial Lessor	Initial Lessee	Current Term	Expiration Date
Trustees Lease No. 3634 (original Lease No. 2324)	1/23/1968	Trustees of the Internal Improvement Fund of the State of Florida	The Florida Board of Parks and Historic Memorials	99 years	1/22/2067

Outstanding Issue	Type of Instrument	Brief Description of the Outstanding Issue	Term of the Outstanding Issue
There is no known deed-related restriction or reservation on use of Manatee Springs State Park.			

Addendum 2—Advisory Group Members and Report

List

Report

Addendum 3—References Cited

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Addendum 4—Soil Descriptions

2 – Tavares fine sand, 1 to 5 percent slopes – These Tavares soils are moderately well drained and very deep occurring on sandy uplands. They are nearly level to gently sloping soils with very dark grayish brown fine sands in surface layers extending to a depth of about seven inches. The underlying fine sand is brown to a depth of 41 inches, pale brown to 58 inches and white to 80 inches.

3 – Orsino fine sand, 0 to 8 percent slopes – This unit consists of moderately well drained, very deep Orsino soils. These nearly level to gently rolling soils are on dunes and ridges. Typically, the surface layer is gray fine sand and extends to a depth of four inches. The subsurface layer is fine sand and extends to a depth of about 13 inches. It is very pale brown in the upper four inches, and white below. The subsoil is fine sand and extends to a depth of about 70 inches. It is brownish yellow to a depth of about 48 inches, light yellowish brown to a depth of about 58 inches, and brownish yellow below that. The underlying material is white fine sand.

11 – Placid and Samsula soils, depressional – This unit consists of very poorly drained, very deep Placid and Samsula soils. These nearly level, ponded soils are on depressions. Typically, the surface layer of the Placid soil extends to a depth of about 14 inches. It is black muck in the upper three inches, and very dark gray fine sand below. The underlying material extends beyond a depth of 80 inches. It is light gray fine sand to a depth of about 24 inches, brown fine sand to a depth of about 45 inches, and very pale brown fine sand below that. Typically, the surface layer of the Samsula soil is muck, and extends to a depth of about 47 inches. It is dark brown in the upper six inches, and black below that. The underlying material extends beyond a depth of 80 inches. It is grayish brown fine sand in the upper 15 inches, and light brownish gray fine sand below that.

15 – Holopaw-Pineda complex, frequently flooded – This complex consists of poorly drained, very deep Holopaw and Pineda soils. These nearly level, frequently flooded soils are on the floodplains of rivers and creeks. Typically, the surface layer of the Holopaw soil is very dark gray fine sand, and is about three inches thick. The subsurface layer extends to a depth of about 60 inches. It is light brownish gray fine sand to a depth of about 50 inches, and a pale brown fine sand below that. The subsoil layer extends from a depth of 60 inches to beyond a depth of 80 inches. It is gray sandy clay loam. Typically, the surface layer of the Pineda soil is black fine sand, and is about four inches thick. The subsoil layer is brown fine sand and extends to a depth of about 14 inches. The underlying material extends to a depth of about 35 inches. It is light gray fine sand to a depth of about 28 inches, and white fine sand below that. A loamy subsoil layer extends from a depth of 35 inches to a depth of about 52 inches. It is light gray fine sandy loam. The underlying material extends to a depth beyond 80 inches. It is gray fine sand.

16 – Chobee-Gator complex, frequently flooded – This complex consists of very poorly drained, very deep Chobee and Gator soils. These nearly level, frequently flooded soils are on floodplains of rivers and creeks. Typically, the

surface layer of the Chobee soil extends to a depth of about 19 inches. It is dark brown muck in the upper three inches, and very dark gray fine sandy loam below that. The subsoil is dark gray sandy clay loam, and extends to a depth of about 42 inches. The underlying material is gray loamy fine sand, and extends to beyond a depth of 80 inches. Typically, the surface layer of the Gator soil is black muck, and extends to a depth of about 26 inches. The underlying material extends beyond a depth of 80 inches. It is very dark gray fine sandy loam to a depth of about 40 inches, gray sandy clay loam to depth of about 52 inches, and light gray fine sand below that.

17 – Adamsville fine sand, 0 to 5 percent slopes – This soil type is somewhat poorly drained and very deep occurring on low ridges and knolls. The surface layer of these nearly level to gently sloping soils are dark gray fine sand, extending to a depth of about 14 inches. The underlying material is fine sand extending to a depth of 80 inches. These sands are grayish brown to a depth of 32 inches, pale brown to a depth of 43 inches, light gray to 70 inches, and white below.

27 – Placid and Popash soils, depressional – This unit consists of very poorly drained, very deep Placid and Popash soils. These nearly level, ponded soils are on depressions that are within areas of flatwoods or on marsh prairies. Typically, the surface layer of the Placid soil is black fine sand, and is about 22 inches thick. The underlying material extends beyond a depth of 80 inches. It is dark gray fine sand in the upper 16 inches, and light brownish gray fine sand below that. Typically, the surface layer of the Popash soil is very dark gray fine sand, and is about 12 inches thick. The subsurface layer extends to a depth of about 45 inches. It is a mixture of dark grayish brown and grayish brown fine sand to a depth of about 20 inches, grayish brown fine sand to a depth of about 30 inches, and light brownish gray fine sand below that. The subsoil extends from a depth of about 45 inches to beyond 80 inches. It is dark gray sandy clay loam.

29 – Chobee-Bradenton complex, frequently flooded – This complex consists of very poorly drained, very deep Chobee soils, and poorly drained, very deep Bradenton soils. These nearly level, frequently flooded soils are on floodplains of rivers and creeks. Typically, the surface layer of the Chobee soil extends to a depth of about 11 inches. It is black fine sandy loam in the upper seven inches, and very dark gray fine sandy loam below. The subsoil layer extends to a depth of 48 inches. It is dark gray sandy clay loam with common pockets of soft calcium carbonate accumulations in the upper 26 inches, and gray sandy clay loam below that. The underlying material is greenish gray fine sandy loam to a depth of about 72 inches, and dark gray fine sand below. Typically, the surface layer of Bradenton soil is black fine sand, and is about four inches thick. The subsurface layer is light brownish gray fine sand extending to a depth of about nine inches. The subsoil layer extends to a depth of about 28 inches. It is dark grayish brown sandy clay loam in the upper nine inches, and grayish brown fine sandy loam below that. The underlying material extends from a depth of about 28 inches to beyond a depth of 80 inches. It is white calcareous fine sandy loam to a depth of about

32 inches, strong brown loamy fine sand to a depth of about 48 inches, and light gray fine sand below that.

31 – Jonesville-Otela-Seaboard complex, 1 to 5 percent slopes – These moderately to well drained soils vary in depth from shallow Seaboard soils to moderately deep Jonesville soils to very deep Otela soils. All of these soils are nearly level to gently sloping and occur on karst uplands. Typically, the surface layer of the Jonesville soil is gray fine sand, and is about five inches thick. The subsurface layer extends to a depth of 27 inches and is pale brown fine sand in the upper nine inches and very pale brown fine sand below that. The brownish yellow sandy clay loam subsoil extends to the limestone bedrock at 35 inches. The Otela soil has a surface layer of grayish brown fine sand to a depth of four inches. The subsurface layer is light gray fine sand to about 22 inches, brownish yellow fine sand to about 40 inches, very pale brown fine sand to about 50 inches and brownish yellow fine sand to about 58 inches. Otela subsoil is a yellowish brown sandy clay loam that extends to the limestone bedrock at about 66 inches. The surface layer of the Seaboard soil is dark grayish brown fine sand extending to a depth of eight inches. The underlying material is a pale brown fine sand extending to limestone bedrock at about 17 inches.

32 – Otela-Tavares complex, 1 to 5 percent slopes – This unit consists of moderately well drained, very deep Otela and Tavares soils. These nearly level to gently sloping soils are on karst uplands. Typically, the surface layer of the Otela soil is dark gray fine sand, and is about eight inches thick. The subsurface layer extends to a depth of about 68 inches. It is grayish brown fine sand to a depth of about 18 inches, light brownish gray fine sand to a depth of about 30 inches, very pale brown fine sand to a depth of about 35 inches, white fine sand to a depth of about 41 inches, and very pale brown fine sand below that. The subsoil layer extends from a depth of 68 inches to beyond a depth of 80 inches. It is light yellowish brown fine sandy loam in the upper 10 inches, and gray fine sandy loam below that. Typically, the surface layer of the Tavares soil is dark grayish brown fine sand, and is about nine inches thick. The underlying material is fine sand and extends to beyond a depth of 80 inches. It is grayish brown to a depth of about 18 inches, pale brown to a depth of about 38 inches, very pale brown to a depth of about 48 inches, and white below that.

38 – Myakka sand – This unit consists of poorly drained, very deep Myakka soils. These nearly level soils are on areas of flatwoods. Typically, the surface layer is very dark gray sand, and is about five inches thick. The subsurface layer extends to a depth of about 26 inches. It is grayish brown sand in the upper 13 inches, and light gray sand below that. The subsoil layer is organically coated sand, and extends to a depth of about 58 inches. It is black in the upper 14 inches, and very dark gray below that. The underlying material extends from a depth of 58 inches to beyond a depth of 80 inches. It is pale brown sand.

42 – Ousley-Albany complex, occasionally flooded – This unit consists of somewhat poorly drained, very deep Ousley and Albany soils. These nearly

level, occasionally flooded soils are on slightly elevated knolls and ridges on flood plains. Typically, the surface layer of the Ousley soil extends to a depth of about 12 inches. It is gray fine sand in the upper four inches, and light gray fine sand below that. The underlying material is fine sand and extends to beyond a depth of 80 inches. It is dark brown to a depth of about 18 inches, yellowish brown to a depth of about 28 inches, light yellowish brown to a depth of about 38 inches, pale brown to a depth of about 65 inches, and light gray below that. Typically, the surface layer of the Albany soil is light brownish gray fine sand and extends to a depth of about six inches. The subsurface layer is brown fine sand to a depth of about 15 inches, and light yellowish brown fine sand to a depth of about 50 inches. The subsoil layer extends from a depth of 50 inches, to beyond a depth of 80 inches. It is yellowish brown sandy clay loam in the upper 15 inches, and light gray sandy clay loam below.

