O'Leno State Park
and
River Rise Preserve State Park

Advisory Group Draft
Unit Management Plan

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Division of Recreation and Parks
April 2017

TABLE OF CONTENTS

RESOURCE MANAGEMENT COMPONENT

LAND USE COMPONENT

IMPLEMENTATION COMPONENT

TABLES

MAPS

LIST OF ADDENDA

INTRODUCTION

O'Leno State Park and River Rise Preserve State Park are located in northern Alachua County and southern Columbia County (see Vicinity Map). The main entrance to the park is about five miles north of High Springs on U.S. 41 (see Reference Map). The Vicinity Map also reflects significant land and water resources existing near the park.

O'Leno State Park was initially acquired on June 29, 1936 with funds from the Land Acquisition Trust Fund (LATF). Currently, the park comprises 2,372 acres. River Rise Preserve State Park was initially acquired on September 4, 1974 also with funds from LATF and currently comprises 3,771.86 acres. River Rise Preserve is managed under O'Leno State Park's lease. The Board of Trustees of the Internal Improvement Trust Fund (Trustees) hold fee simple title to both parks and on June 2, 1975, the Trustees leased (Lease Number 2324) the properties to the DRP under a 99-year lease. On March 28, 1984, the Trustees changed the term of Lease No. 2324 as it related to O'Leno State Park to fifty years. On August 24, 1988, the Trustees assigned a new lease number, Lease No. 3638, to O'Leno State Park without changing any of the conditions of Lease No.2324. The current lease will expire on August 23, 2038.

At O'Leno State Park and River Rise Preserve State Park, public outdoor recreation and conservation is the designated single-use of these properties. There are no legislative or executive directives that constrain the use of this property (see Addendum 1).

Purpose and Significance of the Park

The purpose of O'Leno State Park is to provide natural areas for public outdoor recreation and conservation for the enjoyment of Florida residents and visitors. The purpose of River Rise Preserve State Park is to protect environmentally unique and irreplaceable lands in the state and provide compatible resource-based education and recreation opportunities.

Park Significance

- The parks provide recreational access to one of Florida's most diverse riverine ecosystems, including an extensive network of trails for hiking, biking, and equestrian use and outstanding areas for camping, swimming, picnicking, fishing, canoeing/kayaking, and nature study.

- O'Leno State Park was originally developed in the 1930s by the Civilian Conservation Corps and the Works Progress Administration as a Florida Forest Service training camp at the previous site of the mill town of Leno.

- The natural land bridge, created where the Santa Fe River flows underground for three miles from River Sink to River Rise, served as the crossing point for major routes, including the Spanish Mission Trail from St. Augustine to

Pensacola, Florida and the Bellamy Road, the first federally-funded road in Florida.

- The parks protect prominent hydrological features of the Santa Fe River system, including the world-renowned Old Bellamy Cave System, a vast underground system of aquatic caves.

- O'Leno State Park and River Rise Preserve State Park are home to 21 distinct natural communities and 128 cultural sites that span the continuum of Florida's history.

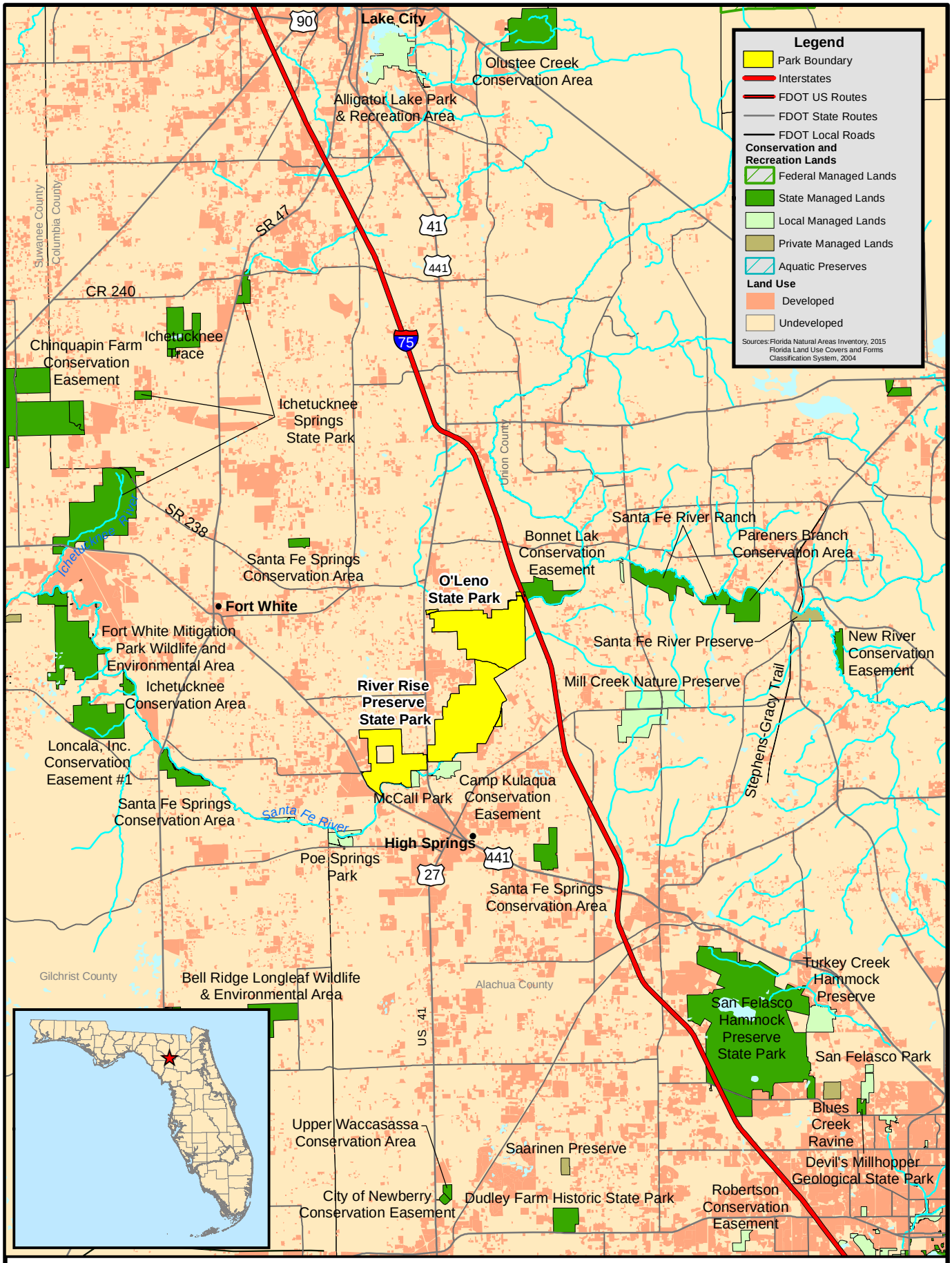
O'Leno State Park is classified as a state park in the DRP's unit classification system. In the management of a state park, a balance is sought between the goals of maintaining and enhancing natural conditions and providing various recreational opportunities. Natural resource management activities are 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.

River Rise Preserve State Park is classified as a state preserve in the DRP's unit classification system. In the management of a preserve, preservation and enhancement of natural conditions is all important. Resource considerations are given priority over user considerations and development is restricted to the minimum necessary for ensuring its protection and maintenance, limited access, user safety and convenience, and appropriate interpretation. Permitted uses are primarily of a passive nature, related to the aesthetic, educational and recreational enjoyment of the preserve, although other compatible uses are permitted in limited amounts. Program emphasis is placed on interpretation of the natural and cultural attributes of the preserve.

Purpose and Scope of the Plan

This plan serves as the basic statement of policy and direction for the management of O'Leno State Park and River Rise Preserve 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 2003 approved plan.

The plan consists of three interrelated components: the Resource Management Component, the Land Use Component and the 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



O'LENO STATE PARK & RIVER RISE PRESERVE STATE PARK

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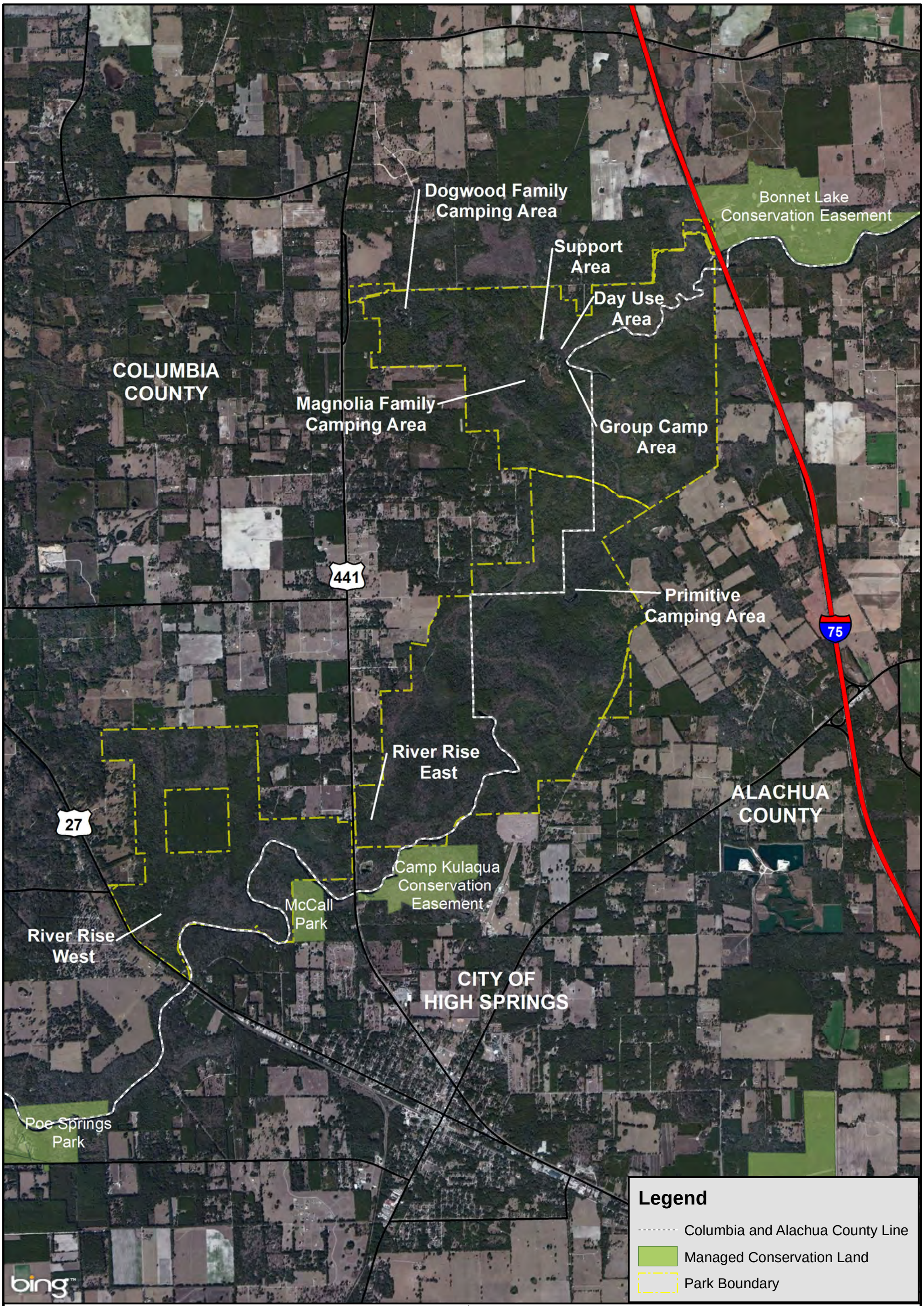
Florida Department of Environmental Protection
Division of Recreation and Parks

VICINITY MAP



O'LENO STATE PARK &
RIVER RISE PRESERVE STATE PARK

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Florida Department of Environmental Protection
Division of Recreation and Parks
Date of aerial; 2014

REFERENCE MAP

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, 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.

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 DRP's statutory responsibilities and the resource needs and values of the park. This analysis considered the park's natural and cultural resources, management needs, aesthetic values, visitation, and visitor experiences. For these parks, it was determined that timber management utilized as part of these parks' natural community management and restoration activities could be accommodated in a manner that would not interfere with the primary purpose of resource-based outdoor recreation and conservation. These compatible secondary management purposes are addressed in the Resource Management Component of the plan. 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 or the management purposes of the park.

The potential for generating revenue to enhance management was also analyzed. Visitor fees and charges are the principal source of revenue generated by the park. It was determined that timber management utilized as part of these parks' natural community management and restoration activities would be appropriate at these parks as additional sources of revenue for land management since they are compatible with the park's primary purpose of resource-based outdoor recreation and conservation.

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 Visitor Service Provider (VSP) may provide services to park visitors in order to enhance the visitor experience. For example, a VSP could be authorized to sell merchandise and food and to rent recreational equipment for use in the park. A VSP 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 VSPs, 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. In addition, the Bureau of Beaches and Coastal Systems aid the staff in the development of erosion control projects.

Public Participation

DRP provided an opportunity for public input by conducting a public workshop and an Advisory Group meeting to present the draft management plan to the public. These meetings were held on [INSERT Dates], respectively. Meeting notices were published in the Florida Administrative Register, [INSERT publication date, VOL/ISSUE], 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

O'Leno State Park and River Rise Preserve State Park are not within an Area of Critical State Concern as defined in Section 380.05, Florida Statutes, and are not presently under study for such designation. The parks are components of the Florida Greenways and Trails System, administered by the Department's Office of Greenways and Trails.

All waters within the 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 not within or adjacent to an 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 DEP's overall mission in ecosystem 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 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. O'Leno State Park/River Rise Preserve State Park Management Zones			
Management Zone	**Acreage**	**Managed with Prescribed Fire**	**Contains Cultural Resources**
OL-1A	91.27	Yes	Unknown
OL-1B	49.34	Yes	Unknown
OL-1C	135.22	Yes	Yes
OL-1De	262.11	Yes	Yes
OL-1Dw	25.13	Yes	Yes
OL-1E	117.96	Yes	Yes
OL-1F	19.78	Yes	Yes
OL-1G	139.44	Yes	Yes
OL-1Jn	28.08	Yes	Yes
OL-1Js	30.22	Yes	Yes
OL-1K	82.72	Yes	Yes
OL-1Le	196.92	Yes	Yes
OL-1Lw	118.42	Yes	Yes
OL-1M	237.92	Yes	Yes
OL-1N	164.66	Yes	Unknown
OL-1P	11.50	Yes	Unknown
OL-1Qe	56.04	Yes	Yes
OL-1Qw	160.07	Yes	Unknown
OL-1R	229.48	Yes	Yes
OL-1S	127.57	Yes	Unknown
OL-1T	5.86	Yes	Unknown
OL-1U	27.02	Yes	Yes
OL-1X	7.35	Yes	Yes
OL-1Y	10.92	Yes	Unknown
RR-2Ae	146.15	Yes	Yes
RR-2Aw	71.30	Yes	Yes
RR-2B	38.96	Yes	Yes
RR-2Ce	118.42	Yes	Yes
RR-2Cw	73.38	Yes	Yes
RR-2Dn	74.44	Yes	Yes
RR-2Ds	36.29	Yes	Yes
RR-2E	193.07	Yes	Yes
RR-2Fe	158.65	Yes	Yes
RR-2Fs	137.25	No	Yes
RR-2Fw	69.86	Yes	Yes
RR-2Gn	62.01	Yes	Yes
RR-2Gs	45.80	Yes	Yes
RR-2H	190.90	Yes	Yes
RR-2J	213.67	No	Yes
RR-2Kn	28.31	No	Yes
RR-2Ks	80.61	No	Yes

RR-2L	446.29	Yes	Yes
RR-2M	33.73	Yes	Unknown
RR-2N	282.67	Yes	Yes
RR-3A	29.52	Yes	Unknown
RR-3Bn	25.86	Yes	Unknown
RR-3Bs	140.04	Yes	Yes
RR-3Cn	41.42	Yes	Unknown
RR-3Cs	84.23	Yes	Unknown
RR-3D	158.56	Yes	Unknown
RR-3E	242.56	Yes	Yes
RR-3F	272.85	Yes	Yes
RR-3Ge	164.76	Yes	Unknown
RR-3Gw	39.84	Yes	Unknown
RR-3H	125.26	No	Unknown
OL-4A	33.03	Yes	Unknown
OL-4B	2.31	No	Unknown

Resource Description and Assessment

Natural Resources

Topography

O'Leno State Park lies within the Northern Highlands physiographic zone of Florida, while River Rise Preserve State Park straddles three zones: the Northern Highlands, the Western Valley and the High Springs Gap (White 1970). The Northern Highlands zone consists of a relatively flat upland plateau capped by fairly impermeable, clay-rich sediments, with elevations typically greater than 150 feet mean sea level (msl). In this zone, karst development is minor and the upland plateau exhibits a high degree of surface drainage, resulting in the extensive development of streams, lakes and wetlands (Champion and Upchurch 2003). The Western Valley is an area of subtle relief, underlain by a thin veneer of sand over limestone, with elevations typically between 25 and 75 feet msl. The Western Valley limestone forms a mature karst plain characterized by rapid recharge and numerous sinkholes (Upchurch et al. 2011). The High Springs Gap is one of three openings in the west wall of the Western Valley, providing a drainage egress for the Santa Fe River as it flows toward the coastal lowlands. Some scientists suggest that prior to the formation of this gap, the Western Valley was a remnant of a once flowing, ancient stream system (White 1970).