Addendum 5—Plant and Animal List

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)

LICHENS

.....	*Bulbothrix confoederata*
Evans' reindeer lichen	*Cladina evansii*
.....	*Cladina subtenus*
Turban cladonia.....	*Cladonia peziziformis*
.....	*Heterodermia echinata*
.....	*Heterodermia obscurata*
.....	*Parmotrema gardneri*
P+ orange powdered.....	*Parmotrema hypoleucinum*
.....	*Parmotrema michauxianum*
UV-perforated ruffle.....	*Parmotrema perforatum*
Long-whiskered lichen.....	*Parmotrema rampoddense*
.....	*Parmotrema rigidum*
.....	*Physcia tribacoides*
.....	*Rimelia reticulata*
.....	*Usnea baileyii*
Powder-tipped beard lichen.....	*Usnea dimorpha*
Bushy beard lichen	*Usnea strigosa*

FUNGI

.....	*Amanita* sp.
Grisette.....	*Amanita vaginata*
Ringless honey mushroom	*Armillariella tabescens*
Bolete	*Boletus rubellus*
Small chanterele.....	*Cantharellus minor*
.....	*Cantharellus* sp.
Cort	*Cortinarius* sp.
Fragrant chanterele.....	*Craterellus odoratus*
Orange jelly	*Dacrymyces palmatus*
.....	*Gymnopolis croceoluteus*
.....	*Gymnopolis liquiritiae*
.....	*Entoloma* sp.
Polypore.....	*Fomitopsis durescens*
Laccaria	*Laccaria* sp.
Burnt sugar milky	*Lactarius aquifluus*
Corrugated cap milky	*Lactarius corrugus*
Voluminous latex milky.....	*Lactarius volemis*
Lentinus.....	*Lentinus crinitus*
.....	*Leucocoprinus fragilissimus*
Polypore.....	*Polyporus* sp.
Coral	*Ramaria gracilis*
Purplebloom russula.....	*Russula mariae*
False turkeytail.....	*Stereum ostrea*

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Turkeytail	*Trametes cubensis*	
Turkeytail	*Trametes ectypus*	
Turkeytail	*Trametes versicolor*	
Turkeytail	*Tremella fuciformis*	

PTERIDOPHYTES

Ebony spleenwort	*Asplenium platyneuron*	
Japanese climbing fern	*Lygodium japonicum* *	
Royal fern	*Osmunda regalis L.* var. *spectabilis*	
Golden polypody	*Phlebodium aureum*	
Resurrection fern	*Pleopeltis polypodioides* var. *michauxiana*	
Tailed bracken	*Pteridium aquilinum* var. *pseudocaudatum*	
Water spangles	*Salvinia minima* *	
Maiden fern	*Thelypteris* sp.	
Netted chain fern	*Woodwardia areolata*	

GYMNOSPERMS

Red cedar	*Juniperus virginiana*	
Slash pine	*Pinus elliottii*	
Spruce pine	*Pinus glabra*	
Longleaf pine	*Pinus palustris*	
Loblolly pine	*Pinus taeda*	
Bald-cypress	*Taxodium distichum*	
Coontie	*Zamia pumila*	

ANGIOSPERMS

MONOCOTS

Ticklegrass	*Agrostis hyemalis*	
Florida bluestem	*Andropogon floridanus*	
Bushy bluestem	*Andropogon glomeratus* var. *pumilus*	
Elliott's bluestem	*Andropogon gyrans*	
Hairy bluestem	*Andropogon longiberbis*	
Splitbeard bluestem	*Andropogon ternarius*	
Broomsedge bluestem	*Andropogon virginicus*	
Broomsedge bluestem	*Andropogon virginicus* var. *decipiens*	
Nodding nixie	*Apteria aphylla*	
Greendragon	*Arisaema dracontium*	
Big threeawn	*Aristida condensata*	
Woollysheath threeawn	*Aristida lanosa*	
Slimspike threeawn	*Aristida longespica*	
Tall threeawn	*Aristida patula*	

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Arrowfeather threeawn	*Aristida purpurascens*	
Wiregrass	*Aristida stricta* var. *beyrichiana*	
Virginia snakeroot	*Aristolochia serpentaria*	
Common carpetgrass	*Axonopus affinis*	
Big carpetgrass	*Axonopus furcatus*	
Capillary hairsedge	*Bulbostylis ciliatifolia*	
Bluethread	*Burmannia biflora*	
Sandywoods sedge	*Carex dasycarpa*	
Fescue sedge	*Carex festucacea*	
Gholson's sedge	*Carex gholsonii*	
Long's sedge	*Carex longii*	
Southern sandbur	*Cenchrus echinatus*	
Slender sandspur	*Cenchrus gracillimus*	
Coastal sandbur	*Cenchrus spinifex*	
Slender woodoats	*Chasmanthium laxum*	
Longleaf woodoats	*Chasmanthium laxum* var. *sessiliflorum*	
Florida jointtail grass	*Coelorachis tuberculosa*	DM
Asiatic dayflower	*Commelina communis* *	
Whitemouth dayflower	*Commelina erecta*	
Seven-sisters	*Crinum americanum*	
Bermudagrass	*Cynodon dactylon* *	
Baldwin's flatsedge	*Cyperus croceus*	
Swamp flatsedge	*Cyperus distinctus*	
Wiry flatsedge	*Cyperus filiculmis*	
Yellow flatsedge	*Cyperus flavescens*	
Epiphytic flatsedge	*Cyperus lanceolatus* *	
Pinebarren flatsedge	*Cyperus ovatus*	
Plukenet's flatsedge	*Cyperus plukenetii*	
Manyspike flatsedge	*Cyperus polystachyos*	
Nutgrass	*Cyperus rotundus* *	
Strawcolored flatsedge	*Cyperus strigosus*	
Fourangle flatsedge	*Cyperus tetragonus*	
Durban crowfootgrass	*Dactyloctenium aegyptium* *	
Needleleaf witchgrass	*Dichanthelium aciculare*	
Tapered witchgrass	*Dichanthelium acuminatum*	
Needleleaf witchgrass	*Dichanthelium angustifolium*	
Variable witchgrass	*Dichanthelium commutatum*	
Cypress witchgrass	*Dichanthelium dichotomum*	
Cypress witchgrass	*Dichanthelium ensifolium* var. *unciphyllum*	
Heller's witchgrass	*Dichanthelium oligosanthes*	
Eggleaf witchgrass	*Dichanthelium ovale*	
Hemlock witchgrass	*Dichanthelium portoricense*	
Ravenel's witchgrass	*Dichanthelium ravenelii*	
Roundseed witchgrass	*Dichanthelium sphaerocarpon*	
Roughhair witchgrass	*Dichanthelium strigosum* var. *leucoblepharis*	
Southern crabgrass	*Digitaria ciliaris*	

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Blanket crabgrass	*Digitaria serotina*	
Violet crabgrass	*Digitaria violascens*	
Upright burrhead	*Echinodorus berteroi*	
Dwarf burrhead	*Echinodorus tenellus*	
Baldwin's spikerush	*Eleocharis baldwinii*	
Sand spikerush	*Eleocharis montevidensis*	
Viviparous spikerush	*Eleocharis vivipara*	
Indian goosegrass	*Eleusine indica* *	
Green-fly orchid	*Epidendrum conopseum*	
Elliott's lovegrass	*Eragrostis elliottii*	
Coastal lovegrass	*Eragrostis virginica*	
Centipedegrass	*Eremochloa ophiuroides* *	
Fourspike fingergrass	*Eustachys neglecta*	
Pinewoods fingergrass	*Eustachys petraea*	
Bearded skeletongrass	*Gymnopogon ambiguus*	
Waterthyme	*Hydrilla verticillata* *	
Common yellow stargrass	*Hypoxis curtissii*	
Cogongrass	*Imperata cylindrica* *	
Forked rush	*Juncus dichotomus*	
Shore rush; Grassleaf rush	*Juncus marginatus*	
Needlepod rush	*Juncus scirpoides*	
Path rush	*Juncus tenuis*	
Looseflower waterwillow	*Justicia ovata*	
Fragrant spikesedge	*Kyllinga odorata*	
Whitehead bogbutton	*Lachnocaulon anceps*	
Dotted duckweed	*Landoltia punctata*	
Little duckweed	*Lemna obscura*	
Amer. spongeplant; Frog's bit	*Limnobium spongia*	
Italian ryegrass	*Lolium perenne*	
Southern waternymph	*Najas guadalupensis*	
Woodsgrass; Basketgrass	*Oplismenus hirtellus*	
Beaked panicum	*Panicum anceps*	
Redtop panicum	*Panicum rigidulum*	
Bluejoint panicum	*Panicum tenerum*	
Bahiagrass	*Paspalum notatum* *	
Brownseed paspalum	*Paspalum plicatulum*	
Early paspalum	*Paspalum praecox*	
Water paspalum	*Paspalum repens*	
Thin paspalum	*Paspalum setaceum*	
Blackseed needlegrass	*Piptochaetium avenaceum*	
Water-lettuce	*Pistia stratiotes* *	
Annual bluegrass	*Poa annua* *	
Pickerelweed	*Pontederia cordata*	
Giant orchid	*Pteroglossaspis ecristata*	SH
Starrush whitetop	*Rhynchospora colorata*	
Shortbristle horned beaksedge	*Rhynchospora corniculata*	