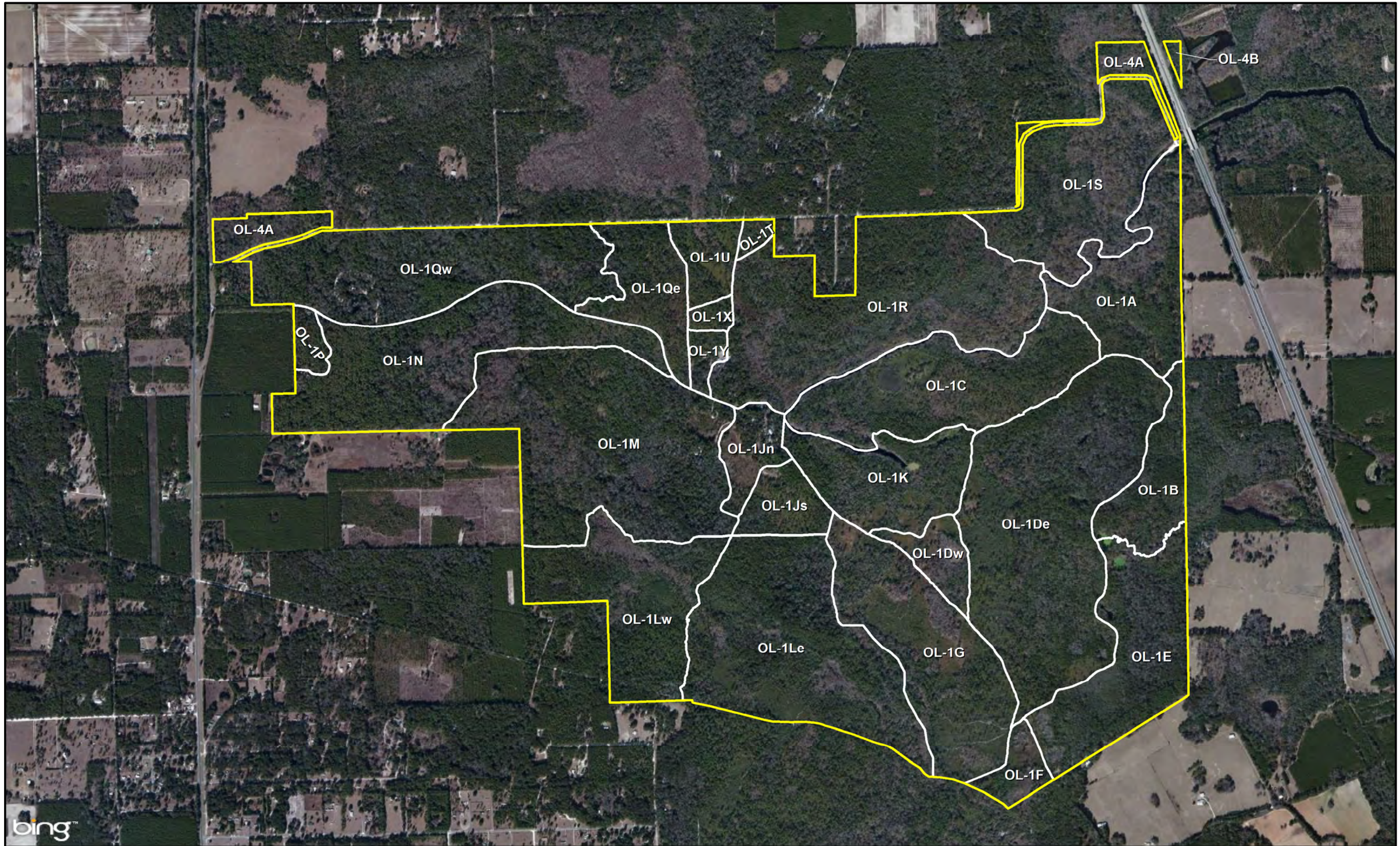
Underlying the Northern Highlands is a moderately erosion-resistant sediment layer called the Hawthorn Group (Scott 1988; Martin and Dean 2001). In the Santa Fe Basin along the western edge of the Northern Highlands plateau, ancient marine shoreline processes through geologic time have eroded limestone facies and soil sediments such as the Hawthorn Group to create the Cody Escarpment, familiarly known as the Cody Scarp (Upchurch 2002). The Cody Scarp is a distinct transitional area between the upland plateau and the coastal lowlands. The width of this scarp

can vary from 1.5 to over 7 miles, with topographic relief up to 80 feet as it gradually slopes downward towards the lowlands (Williams et al. 1977). The abundance of sinkholes and sinking streams (i.e., swallets) in this karst region profoundly influences the hydrology. A large portion of the surface runoff from the Northern Highlands drains across the Cody Scarp, where it rapidly infiltrates the subsurface limestone and becomes groundwater within the Upper Floridan aquifer.

Topographical features at O'Leno State Park and River Rise Preserve State Park (O'Leno/River Rise) include gently rolling to broadly flattened uplands that slope downward to lower, flatter floodplains. Elevations range from about 95 feet msl on the isolated section of River Rise Preserve east of NW 227th Drive to less than 35 feet msl along the Santa Fe River floodplain (see Topographic Map below). The two contiguous park units contain numerous topographic features characteristic of karst terrain including sinkholes, sinkhole lakes, smaller karst windows, disappearing and reemerging streams, and a natural land bridge. Large limestone outcrops are common, particularly along the upper edges of the floodplain, along riverbanks, and along the river bottom where several rocky shoals are exposed at low flows. Perhaps the most significant characteristic of both parks is the sheer abundance of karst windows, openings that lead directly to underground cave conduits. The Santa Fe River flows into two such karst windows within the boundaries of O'Leno State Park, namely the River Sink and the Vinzant Landing Swallet.

Another important topographic feature in the parks is the natural land bridge that stretches between the River Sink and the River Rise. Called the Natural Bridge or Santa Fe Trace, it is a three-mile long topographic anomaly of a former stream valley of the Santa Fe River (Martin and Dean 2001). It contains an ancient riverbed as well as sinkhole lakes (karst windows) that open into extensive subterranean water-bearing conduits. Some water bodies in the Natural Bridge area, Black Lake for instance, apparently no longer maintain direct connection with subsurface conduits. However, they undoubtedly lie within the low elevation pathway of the formerly aboveground, ancient Santa Fe stream system. In that respect, the Santa Fe River at the Natural Bridge has a hydrogeologic origin very similar to that of the Ichetucknee Trace, which is located immediately northwest of the park (Meyer 1962; Champion and Upchurch 2003; Upchurch and Champion 2004; SRWMD 2010a).

A large abandoned mine in O'Leno State Park just north of Bible Camp Road is the most noticeable topographic alteration within the two parks. Another significant alteration is a deep, 1,250-foot long drainage ditch with an associated high berm located just within the River Rise Preserve boundary north of Columbia Spring. Based on historic aerial photography, construction of this ditch occurred between 1951 and 1960. Historic aerial photographs also indicate that the channel of the Santa Fe River, at a point approximately 2.5 miles above the River Sink, had been dredged and redirected in the 1960s to facilitate construction of Interstate Highway 75 (I-75) (Skirvin 1962). Other topographic alterations in the parks include several abandoned limestone quarries, now substantially reclaimed through natural succession, as well as borrow pits, firebreaks, roads and causeways.



O'LENO STATE PARK

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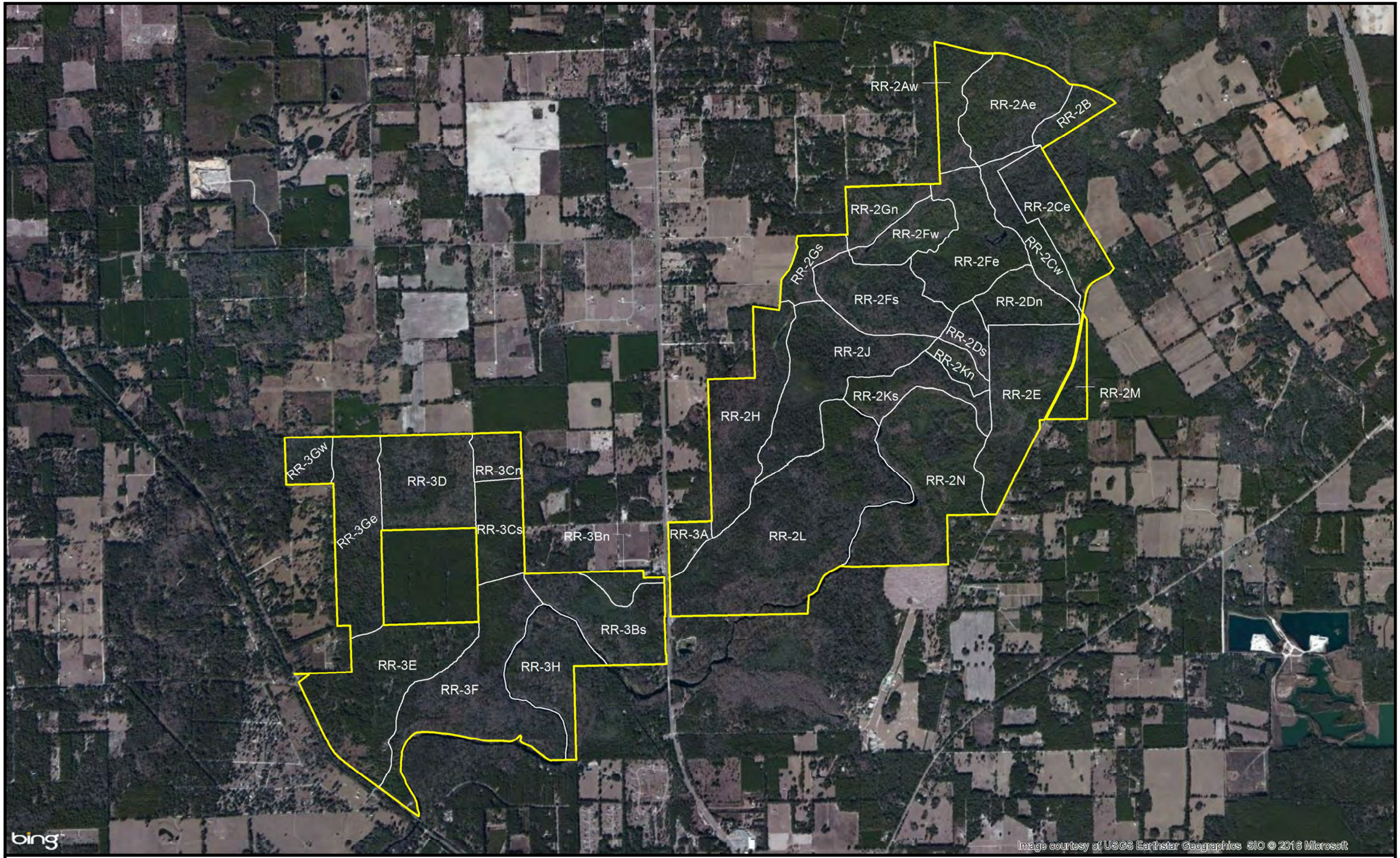
0 1,000 2,000 4,000 Feet

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

MANAGEMENT ZONES MAP



RIVER RISE PRESERVE STATE PARK

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0 0.5 1 2 Miles

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

MANAGEMENT ZONES MAP

Geology

Underlying the O'Leno/River Rise region of north-central Florida, in descending order (youngest to oldest), are the following deposits: unnamed and undifferentiated surficial marine terrace deposits, the Alachua Formation, Hawthorn Group, Ocala Limestone, Avon Park Limestone, Lake City Limestone, Oldsmar Limestone and Cedar Keys Limestone (Hunn and Slack 1983). Suwannee Limestone usually occurs between the Hawthorn Group and the Ocala Limestone throughout this region; however, it is absent locally because of solution processes, strata collapse or erosion (Scott 1991).

The upper surficial material consists of Recent Age deposits mixed with Pleistocene sediments that were deposited as terraces when sea levels fluctuated during successive glacial periods. These deposits consist primarily of fine-grained sands, which are clayey at the surface and become coarser with increasing depth, containing large pebbles of phosphate and quartz near the base. A freshwater marl deposit occurs sporadically along the Santa Fe River, reaching a thickness of up to six feet. Recent and Pleistocene deposits may total 40 feet in thickness (Meyer 1962).

The Alachua Formation, of Miocene or Pliocene age, consists of sandy clay and sand beds that are generally less calcareous and phosphatic than those found in the Hawthorn Group. The clays of the Alachua Formation normally appear light green to gray; with oxidation, however they may turn white, red, pink, brown or buff. Phosphate ore deposits encountered near the base of the Alachua Formation are commonly mined in the region. The Alachua Formation ranges to 150 feet in thickness (Meyer 1962).

The Miocene age Hawthorn Group is composed of sandy clay interbedded with hard phosphatic or dolomitic limestone layers and fine to coarse phosphatic sands. This deposit may attain a thickness of 150 feet. The high clay content of the Hawthorn Group results in relatively low permeability and creates a semi-confining unit for the Floridan aquifer. Beds of nearly pure, light green clay are often exposed along the Santa Fe River. Permeable, water-bearing limestone layers within the clay are a common source of small-scale domestic water supply. For this reason, where it occurs the Hawthorn Group is designated as an intermediate aquifer between the surficial and the Floridan (Meyer 1962). Remarkable topographic relief occurs along the erosional edge of the Hawthorn at the Cody Scarp.

The Ocala Limestone, an Eocene deposit 150 to 250 feet thick, varies in consistency from a cream-colored composition of coquina and shells to a brown limestone dotted with solution chambers and echinoid remnants. In some places, chert overlies the top of the limestone. Other Eocene deposits include the Avon Park Limestone, Lake City Limestone and Oldsmar Limestone. Avon Park Limestone, deposited during the Middle Eocene, consists of chalky limestone containing numerous foraminiferan fossils. This deposit varies from 170 to 270 feet in thickness. The Lake City Limestone deposit contains alternate layers of dark brown dolomite and chalky limestone, each of which may contain chert and gypsum.

Locally, the upper part of this deposit contains carbonaceous material and green clay. The Lake City Limestone reaches 500 feet in thickness. The oldest formation of Eocene age is the Oldsmar Limestone. This deposit, which ranges between 250 and 350 feet in thickness, is generally divided into two zones. The top half is a very porous brown limestone with some gypsum and anhydrite, and the bottom half is a thick layer of dolomite containing chert or anhydrite (Meyer 1962).

The Cedar Keys Limestone is a Paleocene deposit 400 to 450 feet thick. This formation consists primarily of limestone of highly variable color and density, and it contains deposits of gypsum and anhydrite. A distinct bed of clay exists near the middle of this deposit, and the lower section is composed primarily of dolomite (Meyer 1962).

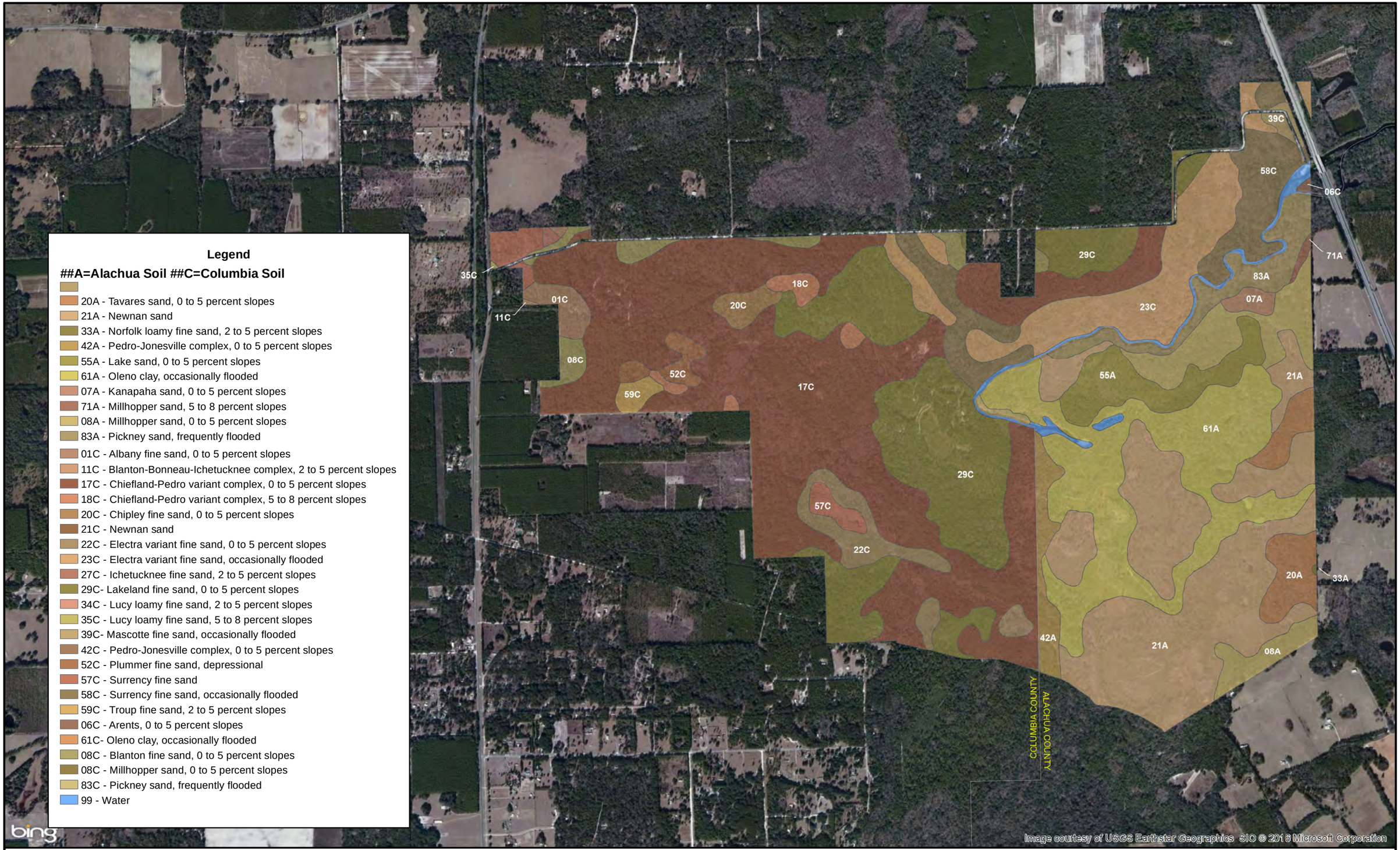
Geologic processes that occurred early in the evolution of the Florida peninsula significantly shaped the limestone structure in the Floridan aquifer system (Florea 2008). Underlying the Cody Scarp region is the Peninsular Arch, a northwest trending geologic feature that controls solution channel orientation deep within the Ocala Limestone (Vernon 1951; Pirkle 1956; Faulkner 1973). Tensional stresses on the limestone structure here, sufficient to cause widespread vertical fracturing, have created a distinct intersecting system of underground faults called the Cross-County Fracture Zone. These fault systems can also include solution-enlarged fractures. Both fracture types contribute to the underground structure of Florida's karst terrain and are important controls in the orientation of solution channels, thereby influencing the development of groundwater circulation patterns (Miller 1986).

Historically, some of the geological formations in O'Leno State Park were altered by limestone mining. In addition, a mill was once located just upstream of the River Sink. The riverbed at the mill site has been significantly altered, as evidenced by the concentration of limestone boulders that has created an unnatural shoal there. No geologic disturbances of this magnitude are known to have occurred within River Rise Preserve State Park.

Soils

There are 28 soil types at O'Leno State Park and 34 at River Rise Preserve State Park. Addendum 4 contains complete descriptions of these soils. The complex hydrogeologic processes within the Santa Fe River basin have contributed to the evolution of the diverse soil types found within the two parks. Soils range from the well-drained sands of the uplands to the frequently flooded, hydric soils of the floodplains (see Soils Map). Soil mapping units with the letter "A" appended are located in Alachua County, while those with the letter "C" appended occur in Columbia County.

Soil disturbance and erosion from surface water runoff can be highly detrimental to the erosion prone, steep-sided banks of the Santa Fe River and to sensitive karst features throughout O'Leno/River Rise. Areas that are most likely to experience



O'LENO STATE PARK

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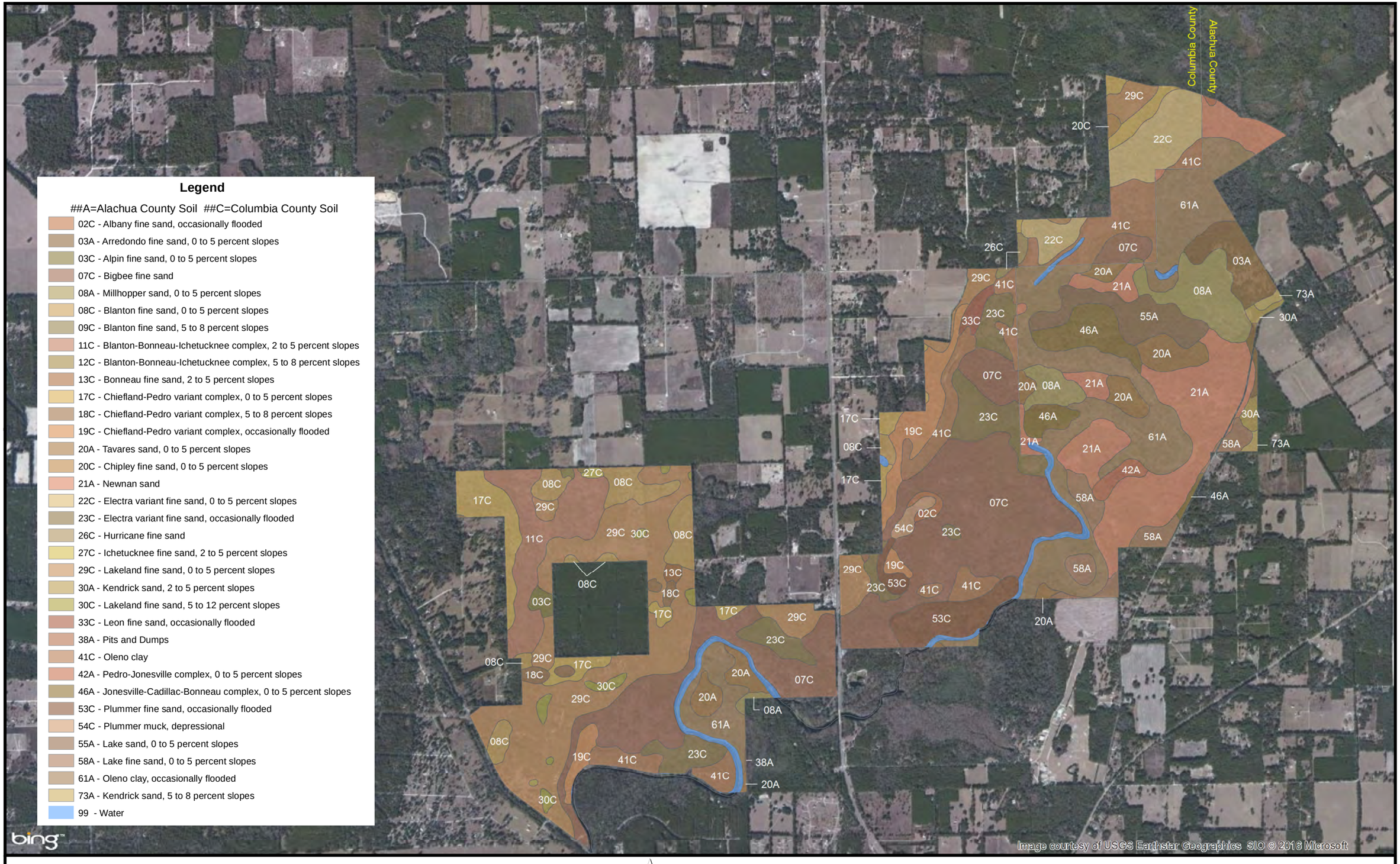
0 1,000 2,000 4,000 Feet

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

SOILS MAP



RIVER RISE PRESERVE STATE PARK

N

0 0.5 1 2 Miles

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

SOILS MAP

significant soil erosion include service roads, footpaths, and areas of high visitor use around karst features such as Santa Fe River Sink. In the past, foot traffic from visitors ascending or descending riverbanks had caused extensive localized erosion near both the River Sink and River Rise. Efforts to mitigate that erosion have included redesigning access routes, re-contouring eroded sites, restoring natural vegetative cover, and building bridges, boardwalks, and overlooks at appropriate locations. These efforts have been largely successful. Similar erosion, though less extensive, has occurred elsewhere in the parks along slopes above sinkholes and along lakes and streams that are easily accessible from park trails. Continual visitor-induced erosion on these slopes may eventually lead to serious degradation of resources. The DRP has attempted to improve protection of the more sensitive areas while still providing public access to some of the more popular features in the parks. Management will comply with best management practices to maintain existing water quality in the two parks, and park staff will continue to take appropriate action where needed to protect water resources from the impacts of significant soil erosion.

In the past decade, one of the more problematic soil erosion sites in O'Leno/River Rise has been along Bible Camp Road, which is an unpaved road along the north boundary of O'Leno State Park that provides public access to the Santa Fe River. Columbia County obtained an easement for the road from the state in the 1970s. The road terminates at a boat ramp on the river in the northeast corner of the park. Aerial photography over the years had documented that there was a significant accumulation of sand in the Santa Fe River where the road terminated, forming an artificial delta. Erosion of the unpaved road along its descent to the boat ramp appeared to be one of the main sources of the sand, while the unpaved parking area at the boat ramp was probably another contributor.

Yet another influencing factor was that the Santa Fe River just above the current boat ramp had been rerouted and channelized in the 1960s to accommodate placement of a bridge across the river for Interstate Highway 75. Widening of I-75 to six lanes in the 2000s required the installation of additional pilings. It is likely that the support pilings for the bridge altered upstream currents and caused additional scouring of the channel, thereby contributing to sediment buildup downstream (Skirvin 1962). Sedimentation also affected forested wetlands bordering the eastern end of Bible Camp Road. Starting in 2004, the Florida Park Service worked closely with Columbia County and Florida Fish and Wildlife Conservation Commission (FWC) officials to develop and implement a long-term restoration plan for the site which was designed to remove sediment deposits from the Santa Fe and mitigate the chronic erosion along the east end of the road that appeared to be causing most of the sedimentation. That project was completed in 2015.

Historically, farming and mining practices caused significant soil disturbances in various parts of what are now O'Leno State Park and River Rise Preserve State Park. Numerous borrow pits are distributed about both properties. Some of the pits may be of greater concern than others because they are located in or near features

of geologic or historic importance or within remnants of high quality natural communities.

Minerals

Limestone was mined at various quarry sites in the early 1900s, well before the state acquired the property. A large mine, probably for limerock extraction, was located north of the present-day Bible Camp Road. Limestone collected in the 1930s by the Works Progress Administration/Civilian Conservation Corps (WPA/CCC) was used in the construction of many of the WPA/CCC era buildings. Whether commercially valuable mineral deposits continue to exist in either of the two parks has not been determined.

Hydrology

O'Leno State Park and River Rise Preserve State Park are located in a hydrologically complex region of north-central Florida. The parks' most prominent hydrological features include the Santa Fe River, numerous karst windows, and a labyrinth of interconnected limestone fractures that make up a vast underground system of aquatic caves called the Old Bellamy Cave System (Poucher 2012). The parks straddle the Cody Scarp, one of the most recognizable hydrogeologic and topographic features in the state (Puri and Vernon 1964; White 1970; Upchurch 2002). Because of its location along the scarp, the O'Leno/River Rise landscape is dominated by an impressive array of sinkholes, sinkhole lakes, and swallets (Copeland 2003). The potential for contaminants in surface waters to pass through swallets directly into the Floridan aquifer and to degrade groundwater quality has numerous implications that will be discussed below in the Water Quality section (Macesich 1988; Means and Scott 2005).

The Santa Fe River is one of three major tributaries of the Suwannee River (Berndt et al. 1996). The Santa Fe River Basin is a 1,384-square mile watershed that occupies portions of nine Florida counties, from Clay County in the east to Gilchrist and Suwannee counties in the west (Clark et al. 1964). The headwaters of the river are located at Santa Fe Lake in the southeastern portion of the basin. The Upper Santa Fe River (above Olustee Creek and thus above O'Leno/River Rise) receives major surface water inputs from tributaries such as Sampson River, New River, Olustee Creek, and Rocky Creek. Below the Olustee Creek tributary, the Santa Fe River begins to cross the wide transitional Cody Scarp. As with most of the major streams that cross this scarp, a sizeable proportion of the river flow disappears underground into swallet openings and reemerges at various resurgence points after mixing with groundwater in the Floridan aquifer (Martin and Dean 2001; Upchurch 2002). In fact, groundwater inputs dominate the Lower Santa Fe system (below Olustee Creek). The base flow of the Santa Fe is derived principally from the Floridan aquifer (Meyer 1962; Meyer et al. 2008). The first major groundwater input is a historically first magnitude spring located just below the Olustee/Santa Fe confluence, appropriately named Santa Fe Spring (Hornsby and Ceryak 1998).

The Santa Fe flows generally westward in a sinuous pattern. Once the river enters the northeast corner of O'Leno State Park at I-75, it flows entirely through parklands until it reaches a point approximately 1.1 miles below the River Rise. From there downstream to U.S. Highway 27, riverfront property consists of state lands within River Rise Preserve State Park and a mixture of private holdings. After exiting the preserve, the Santa Fe eventually flows into the Suwannee River below the town of Branford.

The Santa Fe River is designated as a "Special Water" under Florida's Outstanding Florida Water Administrative Code (Chapter. 62-302.700[9][i][34], F.A.C.). Outstanding Florida Waters are those state waters with "exceptional recreational or ecological significance" (Chapter 62-302.700[3], F.A.C.). Water scientists have described the Santa Fe River system as one of Florida's most biologically diverse regions because of its unique position in the ecological landscape and the distinctly different geological characteristics in the upper and lower sections (SRWMD 2007).

In the Upper Santa Fe, stream flow is highly dependent on surface runoff, but there is some seepage input from the surficial aquifer as well. The surficial in this region has a well-defined confining unit that separates it from the Floridan aquifer below (Miller 1986). In contrast, groundwater inputs heavily influence river discharge in the Lower Santa Fe Basin (Clark et al. 1964). This region, which includes O'Leno/River Rise, is part of an extensive karst plain where the confining units are discontinuous or absent, especially within the western third of the watershed (Williams et al. 1977). In fact, during periods of low surface water flows, discharge from the River Rise consists almost entirely of groundwater, while the river below the Rise receives most of its water supply from springs such as Hornsby and Columbia and from small vents in the river bottom. Hydrologic models have identified as many as ten distinct springshed boundaries within the Santa Fe Basin, with the three largest spring groups in the contributing area being Ichetucknee, Gilchrist Blue, and Hornsby (Kincaid 2011; Upchurch et al. 2011). River Rise is actually the largest single "spring" in terms of total flow volume in the entire basin (Meyer et al. 2008).

Santa Fe Trace and Important Karst Features

Once the Santa Fe River passes under I-75 and enters O'Leno/River Rise, it begins to run a gauntlet of karst features that control its fate. Immediately downstream from I-75, the Santa Fe River experiences its first major subterranean diversion at the Vinzant Landing Swallet (Butt et al. 2007). During periods of low river flow, all of the Santa Fe can disappear underground at this swallet (Smith et al. 2002). Currently, it is unknown where these waters resurface. The volume of flow in the river, however, is usually more than sufficient to offset losses to the swallet and maintain surface flows past this first major obstacle. The Santa Fe must then flow across several significant limestone shoals in the riverbed before reaching the River Sink, its second major obstacle, where the remaining surface flow disappears underground. Similar stretches of limestone shoals are located between River Rise and the U.S Highway 441 bridge, and just below the bridge.

The River Sink is a 36-meter deep sinkhole where the entire Santa Fe River disappears underground (Ellins and Hisert 1991; Ellins and Hisert 1993; Hisert 1994). The river then flows through a massive subsurface conduit system for several miles before resurfacing at River Rise, now considered by hydrologists to be a first magnitude spring (Scott et al. 2004; Upchurch et al. 2011). The area between the River Sink and River Rise, usually called the O'Leno Natural Bridge but also known as the Santa Fe Trace (Martin and Dean 2001), is a six-mile long landscape feature that follows a meandering course along low elevation topographic contours (Meyer 1962; SRWMD 2010a). During extreme flood events when the volume of water entering River Sink exceeds its capacity, excess water flows overland, flooding a normally dry floodplain along its entire length down to the underground river's resurgence point at the Rise. Significant flood events throughout the entire Natural Bridge area happen periodically, with the most recent occurrences in July 2012 after Hurricane Isaac, in August 2008 after Tropical Storm Fay, and in September 2004 following three significant tropical events (District 2 files). Overland flow also occurred in 1999 during the rains associated with Hurricane Floyd (Park Manager Morgan Tyrone, personal communication).

The Natural Bridge (i.e., Santa Fe Trace) encompasses an area of active karst solution that contains numerous surface water bodies (i.e., karst windows) connected to the Upper Floridan aquifer (SRWMD 2010a). By 2012, cave divers had documented nearly 50 different karst windows (sinkhole lakes) at O'Leno/River Rise. Many of these have names such as Ogden Pond, Ravine Sink, Parener's Branch Sink, Small Sink, New Sink, Jim's Sink, Two Hole Sink, Jug Lake, Sweetwater Lake and Downing Lake (Martin and Dean 2001). Surface water levels in these karst features often fluctuate with the rise and fall of the Upper Santa Fe River. If the Upper Santa Fe receives above average rainfall or input from a substantial tropical system, these sinkhole lakes can also exceed their capacity and contribute to overland flow through the Santa Fe Trace. Most of these karst features lie along the trace of the former stream valley, and several provide direct access to the Old Bellamy Cave System.

The Old Bellamy Cave System is world renowned for its complexity. It ranks in the top 100 in the world for length, and is the fourth longest in Florida (Gulden and Coke 2012). Certified cave divers began to explore the depths of the system in the early 1980s, and they have made substantial contributions to our knowledge of the subterranean conduits. By 2012, divers had mapped nearly eight miles of conduits within the Bellamy system (Poucher 2012). Several of the karst windows within the Santa Fe Trace are linked by underground conduits, and connections between them have been verified, including Two Hole Sink to Sweetwater Lake, and Sweetwater to Downing Lake, and then on to the River Rise. A large conduit system feeds into the park from the east as well (Butt et al. 2006). Divers have also nearly finished establishing that there are additional conduits that connect the River Sink in the north with the Two Hole Sink area to the south.

Of interest is the sheer number of karst window openings that exist in the upper Santa Fe Trace. Karst windows above Two Hole Sink are far more abundant than below it. One example is an unusual, intermittent spring-run stream, Dog Leg Sink,

located in zone OL-1De in the upper part of the Santa Fe Trace. This feature consists of three separate sinks, two that act as resurgence points for the Santa Fe River and one located several hundred feet below them that acts as a swallet. This is one example where the Santa Fe resurfaces and subsequently siphons into the ground again, all within a very short distance. There are similar swallet and resurgence features directly within the Santa Fe riverbed below the River Rise. For example, a siphon called River Rise State Park Suck connects directly with Treehouse Spring, which is a resurgence point immediately downstream and is part of the Hornsby Spring complex (Butt et al. 2006). Another similar swallet, Alligator Siphon, is located in the lowest portion of River Rise Preserve. This swallet is estimated to take in river water at nearly 200 cubic feet per second (cfs) (Butt et al. 2007). The resurgence point of this swallow hole is Alligator Rise, located about 750 feet upstream of the U.S. Highway 27 Bridge (Butt et al. 2007).

Dye trace research is an important hydrological tool used to establish a definitive groundwater connection between two surface water bodies (Aley 1999; Skiles et al. 1991). Using this technique, one study in 1994 revealed that there were connections between the River Sink and River Rise through the Bellamy Cave System (Hisert 1994). This work, in conjunction with cave mapping, has since confirmed the existence of extremely large conduits (nearly 80 feet wide) beneath the Santa Fe Trace that transport a mixture of surface water and groundwater an estimated three miles per day from the River Sink to the Santa Fe's resurgence at River Rise. Water scientists now know that not only is flow through this system rapid, but it can also vary significantly and it is highly dependent on river stage (Smith et al. 2002; Screaton et al. 2004). Dye trace work in the Santa Fe Basin has provided scientists with an increased understanding of surface/groundwater connectivity (Hisert 1994; Hirth 1995; Kincaid 1998), springshed delineation (Upchurch et al. 2011), and transport of surface contaminants within the Floridan aquifer (Macesich 1988; Martin and Gordon 2000).

When a water body such as the Santa Fe disappears into a swallet, surface waters and groundwater mix. The mixture can subsequently return to the surface as a resurgence having a chemical signature with characteristics of both sources (Martin and Dean 2001). Since the early 1990s, a number of University of Florida scientists have investigated these complex surface/groundwater/limestone matrix interactions within the Floridan aquifer of this region (Martin and Screaton 2001; Martin 2003; Ritorto et al. 2009; Bailly-Comte et al. 2010; Moore et al. 2010). From this work, the scientists have deduced that, during low flow conditions, the eastern conduits of the Bellamy Cave System (i.e., Alachua Stream System) and the Floridan aquifer matrix both provide large contributions of resurgence water to the River Rise (Martin and Dean 2001). It is only during high river flows that surface water contributions, predominantly derived from the River Sink, surpass those of groundwater. It is important to note, however, that deep-water upwelling from the Upper Floridan aquifer is the primary source of the Bellamy system (Moore et al. 2009).

Because of dye trace evidence and extensive cave mapping, water scientists are now confident that significant connectivity exists between the Lower Santa Fe River

and surface water and groundwater sources (Alachua Stream System) in western Alachua County (Meyer 1962; Martin and Screaton 2001; Moore et al. 2009). The Alachua Stream System is one of the most recognizable and highly researched internally-drained swallet regions in the state (Foose 1981; Williams et al. 1977). This region corresponds strongly with an underground parallel fault system of significantly fractured limestone that runs along the Cody Scarp. The faulted formations make up the Cross-County Fracture Zone (Vernon 1951), which in Alachua County extends from the Santa Fe River southeast past Alachua Sink (at Paynes Prairie) to Orange Lake (Williams et al. 1977).

The valley of Olustee Creek in Columbia County follows a similar northwest-trending fracture zone that makes significant groundwater contributions to the springshed of the River Rise (Meyer 1962; Upchurch et al. 2011). Surface waters in more than 70 square miles of western Alachua County internally drain into the Floridan aquifer by way of numerous swallets all along this unique fracture zone (Foose 1981; Hoenstein and Lane 1991). Parener's Branch is one example of such an internally drained, stream-to-sink creek system. It is directly connected to the Bellamy Cave System at Parener's Branch Sink in the upper portion of the Santa Fe Trace.

One of the best examples of an internally drained system in the Lower Santa Fe region is Cellon Creek, which empties into Lee Sink in San Felasco Hammock Preserve State Park near Alachua. Recent dye trace work has confirmed that there is a direct underground connection between Lee Sink and the Lower Santa Fe River in River Rise Preserve near the Hornsby Spring complex (Butt et al. 2006).

Water Quantity

Given the complexities of the surface water and groundwater interactions at O'Leno/River Rise, it may be best to consider them in terms of "flow in" and "flow out." Long-term records for Santa Fe River discharge at O'Leno/River Rise are somewhat lacking; however, there is a significant but scattered amount of other surface water data available for a variety of locations throughout the Santa Fe Basin (Hunn and Slack 1983; Franklin et al. 2000; USGS 2012; SRWMD 2012).

In terms of "flow in," about 33% of the median flow of the Santa Fe River above O'Leno is derived from two primary sources, Olustee Creek and Santa Fe Spring (SRWMD 2010a). An additional 58% comes from the Upper Santa Fe River upstream from the Olustee tributary. As of 2012, real-time river level gages had been installed on many of the major tributaries of the Upper Santa Fe (SRWMD 2007; SRWMD 2012). From 1961 to 2012, based on 4448 measurements, the average total discharge of the Santa Fe entering O'Leno at I-75 was 253 cfs (USGS 2012; SRWMD 2012). The maximum instantaneous flow ever recorded at this location was 10,500 cubic feet per second (cfs) during the passage of Hurricane Ivan on September 10, 2004. In 2010, a new river level gage was installed on the Santa Fe just below the Bible Camp Road boat ramp and above Vinzant Landing Swallet (Gage #023218980).

It is important to understand that the quantity of surface water flowing into O'Leno/River Rise appears to have decreased gradually over time. Evidence for this is the increased frequency with which the entire Santa Fe River has drained into Vinzant Landing Swallet over the past two decades. O'Leno staff members have obtained evidence of this trend by documenting the periods during which the Santa Fe riverbed has been dry below the swallet (District 2 files). Even though there is some mention of the Vinzant Landing Swallet in professional publications, there is no apparent record of complete river capture at this swallow hole until the major drought of 1998 (Bridges and Franklin 1991). Since that time, O'Leno has documented four distinct periods of total river capture at the swallet. The relatively frequent recurrence of dry riverbed between the Vinzant Swallet and the River Sink during this 14-year period appears to be significant and deserves closer investigation.

Although very few discharge records exist for the River Sink swallet, the park does regularly document river levels just upstream of the River Sink at the O'Leno suspension bridge (District 2 files). In fact, the park manager uses river level measurements as a reference in making decisions about swimming area closures at the park. During periods of very low flow when the Vinzant Swallet completely captures the Santa Fe River well upstream of the swimming area, the river level at the suspension bridge ranges between 32.50 and 33.50. The water is stagnant during these low flow periods and becomes unsuitable for swimming activities.