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Gray's beaksedge	*Rhynchospora grayi*	
Narrowfruit horned beaksedge	*Rhynchospora inundata*	
Sandyfield beaksedge	*Rhynchospora megalocarpa*	
Southern beaksedge	*Rhynchospora microcarpa*	
Plumed beaksedge	*Rhynchospora plumosa*	
Dwarf palmetto	*Sabal minor*	
Cabbage palm	*Sabal palmetto*	
Silver plumegrass	*Saccharum alopecuroides*	
Narrow plumegrass	*Saccharum baldwinii*	
Sugarcane plumegrass	*Saccharum giganteum*	
American cupscale	*Sacciolepis striata*	
Grassy arrowhead	*Sagittaria graminea*	
Springtape	*Sagittaria kurziana*	
Crimson bluestem	*Schizachyrium sanguineum*	
Little bluestem	*Schizachyrium scoparium*	
Fringed nutrush	*Scleria ciliata*	
Netted nutrush	*Scleria reticularis*	
Tall nutgrass	*Scleria triglomerata*	
Cultivated rye	*Secale cereale* *	
Saw palmetto	*Serenoa repens*	
Yellow bristlegrass	*Setaria parviflora*	
Narrowleaf blue-eyed grass	*Sisyrinchium angustifolium*	
Nash's blueeyed grass	*Sisyrinchium nashii*	
Annual blueeyed grass	*Sisyrinchium rosulatum* *	
Earleaf greenbrier	*Smilax auriculata*	
Saw greenbrier	*Smilax bona-nox*	
Cat greenbrier	*Smilax glauca*	
Sarsaparilla vine	*Smilax pumila*	
Jackson vine	*Smilax smallii*	
Slender indiangrass	*Sorghastrum elliottii*	
Lopsided Indiangrass	*Sorghastrum secundum*	
Prairie wedgescale	*Sphenopholis obtusata*	
Hidden dropseed	*Sporobolus compositus* var. *clandestinus*	
Smutgrass	*Sporobolus indicus* *	
Pineywoods dropseed	*Sporobolus junceus*	
St. Augustinegrass	*Stenotaphrum secundatum*	
Bartram's airplant	*Tillandsia bartramii*	
Ballmoss	*Tillandsia recurvata*	
Spanish moss	*Tillandsia usneoides*	
Carolina fluffgrass	*Tridens carolinianus*	
Purpletop tridens	*Tridens flavus*	
Chapman's purpletop tridens	*Tridens flavus* var. *chapmanii*	
Threebirds orchid	*Triphora trianthophoros*	MEH
American eelgrass	*Vallisneria americana*	
Squirreltail fescue	*Vulpia elliotea*	
Brazilian watermeal	*Wolffia brasiliensis*	

* Non-native Species ++ Extirpated Species

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Florida mudmidget	*Wolffiella gladiata*	
Richard's yelloweyed grass	*Xyris jupicai*	
Tall yelloweyed grass	*Xyris platylepis*	
Spanish bayonet	*Yucca aloifolia*	
Adam's needle	*Yucca filamentosa*	
DICOTS		
Slender threeseed mercury	*Acalypha gracilens*	
Red maple	*Acer rubrum*	
Florida maple	*Acer saccharum* ssp. *floridanum*	
Oppositeleaf spotflower	*Acmella oppositifolia* var. *repens*	
Red buckeye	*Aesculus pavia*	
Lesser snakeroot	*Ageratina aromatica*	
Hammock snakeroot	*Ageratina jucunda*	
Mimosa	*Albizia julibrissin* *	
Alligatorweed	*Alternanthera philoxeroides* *	
Common ragweed	*Ambrosia artemisiifolia*	
Bastard false indigo	*Amorpha fruticosa*	
Clusterspike false indigo	*Amorpha herbacea*	
Peppervine	*Ampelopsis arborea*	
Eastern bluestar	*Amsonia tabernaemontana*	
Indianhemp	*Apocynum cannabinum*	
Devil's walkingstick	*Aralia spinosa*	
Thymeleaf sandwort	*Arenaria serpyllifolia* *	
Pinewoods milkweed	*Asclepias humistrata*	
Swamp milkweed	*Asclepias perennis*	
Velvetleaf milkweed	*Asclepias tomentosa*	
Butterflyweed	*Asclepias tuberosa*	
Showy milkwort	*Asemeia violacea*	
Slimleaf pawpaw	*Asimina angustifolia*	
Smallflower pawpaw	*Asimina parviflora*	
Dwarf pawpaw	*Asimina pygmea*	
Groundsel tree; Sea-myrtle	*Baccharis halimifolia*	
Herb-of-grace	*Bacopa monnieri*	
Coastalplain honeycombhead	*Balduina angustifolia*	
White wild indigo	*Baptisia alba*	
Pineland wild indigo	*Baptisia lecontei*	
Twining screwstem	*Bartonia paniculata*	
Alabama supplejack	*Berchemia scandens*	
River birch	*Betula nigra*	
Beggarticks	*Bidens alba*	
Crossvine	*Bignonia capreolata*	
False nettle; Bog hemp	*Boehmeria cylindrica*	
Watershield	*Brasenia schreberi*	
False boneset	*Brickellia eupatorioides*	
Paper mulberry	*Broussonetia papyrifera* *	

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Carolina fanwort	*Cabomba caroliniana*	
American beautyberry	*Callicarpa americana*	
Trumpet creeper	*Campsis radicans*	
American hornbeam	*Carpinus caroliniana*	
Water hickory	*Carya aquatica*	
Pignut hickory	*Carya glabra*	
Mockernut hickory	*Carya tomentosa*	
Sugarberry; Hackberry	*Celtis laevigata*	
Spadeleaf	*Centella asiatica*	
Pineland butterfly pea	*Centrosema arenicola*	
Spurred butterfly pea	*Centrosema virginianum*	
Common buttonbush	*Cephalanthus occidentalis*	
Coontail	*Ceratophyllum demersum*	
Partridge pea	*Chamaecrista fasciculata*	
Spotted sandmat	*Chamaesyce maculata*	
Prostrate sandmat	*Chamaesyce prostrata*	
Mexican tea	*Chenopodium ambrosioides* *	
Cottony goldenaster	*Chrysopsis gossypina*	
Spotted water hemlock	*Cicuta maculate*	
Camphor-tree	*Cinnamomum camphora* *	
Purple thistle	*Cirsium horridulum*	
Swamp leather-flower	*Clematis crispa*	
Browne's savory	*Clinopodium brownei*	
Atlantic pigeonwings	*Clitoria mariana*	
Tread-softly	*Cnidoscolus stimulosus*	
Blue mistflower	*Conoclinium coelestinum*	
American squawroot	*Conopholis americana*	
Canadian horseweed	*Conyza canadensis*	
Leavenworth's tickseed	*Coreopsis leavenworthii*	
Roughleaf dogwood	*Cornus asperifolia*	
Swamp dogwood	*Cornus foemina*	
May haw	*Crataegus aestivalis*	
Cockspur hawthorn	*Crataegus crus-galli*	
Parsley hawthorn	*Crataegus marshallii*	
Michaux's hawthorn	*Crataegus michauxii*	
Dwarf hawthorn	*Crataegus uniflora*	
Slender scratchdaisy	*Croptilon divaricatum*	
Lanceleaf rattlebox	*Crotalaria lanceolata* *	
Rabbitbells	*Crotalaria rotundifolia*	
Vente conmigo	*Croton glandulosus*	
Pineland croton	*Croton linearis*	
Rushfoil	*Croton michauxii*	
Roadside croton	*Croton trinitatis*	
Compact dodder	*Cuscuta compacta*	
Marsh parsley	*Cyclospermum leptophyllum* *	
Titi	*Cyrilla racemiflora*	

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Summer farewell	*Dalea pinnata*	
Hoary ticktrefoil	*Desmodium canescens*	
Panicled beggarweed	*Desmodium paniculatum*	
Pinebarren ticktrefoil	*Desmodium strictum*	
Threeflower ticktrefoil	*Desmodium triflorum* *	
Florida balm	*Dicerandra densiflora*	
Carolina ponysfoot	*Dichondra carolinensis*	
Poor Joe	*Diodia teres*	
Virginia buttonweed	*Diodia virginiana*	
Common persimmon	*Diospyros virginiana*	
Drymary	*Drymaria cordata*	
Water hyacinth	*Eichhornia crassipes* *	
Tall elephantsfoot	*Elephantopus elatus*	
Smooth elephantsfoot	*Elephantopus nudatus*	
Devil's grandmother	*Elephantopus tomentosus*	
American burnweed	*Erechtites hieraciifolius*	
Oakleaf fleabane	*Erigeron quercifolius*	
Prairie fleabane	*Erigeron strigosus*	
Dogtongue wild buckwheat	*Eriogonum tomentosum*	
Coralbean; Cherokee bean	*Erythrina herbacea*	
White thoroughwort	*Eupatorium album*	
Dogfennel	*Eupatorium capillifolium*	
Yankeeweed	*Eupatorium compositifolium*	
Roundleaf thoroughwort	*Eupatorium rotundifolium*	
Lateflowering thoroughwort	*Eupatorium serotinum*	
Common fig	*Ficus carica* *	
Pink thoroughwort	*Fleischmannia incarnata*	
White ash	*Fraxinus americana*	
Carolina ash; pop ash	*Fraxinus caroliniana*	
Cottonweed	*Froelichia floridana*	
Downy milkpea	*Galactia regularis*	
Eastern milkpea	*Galactia volubilis*	
Coastal bedstraw	*Galium hispidulum*	
Hairy bedstraw	*Galium pilosum*	
Stiff marsh bedstraw	*Galium tinctorium*	
Pennsylvania everlasting	*Gamochaeta pensylvanica*	
Spoonleaf purple everlasting	*Gamochaeta purpurea*	
Southern beeblossom	*Gaura angustifolia*	
Blue huckleberry	*Gaylussacia frondosa*	
Yellow jessamine	*Gelsemium sempervirens*	
Water locust	*Gleditsia aquatica*	
Rabbit tobacco	*Gnaphalium obtusifolium*	
Angularfruit milkvine	*Gonolobus suberosus*	UMW, UP
Roundfruit hedgehyssop	*Gratiola virginiana*	
Carolina silverbell	*Halesia carolina*	
Carolina frostweed	*Helianthemum carolinianum*	