River Rise is classified as a first magnitude spring even though some of its discharge is a known resurgence of the Santa Fe River (Hunn and Slack 1983; Upchurch et al. 2011). In fact, of the 68 named springs in the Santa Fe Basin, nine of which are historically first magnitude, River Rise is the largest (SRWMD 2010a). As described earlier, the Rise represents a combination of both surface water from the River Sink and groundwater from the Upper Floridan (Moore et al. 2009). The median total discharge at the Santa Fe River Rise is approximately 406 cfs (SRWMD 2012). A maximum discharge of 3,263 cfs was measured in April 1984. The springshed of the River Rise has not been precisely determined, but apparently its overall area of influence does not have a significant capture area, which is common for resurgence springs (Upchurch and Champion 2004; Upchurch et al. 2011). In general, the River Rise Springshed has several significant inputs including the River Sink, the Bellamy Cave System, deeper-aged waters of the Upper Floridan, groundwater from western Alachua County (i.e., Alachua Stream System), and even some contribution from the lower reaches of Olustee Creek to the north (Meyer et al. 2008; Upchurch et al. 2011).

An important discharge/river level station downstream from the River Rise is at the U.S. Highway 441 Bridge (Site #02321975). SRWMD and Florida Department of Environmental Protection (FDEP) personnel monitor this site as a Temporal Variability Monitoring location (FDEP 2012c). From 1992 to 2010, the average total discharge (6,556 measurements) of the Santa Fe as it passed under the Highway 441 Bridge was 410 cfs (Franklin et al. 2000; USGS 2012). A maximum flow of 9,150 cfs was recorded at this station in February 1998, but it is important to note

that toward the end of the extreme drought of 2001-02, flow at this station was not measurable for at least 3 months (SRWMD 2012). The period of record for monitoring river levels at the U.S. Highway 441 site is from 1932 to present.

The Upper Floridan that underlies the O'Leno/River Rise region is an extremely important source of groundwater input to the Lower Santa Fe River. The quantity of water in the Old Bellamy Caves below the Natural Bridge is significantly dependent on the eastern conduit systems that feed them, including the Alachua Stream System (Williams et al. 1977). Any interruption of flow from the eastern conduits to the intricate Bellamy cave system can have noticeable consequences throughout the watershed. For example, groundwater consumptive use associated with the Murphree Wellfield in the City of Gainesville has created a significant "cone of depression" or drawdown of the Upper Floridan in that region (Mercer et al. 2007). Scientists in the early 1960s were the first to discover a potentiometric low there and interpret it as a direct contributor to significant groundwater declines (Clark et al. 1964). That localized drawdown may have been been influencing Santa Fe River levels for a long time, and consequently water resources at O'Leno/River Rise as well.

Water management experts now acknowledge that there has been a significant lowering of the Floridan aquifer in parts of north Florida (Grubbs and Crandall 2007; Gao et al. 2010; Renken 2011). Water managers understand that springshed boundaries can change naturally over time, but they also recognize that consumptive use and contamination of groundwater within springsheds can be detrimental to the springs within them (Upchurch and Champion 2004). Recent research has revealed that a significant area of groundwater supply in the eastern part of the SRWMD, considered a groundwater divide of sorts between the SRWMD and the SJRWMD, has declined to the extent that a westward shift in groundwater potentiometric contours has occurred (Grubbs and Crandall 2007; Grubbs 2011). In other words, the groundwater divide between the two districts has migrated further west. East of the divide, groundwater now tends to flow in an easterly direction rather than westerly toward the Upper Suwannee Basin. It is unknown at this time whether the shift in location of the divide will negatively affect groundwater resources in the Santa Fe Basin.

Many water management experts believe that a combination of factors such as the current long-term drought and increased consumptive use of groundwater have caused a significant lowering of water tables and decreased spring flows in north Florida (Swihart 2011; Still 2010). Climate driven events, such as drought cycles or seasonal rainfall inputs, may partially explain natural variation in river levels (Kelly 2004). However, in Florida it has been well documented that depletion of freshwater reserves by permitted consumptive uses (e.g., groundwater mining) can result in significant declines in the aquifer and subsequent natural system failures (Bacchus 2006; SWFWMD 2006; Bacchus et al. 2011).

In 2007, the SRWMD finalized the Minimum Flows and Levels (MFL) standard for the Upper Santa Fe River (SRWMD 2007). Following that, in October 2011 the SRWMD designated several areas within its regulatory boundary as "Water

Resources Caution Areas", including the Santa Fe River Basin (SRWMD 2010b). This designation means that groundwater sources in those areas are not adequate to meet future needs over a 20-year planning period. In fact, portions of the Upper Santa Fe River, including River Rise, were expected to show impacts from anticipated consumptive use as early as the year 2010.

Although the SRWMD is ultimately responsible for managing the MFLs it has established within its boundaries, it will nevertheless be important for the Florida Park Service to work with all stakeholders during the recovery and prevention process for the Upper Santa Fe (SRWMD 2007). In October 2011, the SJRWMD, SRWMD and FDEP signed an interagency agreement that outlined closer coordination in the management of north Florida water supplies. The two water management districts are now required to address the issue of decreased groundwater resources when they conduct district water supply planning activities (SRWMD 2010b; SJRWMD 2011). Long-term withdrawals in north Florida may have already affected water resources within O'Leno/River Rise. The SRWMD is the state agency responsible for issuing water use permits in the region, and in doing so, ensures 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, and they recommend that all freshwater consumptive use of the Floridan aquifer be tracked precisely (Kincaid 2011).

Water Quality

The main water quality issues that most influence the water resources at O'Leno/River Rise are regional groundwater contamination and erosion/sedimentation along the banks of the Santa Fe River and within sensitive karst features. As described above in the Soils section, erosion and sedimentation in the two parks are greatest in several areas along the Santa Fe River and around sensitive karst features such as River Sink, River Rise and Ogden Pond.

At present, there seems to be little danger that surface water runoff originating within O'Leno/River Rise itself will cause significant groundwater pollution in the parks' karst features. However, since the Floridan aquifer in the area is unconfined, park staff should always remain vigilant for possible sources of pollution. Highly vulnerable karst features within the park have the potential to funnel contaminated surface waters into high quality groundwater resources (Cichon et al. 2004).

Outside the park, there are numerous potential sources of groundwater pollution. Some of the most important possible sources of contamination are sinking streams along the Cross-County Fracture Zone, as described earlier. These internally drained streams can directly influence groundwater quality within the Santa Fe River, including areas within O'Leno/River Rise.

Water managers have long recognized that urbanized watersheds can create serious water quality issues (Best et al 1995; ACEPD 2008). Two Gainesville area sources of significant contaminant input that could eventually reach the Santa Fe River are Alachua Sink in Paynes Prairie Preserve State Park and Lee Sink in San Felasco Hammock Preserve State Park (Williams et al. 1977; Butt et al. 2006). Both of these sinking streams lie above the Cross-County Fracture Zone and could eventually contribute to groundwater contamination of the Santa Fe River. For many decades, effluent from Gainesville's Main Street Sewage Treatment Plant had discharged directly into Sweetwater Branch, which in turn flowed into Sweetwater Canal and thence to Alachua Sink (JEA 2009). In 2015, however, Gainesville Regional Utilities and the SJRWMD completed the Sweetwater Restoration Wetlands project, which features three wastewater/stormwater treatment cells located at the Sweetwater outfall onto Paynes Prairie. Sweetwater Canal, the direct conduit to Alachua Sink, was also filled in as part of the project. The result has been an almost total elimination of direct discharge to Alachua Sink and a significant reduction of its potential to contribute contaminants to the Santa Fe River system.

There is a vast set of water quality data available for a number of different locations throughout the Santa Fe River Basin (SRWMD 2012; Hornsby and Ceryak 1998; Scott et al. 2004; USGS 2012). Much of the hydrological information that has been collected, stored, and managed by state water management agencies can now be accessed through a variety of web-based filters (USGS 2012; SRWMD 2012; FDEP 2012a; FDEP 2012b).

State water managers have monitored groundwater quality in numerous types of wells over the past 25 years. Near O'Leno/River Rise, 80 different wells are an integral part of a mechanism to track groundwater quality in the area (FDEP 2012a). Some of the wells are associated with Very Intense Study Area (VISA) monitoring, while others have served to document changes associated with known contaminated sites (Maddox et al. 1998). The Division of Water Resource Management in FDEP monitors at least five types of contaminated groundwater wells within the O'Leno/River Rise region, including Storage Tank Contamination wells, STORET wells, Class V wells, Background Monitoring wells, and VISA wells. In the City of Gainesville, approximately 16 miles southeast of O'Leno/River Rise, there are at least 19 VISA wells that monitor contamination of the Upper Floridan aquifer. Additionally, there are at least 35 groundwater monitoring wells located near O'Leno that provide a background data set for the intermediate, upper, and lower Floridan aquifers. Finally, the SRWMD and FDEP are cooperatively conducting a long-term trend analysis at the U.S. Highway 441 Bridge on the Santa Fe River (FDEP 2012c).

Nitrogen enrichment has contaminated much of the upper Floridan aquifer in the northern part of the state. Nitrates specifically have increased by an order of magnitude or more over the past 50 years (Cohen et al. 2007). Human activity, especially the use of inorganic fertilizers, has long been the leading cause of this enrichment, and it may be particularly detrimental to the River Rise Springshed. Groundwater contamination from high nutrient loading has already significantly influenced the ecological health of several river and spring ecosystems across the

state (Cohen et al. 2007; WSI 2010). Studies suggest that one of the primary water quality issues within groundwater and karst systems is unhealthy levels of nitrate-nitrogen (Jones et al. 1996).

Nitrate concentrations (NO3 as N) measured at the U.S. Highway 441 Bridge on the Santa Fe River have ranged from 0.01 mg/L to 3.02 mg/L (July 1993), with an average of 0.24 mg/L (FDEP 2012b). These levels are far below the concentrations found at many spring ecosystems in the state (Harrington et al. 2010). As of 2007, apparently much of the Upper Santa Fe River Basin, including areas within O'Leno/River Rise, showed a decreasing trend for nitrate levels (Upchurch et al. 2007). However, the discharge of the Lower Santa Fe River has a much greater groundwater influence, and therefore nitrate trends tend to increase the further downstream one goes towards the mouth of the Santa Fe. Naturally occurring background levels for nitrates should be less than 0.01 mg/L (Cohen et al. 2007). In 1996, the FDEP initiated a formal, statewide monitoring program for surface waters and groundwater, including those within the Santa Fe River Basin (Maddox et al 1992; FDEP 2005; FDEP 2009). This Integrated Water Resource Monitoring Program (IWRMP) takes a comprehensive watershed approach based on natural hydrologic units. The 52 hydrologic basins in Florida are on a five-year rotating schedule that allows water resource issues to be addressed at different geographic scales (Livingston 2003). In addition, the IWRMP assigns a water body identification number (WBID) to each water body. 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's basin status report for this region, several streams within the Upper Santa Fe River Basin, including the Santa Fe River, New River, Sampson Lake, Rocky Creek, and Parener's Branch, all became potentially impaired water bodies in 2003 because of excessive nutrients, total coliform bacteria, high mercury levels, or low dissolved oxygen (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 (IWR, Chapter 62-303, F.A.C). 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. The compliance process started with assigning a TMDL for each polluted system; that occurred in 2008 (Hallas and Magley 2008). In 2011, a Basin Management Action Plan (BMAP) for the Santa Fe River Basin was completed (FDEP 2012d).

Natural Communities

This section of the management plan describes and assesses each of the natural communities found in the state park. It also describes of 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 management objectives and actions for natural community management, exotic

species management, imperiled species management and 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) (FNAI 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 linking natural communities across the landscape.

O'Leno State Park and River Rise Preserve State Park contain 21 distinct natural communities as well as 8 different altered landcover types (see Natural Communities Map). A list of plants and animals known to occur in the two parks 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 in north Florida will include partridgeberry (*Mitchella repens*), brittle maidenhair fern (*Adiantum tenerum*), netted chain fern (*Woodwardia areolata*), jack-in-the-pulpit (*Arisaema triphyllum*), southern shield fern (*Thelypteris kunthii*), and various species of panicgrass (*Panicum* spp.). Other rare fern species may also occur on limestone outcrops.

Description and Assessment: As might be expected given their location amidst the karst landscape of the Cody Scarp, both O'Leno State Park and River Rise Preserve State Park contain numerous limestone exposures. These occur as limestone outcrops situated along the sides of sinkholes and along traces of former river channels, and as large limestone boulders scattered about certain areas of

hardwood and bottomland forest. The most accessible outcrop of appreciable size occurs at a sinkhole along the Limestone Trail in O'Leno State Park. The largest outcrop appears to be one located along the edges of a sinkhole north of Bible Camp Road where a limestone exposure was once quarried. Another prominent outcrop is associated with a terrestrial cave located along the upper edge of a floodway southeast of Sweetwater Lake. Perhaps the greatest concentration of limestone outcrops occurs within a small tract of upland hardwood forest in zone 3D. Due to their limited size and erratic distribution, only selected examples of limestone outcrops and boulders are included on the natural community maps for the two parks.

The limestone outcrops in the two parks are considered to be in good to excellent condition. Most are located well away from trails or roads or are screened from public view by abundant vegetation or undulating terrain. There are no apparent threats from exotic plant infestations at this time. Rare or imperiled plant species recorded at limestone outcrop or boulder sites in O'Leno/River Rise include plume polypody (*Pecluma plumula*) and modest spleenwort (*Asplenium verecundum*).

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

Mesic Flatwoods

Desired Future Condition: In the typical mesic flatwoods of north Florida, the dominant pine will usually be longleaf pine (*Pinus palustris*). Native herbaceous groundcover will cover at least 50% of the area at a height of less than three feet. Saw palmetto (*Serenoa repens*) will comprise no more than 50% of the total shrub cover, also at a height of less than 3 feet. Other shrub species may include gallberry (*Ilex glabra*), fetterbush (*Lyonia lucida*), runner oak (*Quercus elliottii*), dwarf live oak (*Quercus minima*), shiny blueberry (*Vaccinium myrsinites*), and dwarf huckleberry (*Gaylussacia dumosa*). These shrubs will generally be knee-high or less in height. Few if any large trunks of saw palmetto will run prostrate along the ground. The optimal fire return interval for this community is two to three years.

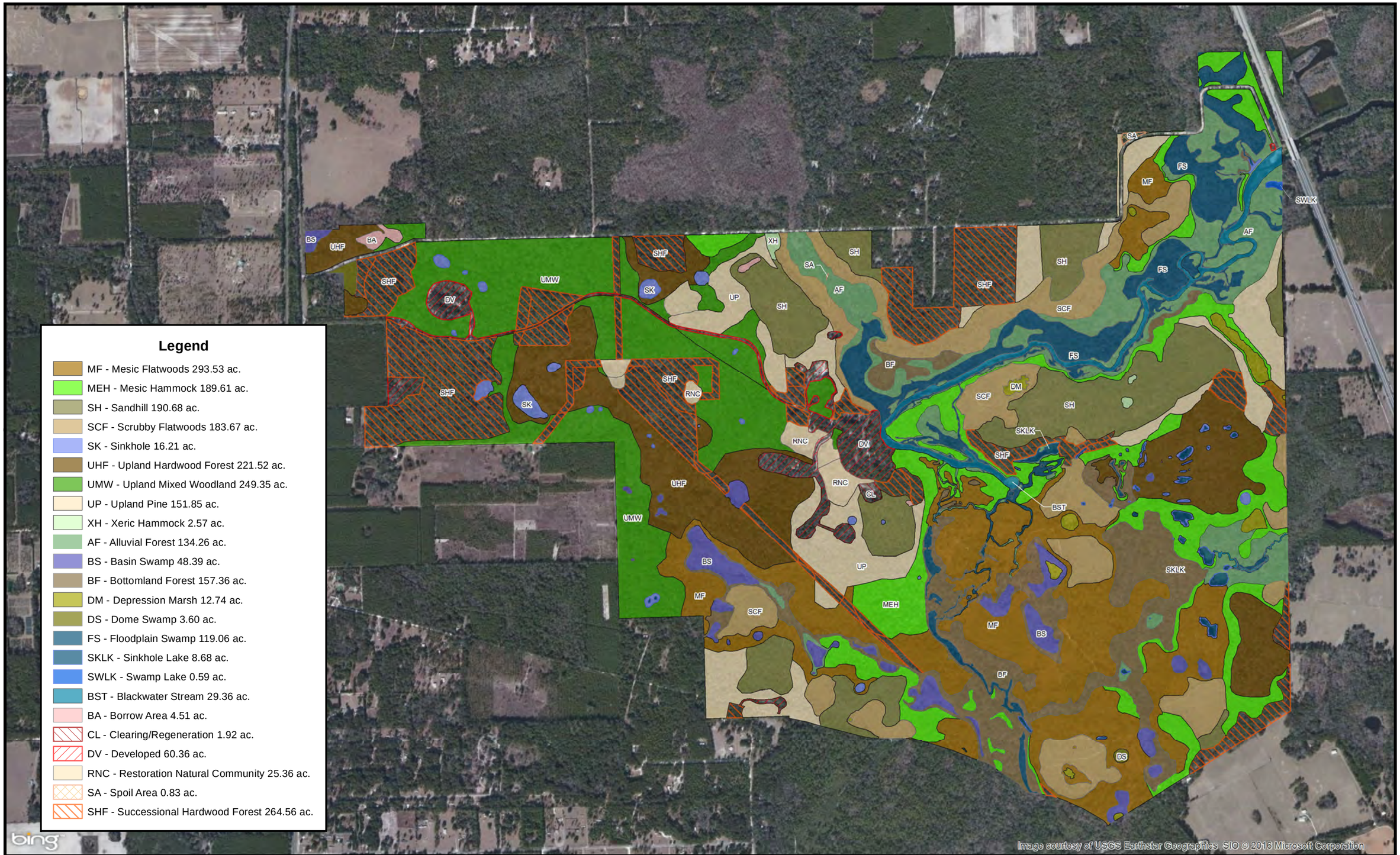
Description and Assessment: The mesic flatwoods community at O'Leno/River Rise occurs primarily within the Natural Bridge area between the River Sink and River Rise, at slightly higher elevations than the adjacent bottomland and alluvial forest communities. Because of past periods of fire suppression, particularly prior to state acquisition of the River Rise property, this community is now more overgrown with

woody shrubs and saw palmetto than it would have been under a natural fire regime. Invasion by offsite hardwoods such as laurel oak (*Quercus laurifolia)* and water oak (*Quercus nigra*) is a problem at many sites. At some of these sites, succession has perhaps proceeded past the point of no return. In these areas, the natural community now resembles either young mesic hammock or an altered landcover type called successional hardwood forest. Substantial effort would be required to restore the mesic flatwoods that originally existed there. In some parts of O'Leno/River Rise, the mesic flatwoods community seems to merge almost imperceptibly with areas of bottomland or alluvial forest that occupy slightly lower elevations, forming an intermediate community type that most closely resembles mesic hammock. It may be that the intermittent, but profound, influence of Santa Fe floodwaters inundating the Natural Bridge has favored development of mesic hammock where mesic flatwoods would ordinarily have predominated.

The condition of the various patches of mesic flatwoods at O'Leno/River Rise ranges from poor to good, depending on the land use practices they experienced in the past as well as their frequency of burning or lack thereof. However, the majority of the flatwoods is in the poor to fair category. Although O'Leno State Park has been under state management since the 1930s and some burning was accomplished during the early decades, most of the prescribed burns in those years targeted sandhill areas. Dedicated burning of the mesic flatwoods at O'Leno did not begin in earnest until the 1980s. The same holds true for the flatwoods at River Rise Preserve. Presently, zones OL-1De and OL-1G in O'Leno contain some areas of good quality mesic flatwoods, although the pine canopy is still inadequate due to past timbering practices.