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Camphorweed	*Heterotheca subaxillaris*	
Queen-devil	*Hieracium gronovii*	
Innocence; Roundleaf bluet	*Houstonia procumbens*	
Whorled marshpennywort	*Hydrocotyle verticillata*	
St. Peter's-wort	*Hypericum crux-andreae*	
Bedstraw St. John's-wort	*Hypericum galioides*	
St. Andrew's-cross	*Hypericum hypericoides*	
Dwarf St. John's-wort	*Hypericum mutilum*	
Tropical bushmint	*Hyptis mutabilis* *	
Carolina holly; Sand holly	*Ilex ambigua*	
Large gallberry	*Ilex coriacea*	
Possumhaw	*Ilex decidua*	
American holly	*Ilex opaca*	
Yaupon	*Ilex vomitoria*	
Carolina indigo	*Indigofera caroliniana*	
Hairy indigo	*Indigofera hirsuta* *	
Virginia willow	*Itea virginica*	
Piedmont marshelder	*Iva microcephala*	
Looseflower waterwillow	*Justicia ovata*	
Virginia dwarfdandelion	*Krigia virginica*	
Grassleaf lettuce	*Lactuca graminifolia*	
Lantana; Shrubverbena	*Lantana camara* *	
Thymeleaf pinweed	*Lechea minor*	
Pineland pinweed	*Lechea sessiliflora*	
Lion's-ear	*Leonotis nepetifolia* *	
Virginia pepperweed	*Lepidium virginicum*	
Hairy lespedeza	*Lespedeza hirta*	
Creeping lespedeza	*Lespedeza repens*	
Tall lespedeza	*Lespedeza stuevei*	
Pinscale fayfeather	*Liatris elegans*	
Fewflower fayfeather	*Liatris pauciflora*	
Shortleaf gayfeather	*Liatris tenuifolia*	
Gopher apple	*Licania michauxii*	
Canadian toadflax	*Linaria canadensis*	
Apalachicola toadflax	*Linaria floridana*	
Sweetgum	*Liquidambar styraciflua*	
Cardinalflower	*Lobelia cardinalis*	FS
Downy lobelia	*Lobelia puberula*	
Creeping primrosewillow	*Ludwigia repens*	
Rusty staggerbush	*Lyonia ferruginea*	
Coastalplain staggerbush	*Lyonia fruticosa*	
Southern magnolia	*Magnolia grandiflora*	
Florida milkvine	*Matelea floridana*	UMW, UP
Axilflower	*Mecardonia acuminata*	
Black medick	*Medicago lupulina* *	
Snow squarestem	*Melanthera nivea*	

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Shade mudflower	*Micranthemum umbrosum*	
Climbing hempvine	*Mikania scandens*	
Sensitive brier	*Mimosa quadrivalvis*	
Partridgeberry	*Mitchella repens*	
Lax hornpod	*Mitreola petiolata*	
Spotted beebalm	*Monarda punctata*	
Indianpipe	*Monotropa uniflora*	
Southern bayberry; Wax myrtle	*Myrica cerifera*	
European watercress	*Nasturtium officinale* *	
Water tupelo	*Nyssa aquatica*	
Blackgum	*Nyssa sylvatica*	
Swamp tupelo	*Nyssa sylvatica* var. *biflora*	
Spatterdock; Yellow pondlily	*Nuphar advena*	
Cutleaf eveningprimrose	*Oenothera laciniata*	
Bosc's mille graines	*Oldenlandia boscii*	
Flattop mille graines	*Oldenlandia corymbosa* *	
Clustered mille graines	*Oldenlandia uniflora*	
Pricklypear	*Opuntia humifusa*	
Wild olive	*Osmanthus americanus*	
Eastern hophornbeam	*Ostrya virginiana*	
Common yellow woodsorrel	*Oxalis corniculata*	
Butterweed	*Packera glabella*	
Coastalplain palafox	*Palafoxia integrifolia*	
American nailwort	*Paronychia americana*	
Baldwin's nailwort	*Paronychia baldwinii*	
Rugel's nailwort	*Paronychia rugelii*	
Virginia creeper	*Parthenocissus quinquefolia*	
Purple passionflower	*Passiflora incarnata*	
Yellow passionflower	*Passiflora lutea*	
Hale's pentodon	*Pentodon pentandrus*	
Red bay	*Persea borbonia*	
Swamp bay	*Persea palustris*	
Oak mistletoe	*Phoradendron leucarpum*	
Turkey tangle fogfruit	*Phyla nodiflora*	
Carolina leafflower	*Phyllanthus caroliniensis*	
Chamber bitter	*Phyllanthus urinaria* *	
False dragonhead	*Physostegia* sp.	
American pokeweed	*Phytolacca americana*	
Pitted stripeseed	*Piriqueta cistoides* ssp. *caroliniana*	
Narrowleaf silkgrass	*Pityopsis graminifolia*	
Waterelm	*Planera aquatica*	
Common plantain	*Plantago major* *	
Dense flower knotweed	*Polygonum densiflorum*	
Bog smartweed	*Polygonum glabrum*	
Dotted smartweed	*Polygonum punctatum*	
Rustweed	*Polypremum procumbens*	

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Marsh mermaidweed	*Proserpinaca palustris*	
Carolina laurelcherry	*Prunus caroliniana*	
Black cherry	*Prunus serotina*	
Flatwoods plum; Hog plum	*Prunus umbellata*	
Common hoptree; Wafer ash	*Ptelea trifoliata*	
Blackroot	*Pterocaulon pycnostachyum*	
Mock bishopsweed	*Ptilimnium capillaceum*	
Florida mountainmint	*Pycnanthemum floridanum*	UMW
Carolina desertchicory	*Pyrrhopappus carolinianus*	
Bastard white oak	*Quercus austrina*	
Chapman's oak	*Quercus chapmanii*	
Spanish oak; Southern red oak	*Quercus falcata*	
Sand live oak	*Quercus geminata*	
Bluejack oak	*Quercus incana*	
Turkey oak	*Quercus laevis*	
Laurel oak; Diamond oak	*Quercus laurifolia*	
Overcup oak	*Quercus lyrata*	
Sand post oak	*Quercus margaretta*	
Swamp chestnut oak	*Quercus michauxii*	
Myrtle oak	*Quercus myrtifolia*	
Water oak	*Quercus nigra*	
Willow oak	*Quercus phellos*	
Running oak	*Quercus pumila*	
Live oak	*Quercus virginiana*	
Carolina buckthorn	*Rhamnus caroliniana*	
West Indian meadowbeauty	*Rhexia cubensis*	
Pale meadowbeauty	*Rhexia mariana*	
Winged sumac	*Rhus copallinum*	
Brownhair snoutbean	*Rhynchosia cinerea*	
Doubleform snoutbean	*Rhynchosia difformis*	
Michaux's snoutbean	*Rhynchosia michauxii*	
Dollarleaf	*Rhynchosia reniformis*	
Tropical Mexican clover	*Richardia brasiliensis* *	
Rough Mexican clover	*Richardia scabra* *	
Sand blackberry	*Rubus cuneifolius*	
Sawtooth blackberry	*Rubus pensilvanicus*	
Southern dewberry	*Rubus trivialis*	
Carolina wild petunia	*Ruellia caroliniensis*	
Heartwing dock	*Rumex hastatulus*	
Coastal rosegentian	*Sabatia calycina*	
Carolina willow	*Salix caroliniana*	
Azure blue sage	*Salvia azurea*	
Lyreleaf sage	*Salvia lyrata*	
Pineland pimpernel	*Samolus valerandi* ssp. *parviflorus*	
Canadian blacksnakeroot	*Sanicula Canadensis*	
Chinese tallow tree	*Sapium sebiferum* *	

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Lizard's tail	*Saururus cernuus*	
Helmet skullcap	*Scutellaria integrifolia*	
Privet wild sensitive plant	*Senna ligustrina*	
Maryland wild sensitive plant	*Senna marilandica*	
Coffeeweed; Sicklepod	*Senna obtusifolia*	
Whitetop aster	*Sericocarpus tortifolius*	
Hemlock waterparsnip	*Sium suave*	
Common wireweed	*Sida ulmifolia*	
Indian hemp; Cuban jute	*Sida rhombifolia*	
Gum bully	*Sideroxylon lanuginosum*	
Florida bully	*Sideroxylon reclinatum*	
Rufous Florida bully	*Sideroxylon rufohirtum*	
Chapman's goldenrod	*Solidago odora* var. *chapmanii*	
Roughfruit scaleseed	*Spermolepis divaricata*	
Bristly scaleseed	*Spermolepis echinata*	
Queensdelight	*Stillingia sylvatica*	
Pineland scalypink	*Stipulicida setacea*	
Pink fuzzybean	*Strophostyles umbellata*	
Coastalplain dawnflower	*Stylisma patens*	
American snowbell	*Styrax americanus*	
Eastern silver aster	*Symphyotrichum concolor*	
Rice button aster	*Symphyotrichum dumosum*	
Common sweetleaf	*Symplocos tinctoria*	
Scurf hoarypea	*Tephrosia chrysophylla*	
Florida hoarypea	*Tephrosia florida*	
Sprawling hoarypea	*Tephrosia hispidula*	
Pineland nerveray	*Tetragonotheca helianthoides*	
Wood sage	*Teucrium canadense*	
Carolina basswood	*Tilia americana* var. *caroliniana*	
Eastern poison ivy	*Toxicodendron radicans*	
Wavyleaf noseburn	*Tragia urens*	
Greater Marsh St. John's-Wort	*Triadenum walteri*	
Forked bluecurls	*Trichostema dichotomum*	
White clover	*Trifolium repens* *	
Clasping Venus' looking-glass	*Triodanis perfoliata*	
Winged elm	*Ulmus alata*	
Cedar elm	*Ulmus crassifolia*	
American elm	*Ulmus americana*	
Leafy badderwort	*Utricularia foliosa*	
Sparkleberry	*Vaccinium arboreum*	
Highbush blueberry	*Vaccinium corymbosum*	
Darrow's blueberry	*Vaccinium darrowii*	
Shiny blueberry	*Vaccinium myrsinites*	
Deerberry	*Vaccinium stamineum*	
Tall ironweed	*Vernonia angustifolia*	
Neckweed	*Veronica peregrina*	

* Non-native Species ++ Extirpated Species

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Walter's viburnum	*Viburnum obovatum*	
Rusty blackhaw	*Viburnum rufidulum*	
Florida vetch	*Vicia floridana*	
Early blue violet	*Viola palmata*	
Common blue violet	*Viola sororia*	
Prostrate blue violet	*Viola walteri*	
Summer grape	*Vitis aestivalis*	
Muscadine	*Vitis rotundifolia*	
Hercules-club	*Zanthoxylum clava-herculis*	

Common Name	*Scientific Name*	Primary Habitat Codes (for all species)

INVERTEBRATES

Mollusks

Asian Clam	*Corbicula fluminea* *	SRST
Variable Spike	*Elliptio icterina*	BST
Iridescent Lilliput	*Toxolasma paulus*	BST
Downy Rainbow	*Villosa villosa*	BST

Crayfish

Hobbs' Cave Amphipod	*Crangonyx hobbsi*	ACV
Alach. Light-fleeing Cave Cray. .	*Procambarus lucifugus*	ACV
Pallid Cave Crayfish	*Procambarus pallidus*	ACV
White tubercled Crayfish	*Procambarus spiculifer*	SRST
N. Florida Spider Cave Crayfish.	*Troglocambarus maclanei*	ACV

Beetles

Flat-faced Longhorn	*Acanthocinus obsoletus*	MTC
Flat-faced Longhorn	*Aegomorphus modestus*	MTC
Longhorned Beetle	*Anelaphus inermis*	MTC
Flat-faced Longhorn	*Astylopsis fascipennis*	MTC
Punctured Tiger Beetle	*Cicindela punctulata*	MTC
Longhorned Beetle	*Distenia undata*	MTC
Flat-faced Longhorn	*Dorcaschema cinereum*	MTC
Longhorned Beetle	*Eburia distincta*	MTC
Ivory-marked Beetle	*Eburia quadrigeminatus*	MTC
Flat-faced Longhorn	*Ecyrus dasycerus*	MTC
Spined Oak Borer	*Elaphidion mucronatum*	MTC
Oak Borer	*Enaphalodes atomarius*	MTC
Red Oak Borer	*Enaphalodes rufulus*	MTC
Flat-faced Longhorn	*Hippopsis lemniscata*	MTC
Flat-faced Longhorn	*Leptostylopsis planidorsus*	MTC
Flat-faced Longhorn	*Leptostylopsis terraecolor*	MTC
Flat-faced Longhorn	*Leptostylus asperatus*	MTC
Flat-faced Longhorn	*Leptostylus transversus*	MTC
Flat-faced Longhorn	*Liopinus alpha*	MTC
Hardwood Stump Borer	*Mallodon dasystomus*	MTC
Checkered Beetle	*Pelonium leucophaeum*	MTC
Tile-horned Prionus	*Prionus imbricornis*	MTC
Flower Longhorn	*Strangalia luteicornis*	MTC
Longhorned Beetle	*Urographis fasciatus*	MTC

Grasshoppers (GH)

Longheaded Toothpick GH	*Achurum carnatum*	MTC
Brown Winter GH	*Amblytropidia mysteca*	MTC

* Non-native Species ++ Extirpated Species

Common Name	*Scientific Name*	Primary Habitat Codes (for all species)
Southern Greenstriped GH	*Chortophaga australior*	MTC
Handsome Florida GH	*Eoettix signatus*	MTC
Spottedwinged GH	*Orphulella pelidna*	MTC
Mayflies		
Amer. Sand-burrowing Mayfly	*Dolania americana*	SRST
Acid Gunkophile Mayfly	*Stenacron floridense*	SRST
Dragonflies		
Common Green Darner	*Anax junius*	MTC
Southeastern Spineyleg	*Dromogomphus armatus*	MTC
Prince Baskettail	*Epitheca princeps*	BST, SRST
Eastern Pondhawk	*Erythemis simplicicollis*	MTC
Bar-winged Skimmer	*Libellula axilena*	MTC
Slaty Skimmer	*Libellula incesta*	BST, SRST
Needham's Skimmer	*Libellula needhami*	MTC
Great Blue Skimmer	*Libellula vibrans*	MTC
Umber Shadowfly	*Neurocordulia obsoleta*	SRST, BST
Blue Dasher	*Pachydiplax longipennis*	MTC
Carolina Saddlebags	*Tramea carolina*	MTC
Butterflies		
Gulf Fritillary	*Agraulis vanillae*	MTC
Red Spotted Purple	*Basilarchia astyanax*	MH, BF,UHF
Pipe-vine Swallowtail	*Battus philenor*	SH, UP UMW
Juniper Hairstreak	*Callophrys gryneus*	MH
Red-banded Hairstreak	*Calycopis cecrops*	MTC
Gemmed Satyr	*Cyllopsis gemma*	MEH
Barred Yellow	*Eurema daira*	MTC
Zebra Swallowtail	*Eurytides marcellus*	SH, UP
Carolina Satyr	*Hermeuptychia sosybius*	MH, BF,UHF
Fiery Skipper	*Hylephila phyleus*	MTC
Buckeye	*Junonia coenia*	MTC
Viola's Wood Satyr	*Megisto viola*	MTC
Eastern Tiger Swallowtail	*Papilio glaucus*	MTC
Palamedes Swallowtail	*Papilio palamedes*	MTC
Spicebush Swallowtail	*Papilio troilus*	MTC
Cloudless Sulfur	*Phoebis sennae*	MTC
Zabulon Skipper	*Poanes zabulon*	UHF, MH
Whirlabout	*Polites vibex*	MTC
Question Mark	*Polygonia interrogationis*	MH, BF,UHF
King's Hairstreak	*Satyrium kingi*	MEH
Gray Hairstreak	*Strymon melinus*	MTC
Northern Cloudywing	*Thorybes pylades*	MTC
Dorantes Long-tail	*Urbanus dorantes*	MTC
Long-tailed Skipper	*Urbanus proteus*	MTC

FISH

Common Name	*Scientific Name*	Primary Habitat Codes (for all species)
Gulf Sturgeon	*Acipenser oxyrinchus desotoi*	BST, SRST
Alabama Shad	*Alosa alabamae*	BST, SRST
White Catfish	*Ameiurus catus*	BST, SRST
Yellow Bullhead	*Ameiurus natalis*	BST, SRST
Brown Bullhead	*Ameiurus nebulosus*	BST, SRST
Spotted Bullhead	*Ameiurus serracanthus*	BST, SRST
Bowfin	*Amia calva*	BST, SRST
American Eel	*Anguilla rostrata*	BST, SRST
Pirate Perch	*Aphredoderus sayanus*	BST, SRST
Sheepshead	*Archosargus probatocephalus*	BST, SRST
Okefenokee Pygmy Sunfish	*Elassoma okefenokee*	BST, SRST
Banded Pygmy Sunfish	*Elassoma zonatum*	BST, SRST
Bluespotted Sunfish	*Enneacanthus gloriosus*	BST, SRST
Lake Chubsucker	*Erimyzon sucetta*	BST, SRST
Redfin Pickerel	*Esox americanus americanus*	BST, SRST
Chain Pickerel	*Esox niger*	BST, SRST
Brown Darter	*Etheostoma edwini*	BST, SRST
Swamp Darter	*Etheostoma fusiforme*	BST, SRST
Seminole Killifish	*Fundulus seminolis*	BST, SRST
Eastern Mosquitofish	*Gambusia holbrooki*	BST, SRST
Least Killifish	*Heterandria formosa*	BST, SRST
Channel Catfish	*Ictalurus punctatus*	BST, SRST
Longnose Gar	*Lepisosteus ossens*	BST, SRST
Florida Gar	*Lepisosteus platyrhincus*	BST, SRST
Redbreast Sunfish	*Lepomis auritus*	BST, SRST
Warmouth	*Lepomis gulosus*	BST, SRST
Bluegill	*Lepomis macrochirus*	BST, SRST
Redear Sunfish	*Lepomis microlophus*	BST, SRST
Spotted Sunfish	*Lepomis punctatus*	BST, SRST
Bluefin Killifish	*Lucania goodei*	BST, SRST
Suwannee Bass	*Micropterus notius*	BST, SRST
Florida Largemouth Bass	*Micropterus salmoides floridanus*	BST, SRST
Spotted Sucker	*Minytrema melanops*	BST, SRST
Striped Mullet	*Mugil cephalus*	BST, SRST
Golden Shiner	*Notemigonus crysoleucas*	BST, SRST
Redeye Chub	*Notropis harperi*	BST, SRST
Taillight Shiner	*Notropis maculatus*	BST, SRST
Coastal Shiner	*Notropis petersoni*	BST, SRST
Tadpole Madtom	*Noturus gyrinus*	BST, SRST
Sailfin Molly	*Poecilia latipinna*	BST, SRST
Black Crappie	*Pomoxis nigromaculatus*	BST, SRST
Atlantic Needlefish	*Strongylura marina*	BST, SRST
Hogchoker	*Trinectes maculatus*	BST, SRST

AMPHIBIANS

Common Name	*Scientific Name*	Primary Habitat Codes (for all species)
Frogs and Toads		
Southern Toad	*Anaxyrus terrestris*	UMW, MEH
Greenhouse Frog	*Eleutherodactylus planirostris* *	MTC
Cope's Gray Treefrog	*Hyla chrysoscelis*	MEH, AF
Southern Leopard Frog	*Lithobates sphenocephala*	MEH, AF
Spring Peeper	*Pseudacris crucifer*	BS, SWLK
Eastern Spadefoot Toad	*Scaphiopus holbrookii*	UMW
Salamanders		
Mole Salamander	*Ambystoma talpoideum*	MEH
Eastern Newt	*Notophthalmus viridescens*	SWLK
REPTILES		
Crocodilians		
American Alligator	*Alligator mississippiensis*	BST, SRST
Turtles		
Florida Softshell Turtle	*Apalone ferox*	BST, DM, SRST
Florida Snapping Turtle	*Chelydra serpentina osceola*	SWLK, BST
Gopher Tortoise	*Gopherus polyphemus*	UMW, SH, SCF
Striped Mud Turtle	*Kinosternon baurii*	BS
Eastern Mud Turtle	*Kinosternon subrubrum*	BS, FS
Alligator Snapping Turtle	*Macrochelys temminckii*	BST
Suwannee Cooter	*Pseudemys concinna suwanniensis*	BST, SRST
Florida Red-bellied Cooter	*Pseudemys nelsoni*	BST, SRST
Peninsula Cooter	*Pseudemys peninsularis*	BST, SRST
E. Loggerhead Musk Turtle	*Sternotherus minor minor*	BST, SRST
Eastern Musk Turtle; Stinkpot	*Sternotherus odoratus*	BST, SRST
Red-eared Slider	*Trachemys scripta elegans* *	BST, SRST
Yellow-bellied Slider	*Trachemys scripta scripta*	BST, SRST
Lizards		
Green Anole	*Anolis carolinensis*	MTC
Brown Anole	*Anolis sagrei* *	DV
Six-lined Racerunner	*Aspidoscelis sexlineata*	SCF, SH
Southeastern Five-lined Skink	*Plestiodon inexpectatus*	UMW
Broad-headed Skink	*Plestiodon laticeps*	MEH
Eastern Fence Lizard	*Sceloporus undulatus*	SH, UMW
Little Brown Skink	*Scincella lateralis*	MEH
Snakes		