Logging, turpentining, and farming operations during previous centuries depleted, or sometimes even eliminated, some of the natural components of the mesic flatwoods at O'Leno/River Rise, particularly the dominant stands of mature longleaf pines. Outbreaks of southern pine beetles in the mid-1990s and the accompanying control efforts, which included several large clear cuts, have greatly modified the tree canopy within several areas of mesic flatwoods. Offsite loblolly pines (*Pinus taeda*) bore the brunt of the beetle infestations, but many slash pines (*Pinus elliottii*) and longleaf pines were also killed by beetles or were logged to control the spread of the beetles. In spring 2001, additional outbreaks of southern pine beetles were recorded. Salvage logging of the new infestations took place in early summer of 2001.

General Management Measures: Restoration of previously logged areas has proceeded steadily, mainly through the use of prescribed fire, the cutting and chipping of offsite hardwoods, and the planting of containerized longleaf pines. Any additional clear-cuts in the mesic flatwoods will require replanting with longleaf pines. In most cases, slash pines will seed in naturally from surrounding areas. Regular prescribed fire will ultimately determine the distribution and relative abundance of longleaf and slash pines within the mesic flatwoods. Most of the mesic flatwoods in the two parks will require much more frequent burning if their condition is to improve, supplemented by offsite hardwood removal and replanting with appropriate flatwoods species.



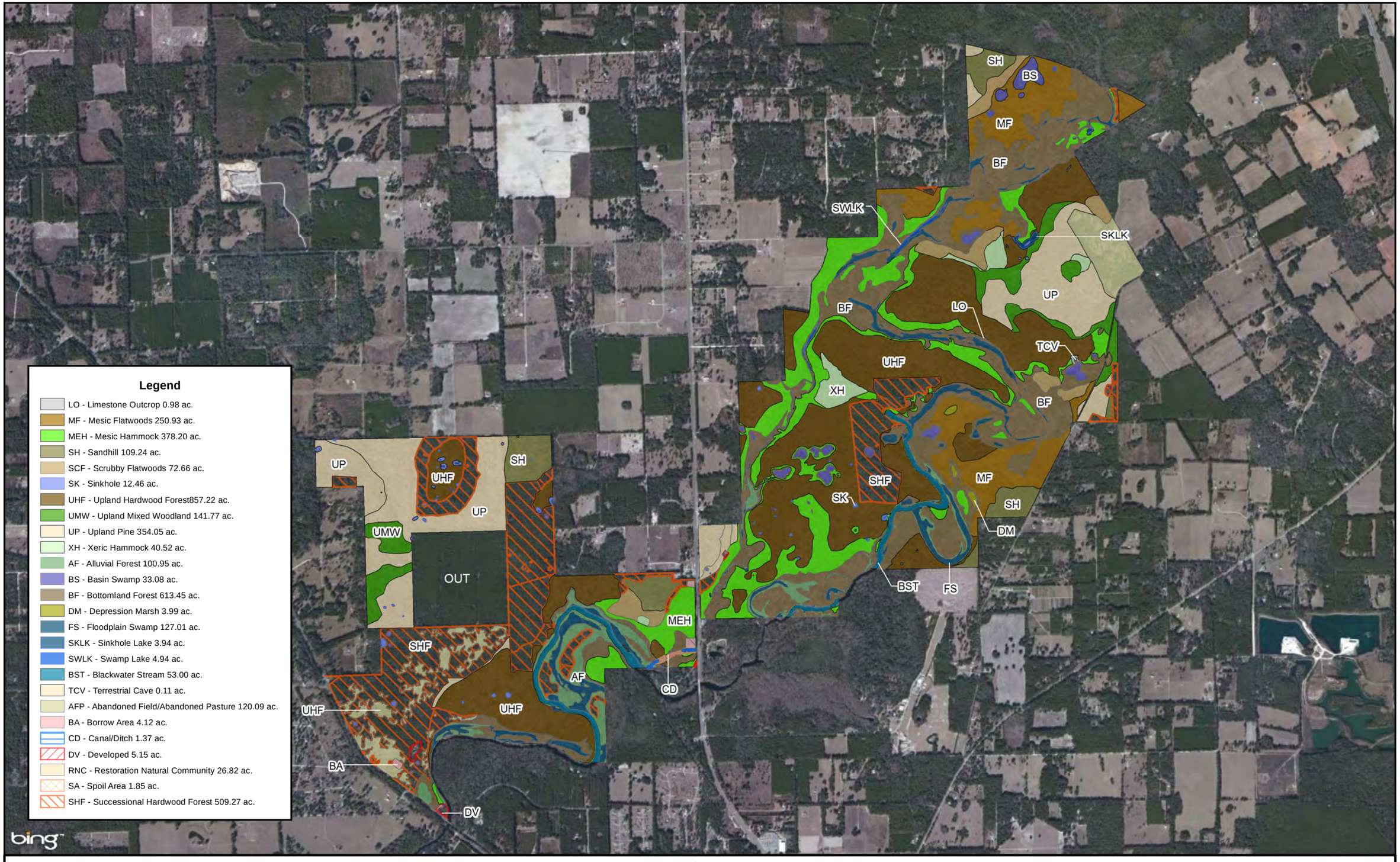
O'LENO STATE PARK

N

0 1,000 2,000 4,000 Feet

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

NATURAL COMMUNITIES
EXISTING CONDITIONS MAP



RIVER RISE PRESERVE STATE PARK

N

0 0.5 1 2 Miles

Florida Department of Environmental Protection
Division of Recreation and Parks
Date of aerial: 2010

NATURAL COMMUNITIES
EXISTING CONDITIONS MAP

Mesic Hammock

Desired Future Condition: Mesic hammock is a well-developed evergreen hardwood and/or palm forest that can occur, with variation, through much of peninsular Florida. Live oak (*Quercus virginiana*) will typically dominate the canopy, which is often dense. Cabbage palm (*Sabal palmetto*) may be intermixed in the canopy and in the understory as well. In north Florida, southern magnolia (*Magnolia grandiflora*) and pignut hickory (*Carya glabra*) will often be components in both the canopy and subcanopy, with laurel oak (*Quercus laurifolia*) and water oak (*Quercus nigra*) occurring 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*), coastalplain staggerbush (*Lyonia fruticosa*), highbush blueberry (*Vaccinium corymbosum*), and sparkleberry (*Vaccinium arboreum*). The groundcover may be sparse and patchy, but it will generally contain panicgrasses (*Panicum* spp.), switchgrass (*Panicum virgatum*), and sedges, as well as various ferns and forbs. Vines and epiphytes will be abundant on live oaks and on the cabbage palms and other subcanopy trees. Mesic hammocks will generally have sandy soils with some organic materials mixed in, and there may be a thick layer of leaf litter at the surface. Mesic hammocks are rarely inundated and are not considered fire-adapted communities; typically, they are shielded from fire.

Description and Assessment: The several varieties of mesic hammock found at O'Leno/River Rise usually occur on slopes or plateaus above bottomland forest or alluvial forest. Perhaps the most common variety occurs in the narrow ecotone between wetland and upland natural communities. A typical example would be the strip of mesic hammock that separates sandhill or upland pine from bottomland forest, alluvial forest, or floodplain swamp along the Santa Fe River in zones OL-1A and OL-1C. Development of mesic hammock in such areas may have been caused by inadequate fire frequency, perhaps a result of direct suppression. Another variety of mesic hammock at O'Leno/River Rise occupies "islands" of higher ground within floodplain communities associated with the Santa Fe River (e.g., at the far western end of zone OL-1C), while yet another variety occurs on river levees. The latter two are similar in that they are located where landscape characteristics may greatly hinder the spread of fire from nearby fire-dependent communities.

Dominant canopy species in the more mature areas of mesic hammock at O'Leno/River Rise include laurel oak, water oak, southern magnolia, pignut hickory, and live oak. The live oaks are widely scattered and less common than the other dominants. Cabbage palm may be virtually absent. Common understory species may include saw palmetto, ranging in density from moderate to high, coastalplain staggerbush, sparkleberry, deerberry (*Vaccinium stamineum*), highbush blueberry, red bay (*Persea borbonia*), American holly, and horse sugar (*Symplocos tinctoria*). Groundcover is sparse, with bracken fern (*Pteridium aquilinum*) and low panic grasses (*Panicum* spp.) occasional.

Younger mesic hammock at O'Leno/River Rise may be difficult to distinguish from successional hardwood forest that has developed because of fire exclusion in mesic flatwoods. Canopy pines in the mesic hammock, however, are usually infrequent,

and they typically are loblollies, not the slash or longleaf pine survivors that might be expected in fire-excluded mesic flatwoods. Laurel oak, water oak, and sweetgum (*Liquidambar styraciflua*), generally 25-35 years in age, and dense saw palmetto are the dominant species in young mesic hammock.

Forested areas at O'Leno/River Rise, both upland and wetland, endured many decades of consumptive use before the state acquired the properties. The mesic hammock was not exempt from these activities. Additional disturbances caused by logging to control southern pine beetle outbreaks have reduced some mesic hammock areas to poor condition. Fortunately, the majority of the mesic hammock has proven quite resilient, and currently it is in fair to good condition.

General Management Measures: Little active management of mesic hammock is required beyond control of feral hog populations and periodic surveys for invasive exotic plants. Even for areas heavily disturbed by pine beetle outbreaks, the objective will be to allow a natural return to mature mesic hammock. 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 the sandhills of north Florida will be longleaf pine (*Pinus palustris*). Herbaceous cover, dominated by wiregrass (*Aristida beyrichiana*), will be 80% or greater and reach a height of less than three feet. In addition to the characteristic groundcover species and longleaf pines, the sandhill community will contain scattered individual trees, clumps, or ridges of onsite oak species such as turkey oak (*Quercus laevis*), sand post oak (*Quercus margaretta*), and bluejack oak (*Quercus incana*). In old growth conditions, sand post oaks will commonly be 150-200 years old, and some turkey oaks will be over 100 years old. The optimal fire return interval for this community is two to three years.

Description and Assessment: Dominant canopy species in the O'Leno/River Rise sandhill community include longleaf pine, turkey oak and sand post oak. The understory consists of younger individuals of the same species, supplemented by widely scattered sand live oaks (*Quercus geminata*). Sparkleberry and deerberry are representative shrubs, and saw palmetto is occasional. Wiregrass dominates the abundant groundcover, which also contains pineywoods dropseed (*Sporobolus junceus*), bracken fern, and various forbs typical of sandhills. At O'Leno/River Rise, the sandhill community often grades into upland pine, which in some cases forms a broad ecotone between the sandhills and more mesic communities such as upland mixed woodland or upland hardwood forest. The dominance of turkey oaks over southern red oaks typically defines the boundary between sandhill and adjacent upland pine or upland mixed woodland communities.

The distribution of the sandhill community at O'Leno/River Rise seems to coincide with that of the excessively drained soils in the two parks, namely Lakeland fine sand, Lake sand and Lake fine sand. Those soils are unevenly distributed owing to the dynamic nature of the hydrogeologic processes that have shaped the area. The

result is that most of the sandhills at O'Leno/River Rise occur in isolated, relatively small 15-100 acre patches, often with expanses of closed canopy hardwood forest segregating one patch from another. The fact that the sandhill patches vary significantly in quality reduces their effective size. For example, past fire exclusion and suppression have encouraged the spread of invasive offsite hardwoods into areas that formerly were open sandhill, in effect shrinking available living space for species requiring broad expanses of open pineland.

The sandhill community at O'Leno/River Rise ranges in condition from poor to excellent. Several of the better quality sandhill areas are located within O'Leno State Park. The Florida Park Service has maintained these areas with fire since at least the 1950s, at first using limited winter burning, and later initiating lightning season burns. The park's burn records are somewhat vague or lacking for dates before 1970. The sandhills in zone OL-1Js, south of the Group Camp, and in zones OL-1Qe, OL-1X, and OL-1Y, north and west of the shop complex, have been recorded as burning regularly since at least the early 1970s. These areas are considered to be in good to excellent condition. They each have a diverse groundcover with abundant wiregrass. In several of the sandhill patches, however, the core area may be in relatively good condition, but the adjoining sandhill is in poor to fair condition due to the location of traditional firebreaks and other landscape disturbances as noted below. Despite this, the increased use of natural firebreaks at O'Leno/River Rise rather than traditional hard breaks has significantly expanded the sandhill acreage currently managed by fire.

Numerous traces of old firebreak/fire plow lines remain visible in the sandhill landscape today, often occurring near ecotones between sandhills and adjacent communities. These abandoned fire lines have essentially segregated significant areas of sandhill from the main body of the community. To a certain extent, the fire lines still fulfill their original fire prevention function, but the unfortunate outcome today is that they often hinder prescribed fires from reaching all the sandhill areas in a zone.

There are many other examples of fragmentation of sandhill habitat at O'Leno/River Rise. A number of historic roads cut through the parks, including those that crisscross the Natural Bridge area. Other roads were pushed through the O'Leno sandhills during early days of the Civilian Conservation Corps and the Florida Park Service. Although a substantial number of these roads are no longer in use, traces of their original tracks persist at a number of sites. Finally, logging outfits operating in the River Rise property prior to state acquisition constructed skid trails and roads throughout the sandhills, causing additional extensive fragmentation. All of these old roads, trails, and plow scars have not only continued to act as firebreaks but have also created multiple edges where fire intensities are typically lower, resulting in the proliferation of offsite hardwood species, especially laurel oaks.

Over the past decade, small-scale sandhill improvement projects have taken place in zones OL-1A, OL-1C, and OL-1De, where staff and volunteers have herbicided numerous offsite hardwood trees. These three zones, as well as others yet unaddressed, will require much more restoration work before they will be in good

enough condition to support the full range of species that should occur there. Details about sandhill restoration or improvement activities planned for O'Leno/River Rise are contained in the Resource Management Program section of the plan, in various Goals and Objectives listed under the heading, Natural Communities Management.

O'Leno/River Rise currently contains many acres of altered landcover. FNAI recently provided definitions of the altered landcover types that most commonly occur in Florida's natural areas, including one called successional hardwood forest that now sometimes prevails where sandhill once existed. Analysis of historical aerial photographs of O'Leno/River Rise reveals that the sandhill community once occupied many of the altered sites that are now termed successional hardwood forest (see the Altered Landcover Types section that follows this Natural Communities section).

A large-scale sandhill restoration effort has been underway for a number of years at a clear-cut, 25-acre former pine plantation in zone RR-3A, just east of U.S. Highway 441. This area fits the FNAI description for a newly recognized altered landcover type, restoration natural community, and it is mapped as such on the Natural Communities Map. Additional information about the sandhill restoration underway in zone RR-3A appears in the Altered Landcover Types section below.

General Management Measures: Offsite hardwoods and turkey oaks dominate some of the sandhills that have experienced long-term fire exclusion and that have relatively few large longleaf pines remaining. These areas, and similar areas of upland pine, will require additional hardwood reduction to release suppressed herbaceous species and encourage longleaf pine recruitment. Zones that require restoration but retain at least some of the typical sandhill groundcover species will be given a higher priority than degraded sites now devoid of characteristic species. Other than that, the continued use of frequent prescribed fire in the parks' sandhills will be essential to maintaining community structure and ecological integrity. Additional lightning season burning will no doubt continue to improve sandhills that are already in fair to good condition.

The fragmenting effects of old roads, trails, and fire plow scars are still apparent in too many of the sandhill areas in the two parks. There should be renewed efforts to close and rehabilitate old, unneeded roads and trails (e.g., the one to the Ravine Sinks) by regularly brushing them in and planting native vegetation as needed.

Scrubby Flatwoods

Desired Future Condition: The dominant tree in the scrubby flatwoods of north Florida will usually be longleaf pine (*Pinus palustris*). Mature sand pines (*Pinus clausa*) will typically 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 often be present that will vary in height from 3 to 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 total well below 40 percent. The Optimal Fire Return Interval for this community is regionally variable, but areas may be burned as frequently as every 3-8 years when burn prescriptions are designed to achieve a mosaic of burned and unburned areas.

Description and Assessment: The scrubby flatwoods community at O'Leno/River Rise occurs primarily in sandy areas that are slightly elevated above the Santa Fe River floodplain, higher in elevation than mesic flatwoods but not as high as sandhill, upland pine, or upland hardwood areas. Scrubby flatwoods also occur within the Natural Bridge area as transitional bands between lower elevation mesic flatwoods or alluvial forest and higher elevation sand ridges containing sandhill or upland pine communities. Scrubby flatwoods often intergrade with sandhills and mesic flatwoods. In the absence of regular fire, ecotones between these community types may easily become blurred.

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 three scrub oaks that occur at O'Leno/River Rise, but some areas of scrubby flatwoods in the two parks seem to contain only one of those species, namely sand live oak. In earlier versions of the O'Leno/River Rise management plan, those areas may have been classified as mesic flatwoods due to the absence of myrtle oak or Chapman's oak, but today they fit the current FNAI definition of scrubby flatwoods. Patches of scrubby flatwoods in which sand live oak is virtually the only scrub oak present are found mainly in zones OL-1C, OL-1R, OL-1S, and OL-1U. Sizeable blocks of the more representative scrubby flatwoods containing all three scrub oak species occur in zones OL-1De, OL-1E, OL-1G, OL-1K, and RR-2Aw. Other shrub species common in the O'Leno/River Rise scrubby flatwoods include saw palmetto, rusty staggerbush (*Lyonia ferruginea*), coastalplain staggerbush, and deerberry. Scrub palmetto (*Sabal etonia*) is also present, but it is more sparsely distributed.

The scrubby flatwoods canopy at O'Leno/River Rise tends to be sparse unless sand live oaks have attained tree status. Scattered longleaf pines may be present, but most were logged out before the state acquired the properties. Typically, slash pines are now the dominant species, although loblolly pines are common in areas where fire has been excluded or suppressed for a long time. Although the scrub oaks in some areas have grown excessively robust in the absence of intense fire, several zones containing scrubby flatwoods have burned under conditions extreme enough to top-kill all of the shrubby vegetation. Unfortunately, high fuel buildup in the scrubby flatwoods has contributed to the demise of a substantial number of adult longleaf pines shortly after the initial prescribed burns. Mechanical removal of fuel concentrations near adult longleaf pines should reduce that threat.

The condition of the scrubby flatwoods at O'Leno/River Rise ranges from poor to good, depending on the success of prescribed fires at penetrating the taller scrub and top-killing canopy oaks. Some areas would qualify as excellent if they

contained a representative component of adult longleaf pines. Zones containing some of the best quality scrubby flatwoods include OL-1C and OL-1G. Details about improvement activities planned for the scrubby flatwoods in O'Leno/River Rise are contained in the Resource Management Program section of this plan, in Goals and Objectives listed under the heading, Natural Communities Management.

Scrubby flatwoods is a relatively rare community type within Alachua County and Columbia County. Although the isolated patches at O'Leno/River Rise are too small and discontinuous to support many scrubby flatwoods endemics, gopher tortoises (*Gopherus polyphemus*) are common in these areas.