Common Name	*Scientific Name*	Primary Habitat Codes (for all species)
Florida Cottonmouth	*Agkistrodon piscivorus conanti*	FS
Southern Black Racer	*Coluber constrictor priapus*	MEH, UMW
Eastern Coachwhip	*Coluber flagellum flagellum*	SH, UMW
E. Diamond-backed Rattlesnake	*Crotalus adamanteus*	SCF, UMW, SH
Eastern Indigo Snake	*Drymarchon couperi*	SCF, SH, UMW
Eastern Hognose Snake	*Heterodon platyrhinos*	UMW
Southern Hognose Snake	*Heterodon simus*	SH, UMW
Short-tailed Snake	*Lampropeltis extenuata*	SH, UMW
Red-bellied Watersnake	*Nerodia erythrogaster*	SRST, BST
Florida Water Snake	*Nerodia fasciata pictiventris*	BST, SRST
Brown Water Snake	*Nerodia taxispilota*	SRST, BST
Eastern Ratsnake	*Pantherophis alleghaniensis*	MEH
Eastern Corn Snake	*Pantherophis guttatus*	SH, UMW
Florida Crowned Snake	*Tantilla relicta*	SH, UMW
Eastern Garter Snake	*Thamnophis sirtalis sirtalis*	MEH, UMW

BIRDS

Waterfowl

Canada Goose	*Branta canadensis*	OF
Wood Duck	*Aix sponsa*	SWLK, SRST, BST
Ring-necked Duck	*Aythya collaris*	SWLK
Lesser Scaup	*Aythya affinis*	SWLK
Hooded Merganser	*Lophodytes cucullatus*	SWLK

Partridges, Grouse, and Turkeys

Wild Turkey	*Meleagris gallopavo*	BF, MEH, UMW, UP

New World Quail

Northern Bobwhite	*Colinus virginianus*	UMW, SH

Grebes

Pied-billed Grebe	*Podilymbus podiceps*	SWLK

Storks

Wood Stork	*Mycteria americana*	DM, SWLK

Cormorants

Double-crested Cormorant	*Phalocrocorax auritus*	SWLK, SRST, BST

Anhingas

Anhinga	*Anhinga anhinga*	SWLK, SRST, BST

Pelicans

American White Pelican	*Pelecanus erythrorhynchos*	SWLK, OF

Herons, Egrets, and Bitterns

Common Name	*Scientific Name*	Primary Habitat Codes (for all species)
Great Blue Heron	*Ardea herodias*	DM, SWLK, SKLK, SRST
Great Egret	*Ardea alba*	SWLK
Snowy Egret	*Egretta thula*	SRST
Little Blue Heron	*Egretta caerulea*	SWLK, SKLK, SRST
Tricolored Heron	*Egretta tricolor*	SWLK
Cattle Egret	*Bubulcus ibis*	DV, OF
Green Heron	*Butorides virescens*	SWLK, SKLK, SRST
Black-crowned Night-Heron	*Nycticorax nycticorax*	SWLK
Yellow-crowned Night-Heron	*Nyctanassa violacea*	SWLK
Ibises and Spoonbills		
White Ibis	*Eudocimus albus*	DM, SWLK, SRST
New World Vultures		
Black Vulture	*Coragyps atratus*	MTC, OF
Turkey Vulture	*Cathartes aura*	MTC, OF
Hawks, Eagles, and Kites		
Osprey	*Pandion haliaetus*	SRST, BST, SWLK, OF
Swallow-tailed Kite	*Elanoides forficatus*	SWLK, OF
Mississippi Kite	*Ictinia mississippiensis*	MTC, OF
Bald Eagle	*Haliaeetus leucocephalus*	SWLK, OF
Northern Harrier	*Circus cyaneus*	OF
Red-shouldered Hawk	*Buteo lineatus*	MTC, OF
Broad-winged Hawk	*Buteo platypterus*	AF, BF, MEH, OF
Red-tailed Hawk	*Buteo jamaicensis*	UMW, UP, OF
Rails and Coots		
Purple Gallinule	*Porphyrio martinicus*	SWLK
Common Gallinule	*Gallinula chloropus*	SWLK
American Coot	*Fulica americana*	SWLK, SRST
Limpkins		
Limpkin	*Aramus guarauna*	SRST, BST
Sandpipers		
Spotted Sandpiper	*Actitis macularius*	SRST, BST
Wilson's Snipe	*Gallinago gallinago*	DM, SWLK
American Woodcock	*Scolopax minor*	FS, AF, BF, BS
Pigeons and Doves		
Rock Dove	*Columba livia* *	DV, OF
Mourning Dove	*Zenaida macroura*	MTC
Common Ground-Dove	*Columbina passerina*	SH, SCF
Cuckoos		

Common Name	*Scientific Name*	Primary Habitat Codes (for all species)
Yellow-billed Cuckoo	*Coccyzus americanus*	MEH, UMW, BF
Owls		
Eastern Screech-Owl	*Megascops asio*	MEH, UMW, UP
Great Horned Owl	*Bubo virginianus*	MEH, UMW, UP
Barred Owl	*Strix varia*	FS, AF, BF, BS
Nightjars		
Common Nighthawk	*Chordeiles minor*	UP, SH, OF
Chuck-will's-widow	*Antrostomus carolinensis*	MEH, UMW
Eastern Whip-poor-will	*Antrostomus vociferus*	MEH, UMW
Swifts		
Chimney Swift	*Chaetura pelagica*	OF
Hummingbirds		
Ruby-throated Hummingbird	*Archilochus colubris*	UMW, UP
Kingfishers		
Belted Kingfisher	*Ceryle alcyon*	SRST, BST, SWLK
Woodpeckers		
Red-headed Woodpecker	*Melanerpes erythrocephalus*	SH, UP, UMW
Red-bellied Woodpecker	*Melanerpes carolinus*	MTC
Yellow-bellied Sapsucker	*Sphyrapicus varius*	MEH, BF, UMW
Downy Woodpecker	*Picoides pubescens*	MTC
Hairy Woodpecker	*Picoides villosus*	UMW, UP
Northern Flicker	*Colaptes auratus*	SH, UP
Pileated Woodpecker	*Dryocopus pileatus*	MTC
Tyrant Flycatchers		
Acadian Flycatcher	*Empidonax flaviventris*	FS, AF, BS
Eastern Phoebe	*Sayornis phoebe*	UP, UMW, SH
Eastern Kingbird	*Tyrannus tyrannus*	SH, DV
Gray Kingbird	*Tyrannus dominicensis*	DV
Shrikes		
Loggerhead Shrike	*Lanius ludovicianus*	SH, DV
Vireos		
White-eyed Vireo	*Vireo griseus*	MTC
Yellow-throated Vireo	*Vireo flavifrons*	UP, UMW, SH
Blue-headed Vireo	*Vireo solitarius*	MEH, UMW
Red-eyed Vireo	*Vireo olivaceus*	BF, MEH, UMW
Crows and Jays		

Common Name	*Scientific Name*	Primary Habitat Codes (for all species)
Blue Jay	*Cyanocitta cristata*	MTC
Florida Scrub Jay	*Aphelocoma coerulescens* ++	SCF
Fish Crow	*Corvus ossifragus*	OF
American Crow	*Corvus brachyrhynchos*	MTC
Swallows		
Tree Swallow	*Tachycineta bicolor*	OF
Bank Swallow	*Riparia riparia*	OF
Barn Swallow	*Hirundo rustica*	BST, OF
Tits and Allies		
Carolina Chickadee	*Poecile carolinensis*	MEH, UMW, UP, SH
Tufted Titmouse	*Baeolophus bicolor*	MTC
Wrens		
House Wren	*Troglodytes aedon*	SCF, SH
Carolina Wren	*Thryothorus ludovicianus*	MTC
Kinglets		
Golden-crowned Kinglet	*Regulus satrapa*	UP, SH
Ruby-crowned Kinglet	*Regulus calendula*	MTC
Old World Warblers and Gnatcatchers		
Blue-gray Gnatcatcher	*Polioptila caerulea*	MTC
Thrushes		
Eastern Bluebird	*Sialia sialis*	UP, SH
Veery	*Catharus fuscescens*	MEH, UMW
Swainson's Thrush	*Catharus ustulatus*	MEH, UMW
Hermit Thrush	*Catharus guttatus*	MEH, UMW
American Robin	*Turdus migratorius*	MTC, OF
Mockingbirds and Thrashers		
Gray Catbird	*Dumetella carolinensis*	MEH, SCF
Northern Mockingbird	*Mimus polyglottos*	SH, SCF, DV
Brown Thrasher	*Toxostoma rufum*	MEH, SCF
Starlings		
European Starling	*Sturnus vulgaris* *	DV
Waxwings		
Cedar Waxwing	*Bombycilla cedrorum*	SH, UP, UMW, OF
New World Warblers		
Ovenbird	*Seiurus aurocapilla*	MEH, UMW, BF
Worm-eating Warbler	*Helmitheros vermivorum*	MEH, UMW
Louisiana Waterthrush	*Parkesia motacilla*	FS, BS, BST, SRST

* Non-native Species ++ Extirpated Species

Common Name	*Scientific Name*	Primary Habitat Codes (for all species)
Northern Waterthrush	*Parkesia noveboracensis*	FS, BST, SRST
Golden-winged Warbler	*Vermivora chrysoptera*	UMW, UP, SH
Black-and-white Warbler	*Mniotilta varia*	MTC
Prothonotary Warbler	*Protonotaria citrea*	BS, FS
Tennessee Warbler	*Oreothlypis peregrina*	MEH, AF
Orange-crowned Warbler	*Oreothlypis celata*	SH, UP, UMW
Hooded Warbler	*Setophaga citrina*	MEH, AF
American Redstart	*Setophaga ruticilla*	MEH, AF, UMW
Cape May Warbler	*Setophaga tigrina*	UMW, UP, MEH
Northern Parula	*Setophaga americana*	MTC
Magnolia Warbler	*Setophaga magnolia*	AF, MEH, UMW
Blackburnian Warbler	*Setophaga fusca*	UP, SH
Yellow Warbler	*Setophaga petechia*	DM
Blackpoll Warbler	*Setophaga striata*	SH, UP
Black-throated Blue Warbler	*Setophaga caerulescens*	MEH, BF, UMW
Palm Warbler	*Setophaga palmarum*	SH, UP
Pine Warbler	*Setophaga pinus*	UMW, UP, SH
Yellow-rumped Warbler	*Setophaga coronata*	MTC
Yellow-throated Warbler	*Setophaga dominica*	UMW, UP, SH
Prairie Warbler	*Setophaga discolor*	SH, UP
Tanagers		
Summer Tanager	*Piranga rubra*	SH, UP, UMW
Sparrows and Allies		
Eastern Towhee	*Pipilo erythrophthalmus*	SCF, SH
Chipping Sparrow	*Spizella passerina*	SH, DV
White-throated Sparrow	*Zonotrichia albicollis*	MEH, SH
White-crowned Sparrow	*Zonotrichia leucophrys*	UP, SH
Cardinals, Grosbeaks and Buntings		
Northern Cardinal	*Cardinalis cardinalis*	MTC
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	MEH
Indigo Bunting	*Passerina cyanea*	SCF, SH
Blackbirds and Allies		
Red-winged Blackbird	*Agelaius phoeniceus*	BS, FS, DM, OF
Eastern Meadowlark	*Sturnella magna*	SH
Rusty Blackbird	*Euphagus carolinus*	BS, FS
Common Grackle	*Quiscalus quiscula*	SH, DV
Brown-headed Cowbird	*Molothrus ater*	MTC
Finches and Allies		
American Goldfinch	*Carduelis tristis*	MTC, OF
Old World Sparrows		

Common Name	*Scientific Name*	Primary Habitat Codes (for all species)
House Sparrow	*Passer domesticus* *	DV

MAMMALS

Didelphids		
Virginia Opossum	*Didelphis virginiana*	MTC
Insectivores		
Eastern Mole	*Scalopus aquaticus*	UMW
Bats		
Rafinesque's Big-eared Bat	*Corynorhinus rafinesquii*	AF, MEH
Edentates		
Nine-banded Armadillo	*Dasypus novemcinctus* *	MTC
Lagomorphs		
Eastern Cottontail	*Sylvilagus floridanus*	MTC
Rodents		
Beaver	*Castor canadensis*	BST
Southeastern Pocket Gopher	*Geomys pinetis*	SH, UMW
Southern Flying Squirrel	*Glaucomys volans*	MEH, UMW
Golden Mouse	*Ochrotomys nuttalli*	MEH
Eastern Gray Squirrel	*Sciurus carolinensis*	MTC
Sherman's Fox Squirrel	*Sciurus niger shermani*	SH, UMW
Carnivores		
River Otter	*Lutra canadensis*	BST, SRST
Bobcat	*Lynx rufus*	MTC
Striped Skunk	*Mephitis mephitis*	MEH, UMW
Raccoon	*Procyon lotor*	MTC
Gray Fox	*Urocyon cinereoargenteus*	MEH, UMW
Florida Black Bear	*Ursus americanus floridanus*	MTC
Red Fox	*Vulpes vulpes* *	MEH, UMW
Manatees		
West Indian Manatee	*Trichechus manatus*	SRST, BST
Artiodactyls		
White-tailed Deer	*Odocoileus virginianus*	MTC
Feral Pig	*Sus scrofa* *	FS, AF, MEH

TERRESTRIAL

Beach Dune	BD
Coastal Berm	CB
Coastal Grassland	CG
Coastal Strand	CS
Dry Prairie	DP
Keys Cactus Barren	KCB
Limestone Outcrop	LO
Maritime Hammock	MAH
Mesic Flatwoods	MF
Mesic Hammock	MEH
Pine Rockland	PR
Rockland Hammock	RH
Sandhill	SH
Scrub	SC
Scrubby Flatwoods	SCF
Shell Mound	SHM
Sinkhole	SK
Slope Forest	SPF
Upland Glade	UG
Upland Hardwood Forest	UHF
Upland Mixed Woodland	UMW
Upland Pine	UP
Wet Flatwoods	WF
Xeric Hammock	XH

PALUSTRINE

Alluvial Forest	AF
Basin Marsh	BM
Basin Swamp	BS
Baygall	BG
Bottomland Forest	BF
Coastal Interdunal Swale	CIS
Depression Marsh	DM
Dome Swamp	DS
Floodplain Marsh	FM
Floodplain Swamp	FS
Glades Marsh	GM
Hydric Hammock	HH
Keys Tidal Rock Barren	KTRB
Mangrove Swamp	MS
Marl Prairie	MP
Salt Marsh	SAM
Seepage Slope	SSL
Shrub Bog	SHB
Slough	SLO
Slough Marsh	SLM
Strand Swamp	STS
Wet Prairie	WP

LACUSTRINE

Clastic Upland Lake	CULK
Coastal Dune Lake	CDLK
Coastal Rockland Lake	CRLK
Flatwoods/Prairie	FPLK
Marsh Lake	MLK
River Floodplain Lake	RFLK
Sandhill Upland Lake	SULK
Sinkhole Lake	SKLK
Swamp Lake	SWLK

RIVERINE

Alluvial Stream	AST
Blackwater Stream	BST
Seepage Stream	SST
Spring-run Stream	SRST

SUBTERRANEAN

Aquatic Cave	ACV
Terrestrial Cave	TCV

ESTUARINE

Algal Bed	EAB
Composite Substrate	ECPS
Consolidated Substrate	ECNS
Coral Reef	ECR
Mollusk Reef	EMR
Octocoral Bed	EOB
Seagrass Bed	ESGB
Sponge Bed	ESPB
Unconsolidated Substrate	EUS
Worm Reef	EWR

MARINE

Algal Bed	MAB
Composite Substrate	MCPS
Consolidated Substrate	MCNS
Coral Reef	MCR
Mollusk Reef	MMR
Octocoral Bed	MOB
Seagrass Bed	MSGB
Sponge Bed	MSPB
Unconsolidated Substrate	MUS
Worm Reef	MWR

ALTERED LANDCOVER TYPES

Abandoned field/Abandoned pasture	AFP
Agriculture	AG
Artificial Pond	AP
Borrow Area	BA
Canal/ditch	CD
Clearcut pine plantation	CPP
Clearing/Regeneration	CL
Developed	DV
Impoundment	IM
Invasive exotic monoculture	IEM
Pasture - improved	PI
Pasture - semi-improved	PSI
Pine plantation	PP
Restoration Natural Community	RNC
Road	RD
Spoil area	SA
Successional hardwood forest	SHF
Utility corridor	UC

MISCELLANEOUS

Many Types of Communities	MTC
Overflying	OF

Addendum 6—Imperiled Species Ranking Definitions

The Nature Conservancy and the Natural Heritage Program Network (of which FNAI is a part) define an element as any exemplary or rare component of the natural environment, such as a species, natural community, bird rookery, spring, sinkhole, cave or other ecological feature. An element occurrence (EO) is a single extant habitat that sustains or otherwise contributes to the survival of a population or a distinct, self-sustaining example of a particular element.

Using a ranking system developed by The Nature Conservancy and the Natural Heritage Program Network, the Florida Natural Areas Inventory assigns two ranks to each element. The global rank is based on an element's worldwide status; the state rank is based on the status of the element in Florida. Element ranks are based on many factors, the most important ones being estimated number of Element occurrences, estimated abundance (number of individuals for species; area for natural communities), range, estimated adequately protected EOs, relative threat of destruction, and ecological fragility.

Federal and State status information is from the U.S. Fish and Wildlife Service; and the Florida Fish and Wildlife Conservation Commission (animals), and the Florida Department of Agriculture and Consumer Services (plants), respectively.

FNAI GLOBAL RANK DEFINITIONS

G1..... Critically imperiled globally because of extreme rarity (5 or fewer occurrences or less than 1000 individuals) or because of extreme vulnerability to extinction due to some natural or fabricated factor.

G2..... Imperiled globally because of rarity (6 to 20 occurrences or less than 3000 individuals) or because of vulnerability to extinction due to some natural or man-made factor.

G3..... Either very rare or local throughout its range (21-100 occurrences or less than 10,000 individuals) or found locally in a restricted range or vulnerable to extinction of other factors.

G4..... apparently secure globally (may be rare in parts of range)

G5..... demonstrably secure globally

GH ..... of historical occurrence throughout its range may be rediscovered (e.g., ivory-billed woodpecker)

GX..... believed to be extinct throughout range

GXC..... extirpated from the wild but still known from captivity or cultivation

G#?..... Tentative rank (e.g., G2?)

G#G# ..... range of rank; insufficient data to assign specific global rank (e.g., G2G3)

G#T# ..... rank of a taxonomic subgroup such as a subspecies or variety; the G portion of the rank refers to the entire species and the T portion refers to the specific subgroup; numbers have same definition as above (e.g., G3T1)

G#Q ..... rank of questionable species - ranked as species but questionable whether it is species or subspecies; numbers have same definition as above (e.g., G2Q)

G#T#Q ..... same as above, but validity as subspecies or variety is questioned.
GU ..... due to lack of information, no rank or range can be assigned (e.g., GUT2).
G? ..... Not yet ranked (temporary)
S1 ..... Critically imperiled in Florida because of extreme rarity (5 or fewer occurrences or less than 1000 individuals) or because of extreme vulnerability to extinction due to some natural or man-made factor.
S2 ..... Imperiled in Florida because of rarity (6 to 20 occurrences or less than 3000 individuals) or because of vulnerability to extinction due to some natural or man-made factor.
S3 ..... Either very rare or local throughout its range (21-100 occurrences or less than 10,000 individuals) or found locally in a restricted range or vulnerable to extinction of other factors.
S4 ..... apparently secure in Florida (may be rare in parts of range)
S5 ..... demonstrably secure in Florida
SH..... of historical occurrence throughout its range, may be rediscovered (e.g., ivory-billed woodpecker)
SX..... believed to be extinct throughout range
SA..... accidental in Florida, i.e., not part of the established biota
SE..... an exotic species established in Florida may be native elsewhere in North America
SN..... regularly occurring but widely and unreliably distributed; sites for conservation hard to determine
SU..... due to lack of information, no rank or range can be assigned (e.g., SUT2).
S? ..... Not yet ranked (temporary)
N..... Not currently listed, nor currently being considered for listing, by state or federal agencies.

LEGAL STATUS

FEDERAL

(Listed by the U. S. Fish and Wildlife Service - USFWS)

LE ..... Listed as Endangered Species in the List of Endangered and Threatened Wildlife and Plants under the provisions of the Endangered Species Act. Defined as any species that is in danger of extinction throughout all or a significant portion of its range.