General Management Measures: Restoration of overgrown scrubby flatwoods to a more characteristic condition through prescribed fire alone would require the gradual buildup of sufficient pyrogenic materials at the edges of the community to fuel a fire intense enough to reach the scrub oak canopy and move through the heart of the scrub. This process can take many years. If speeding up the restoration process is desirable, it will be necessary to mechanically treat overgrown sites to lower the fuel structure and open the closed canopy before initiating prescribed burns. The preferred fire return interval for the scrubby flatwoods at O'Leno/River Rise is 3-8 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. The vegetation that is predominant in a sinkhole depends upon the age of the sinkhole. For example, the vegetation in older sand-walled sinkholes in north Florida will form a well-developed forest that includes species such as southern magnolia (*Magnolia grandiflora*), sweetgum (*Liquidambar styraciflua*), water oak (*Quercus nigra*), pignut hickory (*Carya glabra*), wax myrtle (*Myrica cerifera*), Virginia creeper (*Parthenocissus quinquefolia*), and grape vines (*Vitis* spp.). Older sinkholes with vertical limestone walls will 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 to buffering from local environmental influences that a lower elevation and a dense tree canopy provide. The desired future condition for sinkholes can be attained by limiting unnatural erosion and protecting the microclimate from disturbance.

Description and Assessment: Sinkholes and depressions are numerous within the O'Leno/River Rise landscape. The karst topography of the area, particularly in the region of the Natural Bridge, makes the two parks very susceptible to sinkhole formation. The sinkholes range from relatively young steep-sided ones with exposed limestone walls to more gradually sloping depressions that contain mature vegetation typical of the surrounding natural communities. Some sinkholes remain dry year-round, while others may hold water for a period of time after heavy rainfall events. Most of the parks' sinkholes are in excellent condition, although sinkholes near public use areas may experience some impacts from foot traffic. At times, visitor impacts are severe enough to warrant restriction of public access. For example, park staff had to place field fence around a large sinkhole within zone OL-

1Js to protect it from overuse by campers in the nearby Youth and Group Camps and to ensure visitor safety. Such extreme protective measures are the exception rather than the rule, however.

General Management Measures: Sinkhole management must emphasize protection of resources. Park staff will continue to protect edges of sinkholes from disturbances, particularly those caused by foot, bicycle, or horse traffic, that could accelerate erosion and cause sedimentation problems. 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 also be necessary.

Upland Hardwood Forest

Desired Future Condition: Upland hardwood forest is a mature, closed-canopy hardwood forest typically occurring on slopes and rolling hills under generally mesic conditions. Overstory tree species in north Florida will generally include southern magnolia (*Magnolia grandiflora*), pignut hickory (*Carya glabra*), sweetgum (*Liquidambar styraciflua*), live oak (*Quercus virginiana*), laurel oak (*Quercus laurifolia*), Florida maple (*Acer saccharum* subsp. *floridanum*), spruce pine (*Pinus glabra*), and swamp chestnut oak (*Quercus michauxii*). Understory species will include trees and shrubs such as American holly (*Ilex opaca*), flowering dogwood (*Cornus florida*), eastern hophornbeam (*Ostrya virginiana*), American hornbeam (*Carpinus caroliniana*), eastern redbud (*Cercis canadensis*), red bay (*Persea borbonia*), horse sugar (*Symplocos tinctoria*), and beautyberry (*Callicarpa americana*). The groundcover will consist of shade tolerant herbaceous species, sedges and vines.

Description and Assessment: O'Leno State Park and River Rise Preserve State Park contain limited areas of upland hardwood forest, most of it in good to excellent condition. The upland hardwood forests of north-central Florida lack some of the characteristic components that partially define this community further north in the state, such as the American beech tree (*Fagus grandifolia*). At O'Leno/River Rise, the more floristically diverse associations of this community tend to occur in areas of abundant limestone outcropping, generally above floodplains, near sinkholes, and within natural fire shadows in the Natural Bridge and Ravine Sink areas. Excellent examples occur within zones OL-1De, OL-1M and OL-1N in O'Leno, within zones RR-2Fs and RR-2J in River Rise Preserve east of U.S. Highway 441, and within zone RR-3F west of U.S. Highway 441. Characteristic canopy species in the upland hardwood forests of O'Leno/River Rise include pignut hickory, bluff oak (*Quercus sinuata*), swamp chestnut oak, white ash (*Fraxinus americana*), Florida maple, sweetgum, and laurel oak. Typical understory vegetation includes red bay, American holly, American hornbeam, eastern hophornbeam, basswood (*Tilia americana*), flowering dogwood, red buckeye, and horse sugar. Partridgeberry (*Mitchella repens*) and longleaf woodoats (*Chasmanthium laxum*) are among the more common groundcover species.

General Management Measures: The main management strategy for this community is to protect it from disturbance or fragmentation. If erosion becomes problematic, park staff will need to implement corrective measures such as

stabilization of disturbed areas. If overly intense public use is a factor in causing erosion, particularly where trails pass through the community, then visitor use patterns in the parks may have to be modified.

Upland Mixed Woodland

Desired Future Condition: Dominant tree species in north Florida 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*) and pignut hickory (*Carya glabra*) may be present, as well as sub-canopy species such as sparkleberry (*Vaccinium arboreum*). Percent herbaceous cover will be comparable to that of sandhill, attaining a height of 3-4 feet during spring and summer. In some areas, grasses and forbs will reach heights of 6-8 feet or more during the fall due to blooming of taller grass species such as yellow indiangrass (*Sorghastrum nutans*), silver plumegrass (*Saccharum alopecuroides*), and big bluestem (*Andropogon gerardii*). In old growth conditions, the oaks and hickories are commonly 150-200 years old. The optimal fire return interval for this community is two to five years, depending on the fire frequency in 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. Being a transitional community, upland mixed woodland is very susceptible to succession to upland hardwood forest when there is a lack of fire. As a result, very few intact examples of this community remain in north-central Florida. Upland mixed woodland sites at O'Leno/River Rise contain all the canopy species mentioned above, plus characteristic sub-canopy species such as flowering dogwood, red bay, sparkleberry, and hawthorn (*Crataegus* sp.).

FNAI personnel who have surveyed O'Leno/River Rise for upland mixed woodland sites have determined that the easternmost part of zone OL-1N just south of the park drive constitutes an exemplary example of that community type, worthy of designation as a reference site for the community (Gulledge 2012). The excellent condition of the site, which has retained an abundant and diverse groundcover, is attributable to a long history of prescribed fire. Many of the other upland mixed woodland sites in the parks, unfortunately, do not share that characteristic. Analysis of historical aerial photographs of the O'Leno/River Rise 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 offsite 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).

Girdling or herbiciding of dense stands of offsite hardwoods will be critical to preparing overgrown upland mixed woodland sites for prescribed burning. 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. To encourage greater fire penetration, park staff should remove nonessential hard firebreaks that have prevented fires in sandhill or upland pine from burning into adjacent upland mixed woodland areas. In a similar manner, fires in upland mixed woodlands should be allowed to creep into adjacent upland hardwood forests and gradually die out, thereby maintaining natural ecotones between communities.

General Management Measures: Restoration and improvement of the upland mixed woodland community will entail the reintroduction of frequent fire (2-5 year return interval) and the removal of offsite hardwood species. The parks will postpone the planting of longleaf pines until the canopy is sufficiently open to allow longleaf seedlings to survive. 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. Restoration of the upland mixed woodland community in zone RR-2Aw south of Bellamy Road will require the removal of push piles along the western edge of the zone created during construction of the boundary road and fence line. Details about restoration or improvement activities planned for upland mixed woodland sites at O'Leno/River Rise 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 in this community in north Florida will be longleaf pine (*Pinus palustris*). Herbaceous cover will be comparable to that in the sandhill community, but may have a higher density of understory shrubs and saplings. Height of the herbaceous cover will generally be less than three feet. An intermittent sub-canopy of smaller hardwood trees will be scattered throughout, usually consisting of southern red oak (*Quercus falcata*), sand post oak (*Quercus margaretta*), mockernut hickory (*Carya tomentosa*), flowering dogwood (*Cornus florida*), bluejack oak (*Quercus incana*), and sassafras (*Sassafras albidum*). In old growth conditions, the oaks and hickories will commonly be 150-200 years old. Wiregrass (*Aristida stricta* var. *beyrichiana*) will dominate the groundcover, but little bluestem (*Schizachyrium scoparium*), broomsedge bluestem (*Andropogon virginicus*), and indiangrass (*Sorghastrum* spp.) will also be present. Typical forbs will include narrowleaf silkgrass (*Pityopsis graminifolia*), bracken fern (*Pteridium aquilinum*), goldenrod (*Solidago* spp.), squarehead (*Tetragonotheca helianthoides*), soft greeneyes (*Berlandiera pumila*), and yellow jessamine (*Gelsemium sempervirens*). The optimal fire return interval for this community is two to three years.

Description and Assessment: Upland pine is widely distributed over both parks. In some locations, it functions as a narrow ecotone between the sandhill community and upland mixed woodland or upland hardwood forest, while in others it covers broader expanses. Also known as “red oak woods” (Duever and Tillman 1997), upland pine is a transitional forest dominated by southern red oak, mockernut hickory, and longleaf pine. It usually has a relatively diverse mid-story of fire-tolerant trees and shrubs and a highly diverse groundcover dominated by wiregrass. Although once treated as a subtype of the sandhill natural community (Tan 1991), or lumped as “mixed hardwoods and pines” (Soil Conservation Service 1981), upland pine is now recognized as a distinct community type. The decline of upland pine in peninsular Florida has been even greater than that of the sandhill community (Duever et al. 1997). The quality of upland pine at O’Leno/River Rise ranges from poor to excellent and is directly linked to past alterations of the community as well as to historical and recent fire regimes.

Upland pine areas that have retained an intact community structure and have a history of regular and recent burning are the highest quality such sites in the two parks. As with the sandhills, several of the better quality upland pine sites occur within zones at O’Leno State Park where the Florida Park Service has used prescribed fire as a management tool since at least the 1950s. At first, only a limited amount of burning took place, and that was in the winter, but in later years the park increased the frequency of burning and initiated lightning season burns. Characteristic upland pine species, particularly longleaf pine, southern red oak, and mockernut hickory, remain common at the sites that received such treatments. River Rise Preserve State Park also contains some high quality upland pine, particularly in zones RR-3D and RR-3Ge.

Historically, in contrast with the sandhills, few areas of upland pine were incorporated into burn zones at O’Leno. However, expansion of existing burn zones to include upland pine habitat and the creation of new zones in the past two decades have greatly increased the acreage of upland pine now under fire management. Additional restoration efforts in upland pine areas along Bellamy Road and in River Rise Preserve west of U.S. Highway 441 have targeted invasive offsite hardwood species for removal. The goal is to herbicide laurel oaks, water oaks and black cherries in order to reopen the upland pine canopy, thereby facilitating a greater penetration of prescribed fire into overgrown areas and increasing the effectiveness of burns.

It is likely that Florida settlers preferentially targeted upland pine areas for agricultural purposes since the soils are more fertile than those of sandhills (Myers 1990) and upland pine would have been easier to clear than upland hardwood forest. Evidence of human occupation of the Natural Bridge area in River Rise Preserve State Park is apparent from the large number of recorded cultural sites and the many lithic scatters and historic trash dumps within the park. Removal of native groundcover to grow crops and the logging of longleaf pines would have hastened the succession of upland pine to successional hardwood forest (as defined by FNAI) upon abandonment of agricultural sites. In the case of upland pine, fire suppression alone would have been sufficient to convert a site to successional

hardwood forest (see the Altered Landcover Types section that follows this Natural Communities section).

Upland pine remains one of the rarest community types in north-central Florida. Research on the natural and cultural history of upland pine in River Rise Preserve was conducted as part of the Bellamy Road project in the mid-1990s. A wealth of additional information about the upland pine community may be found in the reports that resulted from that project (Duever et al. 1997; Duever and Tillman 1997).

A large scale, long-term restoration project is currently underway in the upland pine community in zones RR-3D, RR-3Ge, and part of RR-3Cn, where the strategy is to focus initial efforts on the outer fringes of good quality habitat where offsite hardwoods are beginning to have a detrimental impact. Contract-herbiciding of offsite hardwoods has already been accomplished in the three zones, followed by some planting of longleaf pines. Future restoration activities will proceed gradually outward from those fringes in order to increase the acreage of good quality upland pine habitat in as short a time as possible.

The DRP needs to target additional upland pine remnants for restoration work. Girdling or herbiciding of dense stands of offsite hardwoods will be critical to preparing overgrown sites for prescribed burning. To encourage greater fire penetration, park staff should remove nonessential hard firebreaks that have prevented fires in sandhills from burning into adjacent upland pine areas. In a similar manner, fires in upland pine should be allowed to creep into adjacent upland mixed woodland or upland hardwood forest and gradually die out, thereby maintaining natural ecotones between communities.

General Management Measures: Upland pine areas will require additional hardwood reduction to release suppressed herbaceous species and encourage longleaf pine recruitment. Zones that require restoration but retain some native groundcover species will receive a higher priority for restoration than degraded sites that now lack characteristic species. Other than that, the continued frequent use of prescribed fire (2-3 year return interval) in upland pine zones will be essential to maintaining community structure and ecological integrity at O'Leno/River Rise. Additional lightning season burning will no doubt continue to improve the upland pine that is already in fair to good condition. 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. Restoration of the upland pine community in zone RR-2Aw south of Bellamy Road will require the removal of push piles along the western edge of the zone created during construction of the boundary road and fence line. Details about restoration or improvement activities planned for upland pine sites at O'Leno/ River Rise 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. Xeric hammock in north Florida will typically be dominated by sand live oak (*Quercus geminata*), which creates a low, closed canopy that provides shady conditions. Typical trees may also include Chapman's oak (*Quercus chapmanii*), turkey oak (*Quercus laevis*), sand post oak (*Quercus margaretta*), and laurel oak (*Quercus laurifolia*). Sand pine, slash pine, or longleaf pine (*Pinus clausa, P. elliottii, P. palustris*, respectively) may also be a minor component. Understory species will usually include saw palmetto (*Serenoa repens*), fetterbush (*Lyonia lucida*), myrtle oak (*Quercus myrtifolia*), wild olive (*Osmanthus americanus*), yaupon holly (*Ilex vomitoria*), and Hercules' club (*Zanthoxylum clava-herculis*). Florida rosemary (*Ceratiola ericoides*) will sometimes be present. 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 in need of fire and/or mechanical treatment should not be confused with true xeric hammock.

Description and Assessment: Xeric hammock occurs in only limited areas at O'Leno/River Rise, mostly within River Rise Preserve. Characteristic canopy species include sand live oak, laurel oak, pignut hickory and wild olive. Depending on the origin of the xeric hammock, other species such as sand post oak, turkey oak, or Chapman's oak may also be present. The understory typically consists of sparkleberry, deerberry, rusty staggerbush, and saw palmetto. Xeric hammock at O'Leno/River Rise seems to have developed in localized settings where there has been a long period of fire exclusion, usually the result of fire shadow effects from water bodies or other natural features, but in some cases apparently caused by direct human influence. Most of the xeric hammock at O'Leno/River Rise is at an intermediate stage in development. Its condition ranges from fair to good.

General Management Measures: District 2 biologists need to conduct an extensive evaluation of each xeric hammock patch in order to determine whether the best management strategy would be to let the community continue to develop or restore it to its historic condition (probably sandhill or scrubby flatwoods).

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 four months of the year during the growing season. In north Florida, 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 will often be present.

Description and Assessment: Alluvial forest at O'Leno/River Rise is typically associated with low levees and flood-prone flats along the Santa Fe River. It usually is intermingled with floodplain swamp and bottomland forest. It also occurs in low, flood-prone areas of the Natural Bridge. Distinctions among these communities are often blurred, making accurate categorization difficult. However, the nature of alluvial forest's hydroperiod does distinguish it from the similar floodplain swamp and bottomland forest communities. Alluvial forests tend to flood frequently, usually on an annual basis, and they are found at slightly higher elevations than floodplain swamps, which are usually flooded for most of the year. In contrast, bottomland forests occur at slightly higher elevations than either floodplain swamps or alluvial forests, and they do not flood annually, with at least several years passing between flood events.

Before the state acquired the O'Leno/River Rise properties, selective harvesting of timber in the alluvial forests had taken place. Except for a diminished presence of old growth hardwoods and remnant traces of old logging roads, however, the effects of that past timbering are no longer readily apparent. Nevertheless, District 2 biological staff should assess the hydrological and fragmentation impacts of the old logging roads and consider restoring them to natural grade, if practical. Other than logging, the only known negative impacts on this community are rooting by feral hogs and minor erosion associated with the service roads and trails that still cut through the community. In general, the alluvial forest community at O'Leno/River Rise is in good to excellent condition.

General Management Measures: Alluvial forest requires little active management other than protection from excessive erosion and control of invasive exotic species, especially feral hogs. Park staff will periodically monitor roads and trails that pass through stands of alluvial forest, checking for signs of erosion or feral hog rooting and addressing sources of impacts on a case-by-case basis.

Basin Swamp

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

Description and Assessment: Basin swamps at O'Leno/River Rise are often embedded within mesic flatwoods, but they are also scattered about bottomland areas of the Natural Bridge, where a complex mosaic of basin and floodplain wetlands intertwines with higher elevation upland communities. The intermittent overland flow of the Santa Fe River during flood periods has dramatically affected the natural communities within its area of influence. Basin swamps typically receive some inflow and also produce some outflow, but they are not as heavily influenced by riverine systems as are floodplain swamps. Nevertheless, there is a large overlap in their species composition. In the Natural Bridge area, the cypress/gum swamps that occupy the main overland channels are classified as floodplain swamps, while those that occur in backwaters or exist as distinct systems are classified as basin swamps.

Periodic harvesting of cypress once took place in all of the swamps in the region. The cypress trees that remain in the basin swamps of O'Leno/River Rise are obviously of smaller stature than would have been the case in the original stands. Causeways and roadbeds have negatively affected some of the basin swamps within the two parks. Some of these intrusions will require removal or relocation in order to restore natural sheet flow. If necessary, staff should consider constructing low water crossings or installing additional, larger culverts to facilitate the movement of unnaturally impounded waters. Loblolly pines have invaded some of the basin swamps that have not had fires sweep through them lately. Overall, however, the basin swamps are in fair to good condition.

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

Description and Assessment: In O'Leno/River Rise, this community roughly parallels the floodplain of the Santa Fe River above the River Sink and below the River Rise. Bottomland forest also occurs within Natural Bridge lowlands on plateaus slightly elevated above the adjacent alluvial forest or floodplain swamp. In some areas, zone OL-1De for example, it may also occupy broad shallow depressions within the uplands. Bottomland forests flood less frequently than alluvial forests (FNAI/DNR 1990). 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.

Characteristic species in the bottomland forests at O'Leno/River Rise include laurel oak (formerly diamondleaf oak), live oak, and spruce pine. The bottomland forest also often contains parsley hawthorn (*Crataegus marshallii*), dwarf palmetto, American hornbeam, and highbush blueberry. The understory tends to be somewhat open, and may be relatively grassy compared to adjacent alluvial forest.

Before the state acquired the O'Leno/River Rise properties, selective harvesting of timber in the bottomland forests had taken place. Except for a diminished presence of old growth hardwoods and remnant traces of old logging roads, however, the effects of that past timbering are no longer readily apparent. Nevertheless, District 2 biological staff should assess the hydrological and fragmentation impacts of the old logging roads and consider restoring them to natural grade, if practical. Loblolly pines have invaded some of the bottomland forests that have not had fires pass through recently. Feral hog rooting appears to be the only other significant impact. Based on these factors, the bottomland forests at O'Leno/River Rise are considered to be in fair to good condition.

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 offsite loblolly pines may be necessary in some areas to improve the condition of the bottomland forests. Some of these wetlands may also require protection from impacts of erosion along old roads or trails. The DRP needs to determine whether any of the old roads cause significant enough hydrological harm to warrant their restoration to natural contour. Monitoring for signs of invasive exotic plant species and feral hogs will continue.