PE ..... Proposed for addition to the List of Endangered and Threatened Wildlife and Plants as Endangered Species.

LT ..... Listed as Threatened Species. Defined as any species that is likely to become an endangered species within the near future throughout all or a significant portion of its range.

PT ..... Proposed for listing as Threatened Species.

C..... Candidate Species for addition to the list of Endangered and Threatened Wildlife and Plants. Defined as those species for which the USFWS currently has on file sufficient information on biological vulnerability and threats to support proposing to list the species as endangered or threatened.

E(S/A) ..... Endangered due to similarity of appearance.

T(S/A) ..... Threatened due to similarity of appearance.

EXPE, XE .... Experimental essential population. A species listed as experimental and essential.

EXPN, XN ... Experimental non-essential population. A species listed as experimental and non-essential. Experimental, nonessential populations of endangered species are treated as threatened species on public land, for consultation purposes.

STATE

ANIMALS... (Listed by the Florida Fish and Wildlife Conservation Commission - FWC)

FE ..... Federally-designated Endangered

FT ..... Federally-designated Threatened

FXN ..... Federally-designated Threatened Nonessential Experimental Population

FT(S/A) ..... Federally-designated Threatened species due to similarity of appearance

ST ..... Listed as Threatened Species by the FWC. Defined as a species, subspecies, or isolated population, which is acutely vulnerable to environmental alteration, declining in number at a rapid rate, or whose range or habitat, is decreasing in area at a rapid rate and therefore is

destined or very likely to become an endangered species within the near future.

SSC ..... Listed as Species of Special Concern by the FWC. Defined as a population which warrants special protection, recognition or consideration because it has an inherent significant vulnerability to habitat modification, environmental alteration, human disturbance or substantial human exploitation that, in the near future, may result in its becoming a threatened species.

PLANTS ..... (Listed by the Florida Department of Agriculture and Consumer Services - FDACS)

LE ..... Listed as Endangered Plants in the Preservation of Native Flora of Florida Act. Defined as species of plants native to the state that are in imminent danger of extinction within the state, the survival of which is unlikely if the causes of a decline in the number of plants continue, and includes all species determined to be endangered or threatened pursuant to the Federal Endangered Species Act of 1973,as amended.

LT ..... Listed as Threatened Plants in the Preservation of Native Flora of Florida Act. Defined as species native to the state that are in rapid decline in the number of plants within the state, but which have not so decreased in such number as to cause them to be endangered.

Addendum 7—Cultural Information

These procedures apply to state agencies, local governments, and non-profits that manage state-owned properties.

A. General Discussion

Historic resources are both archaeological sites and historic structures. Per Chapter 267, Florida Statutes, '*Historic property' or 'historic resource' means any prehistoric district, site, building, object, or other real or personal property of historical, architectural, or archaeological value, and folklife resources. These properties or resources may include, but are not limited to, monuments, memorials, Indian habitations, ceremonial sites, abandoned settlements, sunken or abandoned ships, engineering works, treasure trove, artifacts, or other objects with intrinsic historical or archaeological value, or any part thereof, relating to the history, government, and culture of the state."*

B. Agency Responsibilities

Per State Policy relative to historic properties, state agencies of the executive branch must allow the Division of Historical Resources (Division) the opportunity to comment on any undertakings, whether these undertakings directly involve the state agency, i.e., land management responsibilities, or the state agency has indirect jurisdiction, i.e., permitting authority, grants, etc. No state funds should be expended on the undertaking until the Division has the opportunity to review and comment on the project, permit, grant, etc.

State agencies shall preserve the historic resources which are owned or controlled by the agency.

Regarding proposed demolition or substantial alterations of historic properties, consultation with the Division must occur, and alternatives to demolition must be considered.

State agencies must consult with Division to establish a program to location, inventory and evaluate all historic properties under ownership or controlled by the agency.

C. Statutory Authority

Statutory Authority and more in depth information can be found at:
http://www.flheritage.com/preservation/compliance/guidelines.cfm

D. Management Implementation

Even though the Division sits on the Acquisition and Restoration Council and approves land management plans, these plans are conceptual. Specific information regarding individual projects must be submitted to the Division for review and recommendations.

Managers of state lands must coordinate any land clearing or ground disturbing activities with the Division to allow for review and comment on the proposed project. Recommendations may include, but are not limited to: approval of the project as submitted, cultural resource assessment survey by a qualified professional archaeologist, modifications to the proposed project to avoid or mitigate potential adverse effects.

Projects such as additions, exterior alteration, or related new construction regarding historic structures must also be submitted to the Division of Historical Resources for review and comment by the Division's architects. Projects involving structures fifty years of age or older, must be submitted to this agency for a significance determination. In rare cases, structures under fifty years of age may be deemed historically significant. These must be evaluated on a case by case basis.

Adverse impacts to significant sites, either archaeological sites or historic buildings, must be avoided. Furthermore, managers of state property should make preparations for locating and evaluating historic resources, both archaeological sites and historic structures.

E. Minimum Review Documentation Requirements

In order to have a proposed project reviewed by the Division, certain information must be submitted for comments and recommendations. The minimum review documentation requirements can be found at: http://www.flheritage.com/preservation/compliance/docs/minimum_review_documentation_requirements.pdf.

* * *

Questions relating to the treatment of archaeological and historic resources on state lands should be directed to:

Deena S. Woodward
Division of Historical Resources
Bureau of Historic Preservation
Compliance and Review Section
R. A. Gray Building
500 South Bronough Street
Tallahassee, FL 32399-0250

Phone: (850) 245-6425

Toll Free: (800) 847-7278
Fax: (850) 245-6435

The criteria to be used for evaluating eligibility for listing in the National Register of Historic Places are as follows:

1) Districts, sites, buildings, structures, and objects may be considered to have significance in American history, architecture, archaeology, engineering, and/or culture if they possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

- **a)** are associated with events that have made a significant contribution to the broad patterns of our history; and/or
- **b)** are associated with the lives of persons significant in our past; and/or
- **c)** embody the distinctive characteristics of type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; and/or
- **d)** have yielded, or may be likely to yield, information important in prehistory or history.

2) Ordinarily cemeteries, birthplaces, or graves of historical figures; properties owned by religious institutions or used for religious purposes; structures that have been moved from their original locations; reconstructed historic buildings; properties primarily commemorative in nature; and properties that have achieved significance within the past 50 years shall not be considered eligible for the *National Register*. However, such properties will qualify if they are integral parts of districts that do meet the criteria or if they fall within the following categories:

- **a)** a religious property deriving its primary significance from architectural or artistic distinction or historical importance; or
- **b)** a building or structure removed from its original location but which is significant primarily for architectural value, or which is the surviving structure most importantly associated with a historic person or event; or
- **c)** a birthplace or grave of an historical figure of outstanding importance if there is no appropriate site or building directly associated with his productive life; or
- **d)** a cemetery which derives its primary significance from graves of persons of transcendent importance, from age, distinctive design features, or association with historic events; or

e) a reconstructed building, when it is accurately executed in a suitable environment and presented in a dignified manner as part of a restoration master plan, and no other building or structure with the same association has survived; or a property primarily commemorative in intent, if design, age, tradition, or symbolic value has invested it with its own exceptional significance; or

f) a property achieving significance within the past 50 years, if it is of exceptional importance.

Restoration is defined as the act or process of accurately depicting the form, features, and character of a property as it appeared at a particular period of time by means of the removal of features from other periods in its history and reconstruction of missing features from the restoration period. The limited and sensitive upgrading of mechanical, electrical and plumbing systems and other code-required work to make properties functional is appropriate within a restoration project.

Rehabilitation is defined as the act or process of making possible a compatible use for a property through repair, alterations and additions while preserving those portions or features that convey its historical, cultural or architectural values.

Stabilization is defined as the act or process of applying measures designed to reestablish a weather resistant enclosure and the structural stability of an unsafe or deteriorated property while maintaining the essential form as it exists at present.

Preservation is defined as the act or process of applying measures necessary to sustain the existing form, integrity and materials of an historic property. Work, including preliminary measures to protect and stabilize the property, generally focuses upon the ongoing maintenance and repair of historic materials and features rather than extensive replacement and new construction. New exterior additions are not within the scope of this treatment; however, the limited and sensitive upgrading of mechanical, electrical and plumbing systems and other code-required work to make properties functional is appropriate within a preservation project.

Addendum 8—Timber Management Analysis

Manatee Springs State Park
Forest Resource Assessment
Prepared by: Doug Longshore, Senior Forester, Florida Forest Service
August 2013

At the request of Anne Barkdoll, Biologist, Division of Recreation and Parks, a forest resource assessment was prepared for five zones within the Manatee Springs State Park. A field visit was made on August 22, 2013.

Zones MS-5A and MS-5B

This is a stand of 38-year-old planted slash pine that has been third row select thinned in past years. The stand was mechanically site prepared prior to planting based upon the old windrows found throughout the stand. These windrows are now supporting various upland hardwoods of merchantable size. The stand has been prescribe burned in past years.

Further thinning of the slash pine is not recommended at this time. The tree crowns are open and not overcrowded while still providing adequate fuel for prescribe fires. When the decision is made to begin longleaf restoration within this stand, I would recommend delineating five to ten-acre, irregularly shaped areas, randomly spaced within this stand. These areas would be clearcut of pine and hardwood. Windrows extending into these areas could be rehabbed at this time. These areas would be chemically site prepared and planted to longleaf pine. Over time, as additional areas were added to this restoration effort, a mosaic of varying ages and densities of longleaf pine would be created.

Zone MS-5D

This stand is a mixture of scrubby hardwood and scattered slash pine. There are isolated areas within this stand where the slash pine is the dominant species in the overstory. Since these areas of pine are relatively small, it is suggested combining any forest management work such as thinning, with scheduled work that may take place in zones MS-5B.

Zone 3C & 3E

These stands are comprised primarily of mature slash, longleaf pine and upland hardwood. Much like ZoneMS-5D, the pine is concentrated in small patches and quite scattered in the remaining areas. These areas have been prescribe burned in past years. Positive results of the burning can be observed in these areas where the pine component provides adequate fuel for hardwood control. Continue prescribe burning these areas with the intent of gradually pushing back the hardwood edge of these" pine patches". Over time, these areas may provide relatively competition free areas suitable for natural regeneration or possibly hand planting of longleaf pine.