<u>Depression Marsh</u>
Desired Future Condition: Depression marshes in north Florida will characteristically be open vista wetlands 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. The soil surface will often be visible through the vegetation when the community is not inundated. Dominant vegetation will typically include maidencane (*Panicum hemitomon*), panicgrasses (*Panicum* spp.), cutgrass (*Leersia* sp.), common reed (*Phragmites australis*), pickerelweed (*Pontederia cordata*), arrowheads (*Sagittaria* spp.), common buttonbush (*Cephalanthus occidentalis*), St. John's-wort (*Hypericum fasciculatum*), and coastalplain willow (*Salix caroliniana*).

The optimal fire return interval for this community is two to ten years depending on the fire frequency of adjacent communities.

Description and Assessment: Depression marshes at O'Leno/River Rise occur as small, scattered, isolated and mainly herbaceous wetlands. 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 at O'Leno/River Rise to experience large fluctuations in water level. Typically, however, the marshes are dry most of the year. Depression marshes are important as ephemeral wetlands for many amphibian and invertebrate species.

Invasion of the depression marshes by loblolly pine, buttonbush, and Carolina willow is normally kept in check 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 had established themselves when the management policy was to exclude fire from the marshes. Reductions in the regional water table may lead to more frequent droughts and additional incursions by hardwoods, and may eventually encourage succession of the depression marshes to mesic hammock. The depression marshes at O'Leno/River Rise are currently in fair condition.

General Management Measures: Where appropriate, the park should burn depression marshes 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 timbering or herbiciding.

Dome Swamp

Desired Future Condition: Dome swamp is an isolated, forested depression wetland occurring within a fire-maintained matrix such as mesic flatwoods. The characteristic dome appearance is attributable to the growth of smaller trees on the outer edge (shallower water and less peat) and larger trees in the interior. Pond cypress (*Taxodium ascendens*) will typically dominate, but swamp tupelo (*Nyssa sylvatica* var*. biflora*) may also form a pure stand or occur as a co-dominant. Sub-canopy species in north Florida will generally include red maple (*Acer rubrum*), dahoon holly (*Ilex cassine*), swamp bay (*Persea palustris*), sweetbay (*Magnolia viginiana*), and loblolly bay (*Gordonia lasianthus*). Shrubs will be absent to moderately common (a function of fire frequency), and may include Virginia willow (*Itea virginica*), fetterbush (*Lyonia lucida*), buttonbush (*Cephalanthus occidentalis*), wax myrtle (*Myrica cerifera*), and titi (*Cyrilla racemiflora*). Herbaceous cover will be absent to dense and include ferns, maidencane (*Panicum hemitomon*), sawgrass (*Cladium jamaicense*), sedges (*Carex* spp.), lizards tail (*Saururus cernuus*), and sphagnum moss (*Sphagnum* spp.). Vines and epiphytes will be common. Maintaining the appropriate hydrology and fire frequency will be critical for preserving the structure and species composition of the community. Dome swamps should generally burn on the same frequency as adjacent fire-type communities,

with fires being allowed to burn across ecotones naturally. Fires in dome swamps should be appropriately planned for intervals of two to ten years to avoid buildup of high fuel loads.

Description and Assessment: A small dome swamp is located in the northwest corner of O'Leno State Park just south of Bible Camp Road. Construction of that road along the fringes of the dome in the 1970s likely required some filling of wetlands, which would have reduced the size of the dome from its original extent. Despite the presence of the roadbed and its associated fill, however, the community is currently in good condition.

General Management Measures: The dome swamp should be protected from any additional impacts from Bible Camp Road, particularly any increase in storm water drainage. Prescribed fires in adjacent fire-maintained natural communities will be allowed to burn through the ecotone into the dome swamp periodically, under conditions appropriate for restoring the natural transition zone and maintaining the natural fire regime essential to dome management. Removal of offsite hardwoods in the dome swamp may be necessary depending on water level fluctuations and the results of future prescribed burns. Park staff will regularly monitor the dome for the appearance of invasive exotic plant species and remove any found.

Floodplain Swamp

Desired Future Condition: Floodplain swamp in north Florida occurs in low-lying areas along streams and rivers; it will be 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*). Trees bases will typically be buttressed. The understory and groundcover will usually be sparse.

Description and Assessment: Floodplain swamps at O'Leno/River Rise occur in floodways paralleling the Santa Fe River and in the deepest parts of drainage-ways that meander through the Natural Bridge area. Bald cypress and swamp tupelo are the dominant tree species. Both are adapted to long-term flooding, which is the expected condition in the O'Leno/River Rise floodplain swamps except during droughts. As in the basin swamps, large cypress trees were logged out many years ago. Little evidence of that particular human intrusion remains except for an occasional stump or log. Reforestation of the community, particularly through resprouting from stumps, has progressed sufficiently that complete recovery is likely. Floodplain swamp is relatively resilient, and little additional management will be necessary for it to recover from historical impacts.

Existing causeways and roadbeds that cross narrow strands of floodplain swamp may negatively impact the natural hydrological regime. Some impacts may be severe enough to warrant the removal or relocation of roads and causeways in order to restore natural sheet flow. If necessary, staff should consider installing more and larger culverts or low water crossings to facilitate the movement of

unnaturally impounded water. For the most part, however, the floodplain swamps in the two parks are in good to excellent condition.

General Management Measures: Floodplain swamps 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. District 2 biologists will determine whether any old roads/causeways actually cause hydrological disruption that is significant enough to warrant restoration to the natural contour.

Sinkhole Lake

Desired Future Condition: Sinkhole lakes are relatively permanent, typically deep lakes formed in depressions in a limestone substrate. These lakes characteristically will 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 will include limiting disturbances that may cause unnatural erosion and sedimentation, and minimizing possible sources of pollution that might affect connected aquifer systems.

Description and Assessment: Because of the extent of underlying limestone, much of O'Leno/River Rise is dotted with sinkholes and depressions characteristic of karst topography. Sinkhole lakes of varying sizes and shapes are especially abundant in the northeastern part of the park and within the Natural Bridge region. The greatest concentration of these features, including the Ravine Sink assemblage, occurs in zone OL-1De. The larger sinkhole lakes may contain one or more acres of open water, while the smaller ones may only cover a few square feet. Most of the sinkhole lakes maintain a direct connection to underground water sources, either the submerged Santa Fe River or the Floridan and surficial aquifers. Due to extreme variations in water levels of the Santa Fe River and the aquifers, the sinkhole lakes hold water for varying lengths of time. Some are continuously flooded, while others may go dry as groundwater levels drop.

The more inaccessible sinkhole lakes are nearly pristine in appearance. The lakes that are closer to hiking trails or receive fishing pressure, however, are more subject to littering, soil compaction, and disturbance of vegetation. These impacts seem to have declined in recent years (Younker 2001). In general, the sinkhole lakes in the two parks are in good to excellent condition. Additional information about sinkhole lakes at O'Leno/River Rise is located in the Hydrology section above.

General Management Measures:

In the management of sinkhole lakes, the 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. Access to most of the sinkhole lakes in O'Leno/River Rise is usually restricted except for legitimate research purposes or park management activities. 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* sp.), coontail (*Ceratophyllum dermersum*), watermilfoil (*Heterophyllum* sp.), and bladderwort (*Utricularia* sp.). 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 could cause increased sedimentation.

Description and Assessment: Black Lake and Downing Lake in River Rise Preserve State Park are classified as swamp lakes, although either may contain karst windows that link directly to the subterranean flow pathway of the Santa Fe River. Another swamp lake lies in the low drainage-way northeast of the River Rise. As with sinkhole lakes, recreational use of swamp lakes in the past has resulted in trampling of bank vegetation, erosion, soil compaction and littering. This does not appear to have been as much of an issue in recent years. The River Rise swamp lakes are presently in good to excellent condition.

General Management Measures: The banks of swamp lakes need to be protected 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.

Blackwater Stream

Desired Future Condition: Blackwater streams are characterized as perennial or intermittent watercourses originating in lowlands where extensive wetlands with organic soils collect rainfall and runoff, discharging it slowly to the stream. The brown-stained waters will be laden with tannins, particulates, and dissolved organic matter derived from drainage through adjacent swamps, producing streams that have sandy bottoms overlain by organic matter. 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 Santa Fe River is the primary example of blackwater stream at O'Leno/River Rise. The Santa Fe flows through the northeastern part of O'Leno State Park, disappears underground at the River Sink, and then passes through miles of subterranean passages before reemerging at the River Rise in River Rise Preserve State Park. From there, the river winds its way southwesterly through the preserve and under U.S. Highways 441 and 27, eventually joining the Suwannee River about 24 miles southwest of the park. A much smaller blackwater stream, Parener's Branch, flows into the northeast corner of River Rise Preserve and empties into Parener's Branch Sink.

The Santa Fe River and Parener's Branch have a relatively high risk of contamination because they both flow underneath Interstate Highway 75 and could receive any number of a myriad of contaminants that are transported along the interstate corridor. Groundwater resources in the area are vulnerable too, since a characteristic of both streams is stream-to-sink discharge. Water quantity has become an issue within O'Leno/River Rise as well. At least four times since 1998, the Santa Fe River channel from the Vinzant Landing swallet down to the River Sink has dried up to the extent that long stretches of dry riverbed have been completely exposed.

Development along the Santa Fe River and its tributaries has increased the potential for pollution of surface water and groundwater resources in O'Leno/River Rise. Continuous water quality monitoring is needed to ensure the protection of these valuable resources. Foot traffic along riverbanks within the two parks causes erosion and compaction of soil. Past problems with severe erosion in the River Sink and River Rise areas have been mitigated successfully through trail re-routing, boardwalk construction, and brushing-in of unauthorized shoreline access paths. A fishing platform at the River Sink provides access without creating water quality problems or destabilizing the shoreline. The River Rise parking sites have been moved further away from the water and the former parking area has been revegetated with appropriate native species. The access trail from the relocated parking area to the Rise now skirts the restoration zone, following contours that provide a more gradual approach, thereby reducing the potential for erosion. Despite all the threats described above, the blackwater streams within the two parks are still in good condition.

General Management Measures: The continuation of frequent water quality and quantity monitoring, particularly in the upper Santa Fe, 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 as well.

<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 may 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 will sometimes be present. However, plant life may be absent or limited to a few inconspicuous species of fungus that grow on guano or other organic debris. Cave systems are extremely fragile. Desired future management will include maintenance as systems protected from alterations that may affect light penetration, air circulation or microclimate, or increase pollution in aquatic situations.

Aquatic Cave

Description and Assessment: An extensive aquatic cave system, the Old Bellamy Cave System, underlies the Natural Bridge (i.e., Santa Fe Trace) area of O'Leno/River Rise. This system is one of the longest in Florida (Gulden and Coke 2012). Certified cave divers have mapped over eight miles of conduits, accessing them through more than 40 sinkholes as described earlier in the Hydrology section (Poucher 2008).

As the Upper Santa Fe River disappears underground at the River Sink, tannin-stained surface waters mingle with groundwater and the mixture flows through a massive subsurface conduit system for several miles before resurfacing at the River Rise. During periods of high flow, the majority of water passing through this cave system is surface water from the Upper Santa Fe. During low flows, groundwater inputs drive this system, primarily derived from karst areas outside the park and immediately east and north of the Natural Bridge.

Cave crayfish and other troglobites inhabit the park's aquatic cave system, but none has ever been collected to confirm species identification. Relatively little information is available about the population dynamics or ecology of these organisms, however population densities apparently can vary greatly over time and space. Contamination of subsurface waters via sinkholes is always a threat to aquatic caves, especially from stream-to-sink features such as Parener's Branch and the River Sink. Small changes in water quality can significantly influence cave resources, especially troglobitic organisms (Streever 1995).

The aquatic cave systems at O'Leno/River Rise are considered to be in excellent condition, with the possible exception of several karst windows such as River Sink and Hog Sink, where the dumping of surface garbage into the cave system may have occurred historically. This assessment is derived from communications with professional cave divers who have been conducting research explorations in this system over the past 30 years. Cave divers generally consider the Old Bellamy Cave System nearly pristine because of its limited public access, which is restricted to certified divers who have applied for and received standard DRP research permits. Given the sensitive nature of the aquatic caves, recreational diving is not allowed at O'Leno/River Rise. Permitted divers who regularly assess the condition of

the limited access caves at O'Leno have suggested that the cave system could be used as a model of comparison with cave systems in other state parks that do allow recreational cave diving.

General Management Measures: The most important consideration in managing aquatic caves at O'Leno/River Rise is to protect the quality and quantity of groundwater and surface water entering the system. This will entail protecting the numerous springsheds in the area from excessive groundwater withdrawals and from contamination by pollutants. Dye trace studies have shown that the cave systems extend well beyond the parks' boundaries, and thus outside the jurisdictional authority of the DRP, so protection of the water resources will continue to be a difficult challenge. Monitoring and mitigation of erosion on slopes above the springs should also be an integral part of cave management in order to protect aquatic caves from siltation.

Research dives throughout the cave system have provided valuable information about the condition of the caves. Current research projects include mapping to determine the extent of the underground passages and identification of troglobites to the species level. The DRP should continue to promote such research activities and should encourage development of a cave monitoring plan that will allow comparison of the Old Bellamy Cave System data with information gathered at caves in other state parks.

District and park managers will continue to encourage monitoring of all cave entrances and to support periodic cave condition assessments, all in coordination with a Springs Management Team that will provide recommendations regarding use and management of the Old Bellamy Cave System. This team should include certified cave divers from the North Florida Springs Alliance, particularly those who have already volunteered significant time and resources in studying the cave systems of the park or who belong to a national cave diving organization such as the National Speleological Society Cave Diving Section.

Terrestrial Cave

Description and Assessment: Terrestrial caves of limited size occur within O'Leno/River Rise. The most extensive terrestrial cave system is located within a large limestone outcropping in River Rise Preserve south of the Sweetwater Lake area. While large enough to enter for a short distance, the caves do not extend more than a few feet below the surrounding landscape. Other than an occasional roosting bat, few if any troglobitic animals would be expected in areas of such small size. Additional terrestrial cave sites exist within other limestone outcroppings and sinkhole fissures within the two parks, but these are too small to include on a natural communities map. The terrestrial caves are considered to be in very good condition, with limited evidence of human intrusion.

General Management Measures: Due to their sensitive nature, terrestrial caves should be considered restricted zones. If human intrusion becomes an issue at any cave site, appropriate signage and enforcement will become necessary. Otherwise, no additional signage is needed other than the standard park boundary signs already in place.

Altered Landcover Types

O'Leno State Park has been under the management of the Florida Park Service, or its predecessors, for over 75 years. It was during the early part of this period that the remaining old growth longleaf pine stands in Florida were cut, and well-meaning but misguided anti-burning campaigns ushered in a lengthy period of fire suppression. Although loss or degradation of certain fire-dependent natural communities also occurred within O'Leno State Park, early park managers, to their outstanding credit, regularly burned some of the sandhills in the winter. Those burns helped maintain the sandhills in relatively good condition until the inception of modern prescribed burning in north Florida. However, many sandhill fringes and the heart of the upland pine/upland mixed woodland communities were excluded from those early prescribed burns.

The dramatic changes that took place in the landscape between 1937 and today are clearly evident in historical aerial photographs. By 1937, most of the upland pine and upland mixed woodlands outside the original boundaries of O'Leno State Park had been converted to pasture or cleared for other agricultural purposes. Likewise, within the park itself a significant amount of upland pine and upland mixed woodland had been cleared away. Many of the areas that hadn't been cleared by 1937 gradually succumbed to hardwood invasion during the decades-long period of fire suppression that followed. By the 1970s, transformation of the upland pine and upland mixed woodland communities to successional hardwood forest, an altered landcover type defined by FNAI, had occurred at multiple locations within O'Leno and River Rise Preserve state parks, and in fact, all over north-central Florida. Even some of the fragments of habitat within O'Leno/River Rise still recognizable as upland pine had become severely degraded. Some ecologists came to the conclusion that no good examples of upland pine (i.e., red oak woods) remained in peninsular Florida (Duever and Tillman 1997).

Recognizing that the upland pine/upland mixed woodland areas at O'Leno/River Rise were in danger of disappearing completely, DRP land managers began to expand restoration efforts, focusing on the burning of remnant patches, girdling of offsite hardwoods, and reintroduction of native groundcover species. With the initiation of the Bellamy Road Project in 1997, the DRP began to restore a significant block of altered landcover, formerly upland pine and upland mixed woodland, at the western end of the Bellamy Road route through River Rise Preserve in order to provide an appropriate backdrop for interpretation of the historic road (Duever et al. 1997; Duever and Tillman 1997). Details about restoration activities planned for altered landcover sites at O'Leno/River Rise are contained in the Resource Management Program section of the plan in various Goals and Objectives listed under the heading, Natural Communities Management.

The restoration process at O'Leno/ River Rise has progressed significantly since the late 1980s, when prescribed fire was introduced to many zones. Even areas of the park that had an established history of burning have dramatically improved during that time span due to an increased commitment to more frequent burning,

particularly growing season burns. However, various altered landcover types still remain at O'Leno/River Rise, including the following.

Abandoned Field/Abandoned Pasture

Desired Future Condition: The long-range plan for the abandoned pastures at River Rise is to restore them to the natural community that originally existed there, in this case upland pine. The desired future condition, after the initial phase of what will be an extended period of restoration, will be a very basic version of upland pine community (as defined by FNAI) that contains a modest assortment of representative species such as longleaf pine, southern red oak, mockernut hickory, and wiregrass, and that has had invading offsite hardwoods (e.g., laurel oak) eliminated from the restoration area (see the Desired Future Conditions Map in the Natural Resource Management, Natural Community Restoration section of this plan).

Description and Assessment: A sizeable portion of River Rise Preserve State Park lying between U.S. Highways 27 and 441 was once in agricultural use. The broad expanse of open pinelands that originally existed there, in all likelihood upland pine, was completely cleared at various times during the 1900s. Historical aerial photographs reveal that the northern third of what is now zone RR-3F, most of zone RR-3Cs, and parts of zone RR-3H were already in agricultural use by 1937. Additional land clearing followed in the early 1960s, converting virtually all of what is currently zone 3F into pastureland. After the state purchased the property in the 1970s, most of these pastures gradually became forested with pioneer species such as laurel oak, sweetgum, and loblolly pine. Those areas now fit the FNAI description for a different type of altered landcover, successional hardwood forest, which is discussed later in this section.

Some areas of former pasture, however, have retained enough openness and characteristic mix of grass species that they more closely resembles what FNAI describes as abandoned pasture. Those areas, located in zone RR-3E near U.S. Highway 27, have experienced some hardwood invasion over the decades, but remnant pasture grasses predominate, along with weedy plants such as blackberry (*Rubus* sp.), hairy indigo (*Indigofera hirsuta*), and wax myrtle. In order that the few upland pine species remaining in this altered landscape might survive until restoration becomes feasible, zone RR-3F is included in the park's burn program.

General Management Measures: Zone RR-3F should be regularly treated with prescribed fire to hinder establishment of additional invasive hardwoods. The fire return interval for the abandoned pasture portions of zone RR-3F will be the same as for the successional hardwood forest that comprises the majority of the zone, every 2-3 years.

Borrow Area

Desired Future Condition: For the restorable borrow pit sites within the two parks, the desired future condition will be sandhill, upland pine, or mesic flatwoods, depending on location. Details are provided below.

Description and Assessment: A relatively large limerock mine pit is located in zone OL-4A in the northwest corner of O'Leno State Park, north of Bible Camp Road. The pit currently functions much like a giant sinkhole and probably will not require restoration measures. Historical aerial photographs of O'Leno/River Rise indicate that several borrow areas of substantial size were dug in the 1960s. The largest of these borrows, located in zones RR-3E and RR-3B, have since become forested with pioneer species such as laurel oak. If restoration of those sites becomes a feasible management option, upland pine will be the desired outcome.

The footprint of another sizeable borrow area is located in the northeast part of zone OL-1Qe. This site is surrounded by intact sandhills and is gradually recovering some of its characteristic vegetation. Its desired future condition is sandhill. Several smaller borrow sites are located adjacent to service roads. In most cases, they were created by excavating sand from the sides of small rises; they were not dug very far below grade. The desired future condition for these sites, depending on location, is sandhill, upland pine, or mesic flatwoods. Some of the borrow sites have been colonized by loblolly pines, and although of limited extent, may require restoration measures such as removal of the pines.

General Management Measures: Borrow pits located within pyrogenic communities should be incorporated into the fire treatment area when burns are conducted. All pits should be evaluated for feasibility of restoration. If any qualify for restoration and a suitable source of replacement soil is found, then gradual back-filling of the pit can be initiated, followed by replanting with appropriate species.

Canal/Ditch

Desired Future Condition: If restoration becomes a possibility, the desired future condition for various sections of the ditch described below will likely be bottomland forest, alluvial forest, or mesic hammock.

Description and Assessment: A deep ditch, constructed around 1960, cuts through a portion of River Rise Preserve in zone RR-3Bs just west of U.S. Highway 441 and north of the Santa Fe River. Some of the spoil from the excavation was deposited alongside the ditch, forming a berm. The ditch begins at a residential area just east of U.S. Highway 441, extends westward through culverts under the highway, and then passes through multiple natural communities in the park en route to a point in the Santa Fe River floodplain just downstream from Columbia Spring. Restoration of the ditch may not be feasible since it may still function in some capacity as a conduit for storm water associated with U.S. Highway 441 and the residential area.

General Management Measures: No active management is necessary other than occasional survey for exotic plants and treatment as needed. Given the size of the ditch and its possible continued hydrological function, restoration does not appear to be a realistic goal at this time.

Clearing

Desired Future Condition: The desired future condition for the clearing at O'Leno will be upland pine (as defined by FNAI).

Description and Assessment: The only clearing in the two parks is at the north end of zone OL-1Js in O'Leno adjacent to the Group Camp. It formerly functioned as a softball field complete with dirt infield and base paths, but that use ceased in the 1980s. Restoration activity there has been minimal since then, basically consisting of planting a few longleaf pines in the 1990s. However, the site does have the potential to be fully restored.

General Management Measures: There has been no serious effort to restore the two-acre site other than planting some longleaf pines. During recent burns of zone OL-1Js, however, fire has been encouraged to pass completely through the old ball field, enabling establishment of some herbaceous groundcover. True restoration to upland pine will require the planting of appropriate groundcover species, particularly wiregrass, as well as some deciduous hardwoods such as southern red oak and mockernut hickory. It will also be necessary to remove any clay from base paths, home plate or pitcher's mound that might remain from the softball era.

Developed

Desired Future Condition: There are no current plans to convert any of the developed areas in the park back to their original natural community. However, park managers will strive to minimize the effects that the developed areas have on adjacent natural areas.

Description and Assessment: O'Leno State Park contains extensive developed areas including a ranger station, administrative office, two residences, a swimming area, two full service campgrounds, a primitive youth camp, and a group camp that includes multiple cabins, pavilions, a playground, a recreation hall, a dining hall, and various support buildings. A paved road extends from the main park entrance near U.S. Highway 441 all the way east to the Day Use Area parking lot near the Group Camp and campground. In contrast, River Rise Preserve is relatively undeveloped. Facilities there include a horse barn and a primitive campsite with restrooms, all located west of U.S. Highway 441. An equestrian trailhead is located just east of U.S. Highway 441 near the River Rise gate. Also east of U.S. Highway 441, adjacent to Sweetwater Lake, is a primitive campsite for backpackers.

General Management Measures: Resource management in the developed areas will focus on removal of 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.

Restoration Natural Community

Desired Future Condition: The desired future condition for the restoration natural community sites described below will be sandhill (as defined by FNAI).

Description and Assessment: There are two former sandhill sites at O'Leno/River Rise that fit the FNAI description for an altered landcover type recently defined as

restoration natural community. One site is located in zone 1Jn in O'Leno State Park and the other in zone 3A in River Rise Preserve State Park.

The OL-1Jn site, about 15 acres in size, is situated along the road to the Magnolia Campground. By 1990, the sandhill there had deteriorated to the point that it had essentially become successional hardwood forest. That situation changed later in the decade when an outbreak of southern pine beetles forced the park to clear-cut the pines in the area. Intensive efforts ensued to restore the sandhill community that would have normally occurred there, including treatment and removal of invasive offsite hardwoods, planting of longleaf pines and wiregrass and other herbaceous species, and the reintroduction of prescribed fire. Much progress has been made, but the restoration process is still underway.

The RR-3A site, about 29 acres in size and located just east of U.S. Highway 441, is a former pine plantation that was clear-cut in 1989. Based on 1937 aerials, this site appears to have once been pasture or cleared field. By 1949, however, slash pines covered the area. After removal of the pine overstory in late 1989, offsite hardwoods such as laurel oak, water oak, and black cherry soon became the dominant trees due to a massive resurgence of hardwood sprouts from the remaining underground rootstocks. Since the early 1990s, the Florida Park Service has made sporadic attempts to restore the sandhill community that originally occupied the site, starting with a five-acre core that still contained several remnant longleaf pines and turkey oaks. District personnel have herbicided invading laurel oaks and sand live oaks and have planted longleaf pines, wiregrass, and other native sandhill species in the core area.

General Management Measures: Zone RR-3A requires much more restoration work, including additional mechanical and herbicide treatment and the more frequent application of prescribed fire. Once areas within the zone open up sufficiently, additional plantings of longleaf pine and wiregrass will be needed. Other than that, the most important factor will be the continued use of frequent prescribed fire, which is essential to maintaining community structure and ecological integrity.

Spoil Area

Desired Future Condition: In the event that restoration becomes a possibility, the desired future condition for various sections of spoil area will probably be bottomland forest, alluvial forest, upland pine or mesic hammock.

Description and Assessment: A large borrow pit was excavated in the 1970s during construction of an extension of the Bible Camp Road to a new boat ramp on the Santa Fe River. In 2015 this borrow, located just north of Bible Camp Road in the northeast corner of zone OL-4A, was filled with materials dredged from sand shoals in the Santa Fe River at the base of the boat ramp. The desired future condition for this site is upland pine, which is the original natural community.

Soil removed during excavation of the deep ditch in zone RR-3Bs described above was deposited along the sides of the ditch, forming a linear berm or spoil area. Trees typical of the surrounding forests have colonized the berm.

General Management Measures: The Bible Camp Road spoil area will require replanting with longleaf pines and groundcover species. No active management will be needed at the linear berm in RR-3Bs other than occasional survey for exotic plants and treatment as needed.

Successional Hardwood Forest

Desired Future Condition: The long-range plan for the now heavily wooded former agricultural areas at O'Leno/River Rise is to restore them to the natural community that originally existed there, in many cases upland pine. Substantial effort will be required to restore the upland pine to a satisfactory level. The desired future condition, after the initial phase of what will be an extended period of restoration, will be a very basic version of upland pine community (as defined by FNAI) that contains a modest assortment of representative species such as longleaf pine, southern red oak, mockernut hickory, and wiregrass, and that has had most of the invading offsite hardwoods (e.g. laurel oak) eliminated from the restoration area (see the Desired Future Conditions Map in the Natural Resource Management, Natural Community Restoration section of this plan). For sites in O'Leno/River Rise that have become successional hardwood forest because of long-term fire exclusion, the desired future condition will be a restored version of the community that originally occurred there, typically upland pine, upland mixed woodland, or sandhill (as defined by FNAI), with the invading offsite hardwoods removed and the natural groundcover reestablished.

The desired future condition for various segments of the abandoned, now forested utility corridor will depend on which natural community it is passing through. The corridor now intersects a variety of natural communities including upland hardwood forest, bottomland forest, alluvial forest, floodplain swamp, and mesic flatwoods. The desired future condition for the 80-acre mixed pine/hardwood site, formerly a cotton field, will be mature upland hardwood forest, which likely was the natural community that originally occupied the area.

Description and Assessment: Humans have had a profound influence on the Santa Fe River corridor and the Natural Bridge area for thousands of years. Typically, the remnants of settlements and past agricultural pursuits in the region were eventually reclaimed by vegetation, often producing an assemblage of fast-growing pioneer species such as laurel oak and loblolly pine that FNAI has designated as successional hardwood forest. In some instances, the disturbance of natural soil profiles and native vegetation at these sites was so radical that restoration to the original natural community may not be practical. Another factor that heavily influenced the transformation of fire-dependent communities into successional hardwood forest was long-term fire exclusion, particularly in upland pine and upland mixed woodland areas.

As an example, the well-maintained sandhill south of the Group Camp in zone OL-1Js at one time transitioned seamlessly into an open-canopy expanse of upland pine to the south and west. The wide open longleaf pine/wiregrass community so visible in zone OL-1Js today was actually twice that size in 1937, when the upland pine adjacent to the sandhill was still in good condition. Now however, that upland

pine area resembles successional hardwood forest, likely because an old road/firebreak that has separated the two communities for decades has discouraged fires in the sandhill from spreading into the adjacent upland pine. Hidden among the laurel oaks in that nominal hardwood forest are scattered longleaf pines and southern red oaks that have remained in the canopy since the cessation of natural burning. Adult longleaf pines can still be found over a thousand feet into the hardwood area beyond the modern limits of the intact sandhill. The amount and diversity of remnant native groundcover in the area is unknown at this time.

Analysis of historical aerial photographs reveals that the upland pine community may have once occupied many of the successional hardwood sites now prevalent in River Rise Preserve State Park. A sizeable tract of former upland pine, now successional hardwood forest, lies west of U.S. Highway 441 in zones RR-3Cs, RR-3E, and RR-3F. Most of this area was converted to pasture sometime after 1960. In zone RR-3Cs, there is an 80-acre tract of former upland pine that was cleared before 1937 and subsequently planted in slash or loblolly pines, or it naturally seeded in. This area was clear-cut in the early 1970s before state acquisition, and it is now best classified as successional hardwood forest. Few remnant upland pine species persist on these sites, although there are limited areas where wiregrass clumps and other groundcover species are very sparsely distributed. Loblolly pine is currently the dominant pine species. Fortunately, some of the successional hardwood forest (e.g., part of zone RR-3Cs) is adjacent to an unaltered area that is still in very good condition. That area retains a nearly full complement of upland pine species that should facilitate the natural spread of propagules into the adjacent restoration site once the offsite hardwoods are removed.

O'Leno State Park also experienced periods of extensive land clearing for agricultural purposes, particularly in zones OL-1M, OL-1N, OL-1P, OL-1Qw, and OL-1R. When the agricultural pursuits in those zones were abandoned, successional hardwood forest eventually developed. Several areas of former sandhill, upland mixed woodland, and mesic flatwoods have also been transformed by hardwood invasion to the extent that they are now considered successional hardwood forest.

While there are no active utility corridors in O'Leno/River Rise today other than standard roadside utility lines, a telephone line easement was cleared through O'Leno sometime between 1937 and 1949. That utility corridor extended from Bible Camp Road near Buzzard Roost Prairie south through zones OL-1Qw, OL-1N, OL-1M, OL-1Le, and RR-2B to Bellamy Road at the east boundary of the park, passing through a variety of natural communities including upland hardwood forest, bottomland forest, alluvial forest, floodplain swamp, and mesic flatwoods. Judging from historical aerial photographs, maintenance of the easement apparently ceased sometime during the late 1970s and the corridor has steadily become vegetated again, first with pioneer species and later with species common in adjacent natural communities. Despite this natural reforestation process, the corridor should still be classified as successional hardwood forest until the various sections more closely resemble the communities through which they pass.

An 80-acre expanse of former upland hardwood forest that is now successional hardwood forest, situated around the head of the River Rise, was once cleared for agricultural purposes (probably cotton production) sometime well before 1937. Based on analysis of historical aerials, slash pines were subsequently planted in the cleared area, perhaps as early as 1949. Apparently, there was no site prep before the planting. The pines grew to harvestable size but were not cut before the state acquired the property in the 1970s. Today, the site contains a 60-70 year old stand of successional hardwood forest consisting of mature slash pines, pioneering hardwood trees such as laurel oak and water oak, and hardwoods representative of the original natural community.

General Management Measures: Substantial effort will be required to restore pyrogenic natural communities in areas that have changed to successional hardwood forest. Such areas will generally not be prioritized for intensive restoration activities such as offsite hardwood removal until the natural communities that are still relatively extant in the parks have been restored to the desired degree. However, prescribed burning of the altered areas will continue.

Zones OL-1M, OL-1N, OL-1P, OL-1Qw, OL-1R, RR-3Cs, RR-3E, and RR-3F will be regularly treated with prescribed fire to hinder establishment of additional invasive hardwoods within the parts of the zones containing successional hardwood forest. The fire return interval for successional hardwood forest within these zones will typically be every 2-3 years if the desired future condition is a fire-type natural community. The actual fire frequency for the successional hardwood forest will be dictated by the recommended fire return interval for whatever natural community is desired there. In certain areas the fire-return interval may be longer if the successional hardwood forest requires some form of mechanical treatment before it is able to support prescribed fire.

Park staff will allow the natural reforestation process along the utility corridor to continue. Where the corridor passes through fire-type communities, prescribed burn managers should ensure that corridor vegetation does not inadvertently act as a firebreak and that fire is able to penetrate regularly. Since the 80-acre pine/hardwood area is environmentally sensitive and is already well along in the process of reverting to upland hardwood forest, the best management strategy there would be to let the pines senesce on their own and gradually be displaced by typical upland hardwood species.

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.

Given the wide variety of natural communities within O'Leno and River Rise Preserve state parks, it is not surprising that they contain a high diversity of plants

and animals and a respectable roster of imperiled species. Records of vascular plants and birds are perhaps the most comprehensive, the result of multiple focused surveys over the years. Decades of breeding bird surveys (with major contributions from local birder John Hintermister and other volunteers), migratory bird counts, and Christmas bird counts have generated a substantial bird list, which includes a number of imperiled species. The completeness of the plant list owes much to a University of Florida graduate student, Bian Tan, who conducted an intensive floristic study in O'Leno State Park and in the northernmost part of River Rise Preserve (Tan 1991). However, Tan did not collect in the majority of River Rise. Additional imperiled species will likely be added to the plant list as more surveys are conducted within the preserve.

Orchids and ferns notably dominate the list of imperiled plant species recorded within O'Leno/River Rise. Two of the listed ferns, modest spleenwort (*Asplenium verecundum*) and plume polypody (*Pecluma plumula*), were discovered in River Rise Preserve subsequent to the previous update of the management plan. Plants on the imperiled list other than ferns and orchids are most prevalent in the fire maintained sandhill, upland pine, and upland mixed woodland communities. Incised agrimony (*Agrimonia incisa*) and Florida spiny pod (*Matelea floridana*) are among those species. The only known occurrence of woodland poppymallow (*Callirhoe papaver*) in the two parks resulted from an introduction of the species to River Rise Preserve as part of a red oak woods restoration project at Bellamy Road (Duever et al. 1997). Historical records for sand butterfly pea (*Centrosema arnicola*), pine lily (*Lilium catesbaei*), autumn coralroot (*Corallorhiza odontoriza*), October ladiestresses (*Spiranthes ovalis*), longlip ladiestresses (*Spiranthes longilabris*), rosebud orchid (*Pogonia divaricata*), and threebirds orchid (*Triphora trianthophoros*) are the product of botanical field work conducted at O'Leno from the mid-1940s to the mid-1960s. However, Tan did not locate any of those species again during his floristic studies in the late 1980s. Some of them may have disappeared because of decades of fire suppression and the resulting closure of the tree canopy.

Restoration measures (e.g., fire and selective hardwood reduction) that open up the canopy in the sandhill, upland pine, upland mixed woodland, and flatwoods natural communities will ultimately benefit many of the imperiled groundcover species that require full or partial sunlight. If the park uses herbicides to control hardwoods, staff must take care to ensure that they do not harm non-target imperiled groundcover species. In general, good stewardship of natural communities should suffice to protect many of the imperiled plants in the two parks. Other threats to imperiled plants at O'Leno/River Rise may include wetland alterations, plant poaching, and disturbance from rooting animals such as armadillos and feral hogs. Feral hogs have become increasingly common in the two parks. Feral hogs and armadillos are removed in accordance with Division policy.

The prescribed fire program at O'Leno/River Rise should also benefit imperiled animal species that inhabit the fire-maintained communities in the two parks, including several invertebrates first recorded there by participants in the North American Butterfly Association's (NABA) Annual 4th of July Butterfly Counts. NABA

has conducted butterfly counts at O'Leno/River Rise annually since 2005. Species identified include King's hairstreak (*Satyrium kingi*), Sweadner's juniper hairstreak (*Callophrys gyrneus sweadneri*), and Seminole Texan Crescent (*Anthanassa texana seminole*). The specific effects of fire on these species are largely unknown, but the retention of unburned refugia within suitable habitats and adjustments to the frequency and seasonality of prescribed burns may be critical elements for continued survival of imperiled butterflies (Schweitzer et al. 2011).

The Santa Fe River and its tributaries contain several rare species of mollusks. Two of those, the Suwannee moccasinshell (*Medionidus walkeri*) and the oval pigtoe (*Pleurobema pyriforme*), are imperiled mussels whose ranges extend into O'Leno State Park along a stretch of the Santa Fe just below the I-75 bridge. The oval pigtoe is a federally endangered species and the Suwannee moccasinshell is a candidate for federal listing (Blalock and Herod 1999; Blalock-Herod 2000; Blalock-Herod and Williams 2001). Historically, chronic erosion at the east end of the unpaved Bible Camp Road along the north boundary of O'Leno caused soil sediments to wash down a public boat ramp into that same stretch of the Santa Fe River. A large sedimentation plume formed in the river at and below the boat ramp, and washed further downstream along the Santa Fe. This sedimentation plume significantly changed habitat availability for both of the imperiled mussels. A plan to mitigate the Bible Camp Road erosion and to remove the accumulated sediments was developed in 2004. The plan provided for the complete removal of the sediment buildup in the Santa Fe and stabilization of the east end of Bible Camp Road. The park was able to work with Columbia County and multiple agencies to obtain funding and complete the restoration work in the summer of 2015.

Imperiled vertebrate species at O'Leno/River Rise include many that are associated with the sandhill, upland pine, and upland mixed woodland natural communities, for example the gopher tortoise (*Gopherus polyphemus*), Sherman's fox squirrel (*Sciurus niger shermani*), eastern indigo snake (*Drymarchon cooperi*), Florida pine snake (*Pituophis melanoleucus mugitus*), southern hognose snake (*Heterodon simus*), and gopher frog (*Lithobates capito*). Continued restoration of the upland fire-maintained communities will benefit these species. Also on the imperiled species list for O'Leno is the locally extirpated red-cockaded woodpecker (*Picoides borealis*), which was recorded at the park in the late 1930s and early 1940s by Oscar Baynard, a field ornithologist and Florida Park Service park manager and naturalist (District 2 Resource Management Files).

Historically, several imperiled turtle species have been harvested for meat in the region, including the gopher tortoise, Suwannee cooter (*Pseudemys suwanniensis*) and Suwannee alligator snapping turtle (*Macrochelys suwanniensis*). Harvest or possession of gopher tortoises has been prohibited statewide since 1988. Harvest of Suwannee cooters and Suwannee alligator snapping turtles was prohibited statewide in 2009. At that time, species having a similar appearance (all *Pseudemys* species and common snapping turtles (*Chelydra serpentina*) for example) were also protected from harvest statewide. In fact, all wildlife species, including turtles, are protected from harvest within state park boundaries. The area under jurisdiction of O'Leno/River Rise includes a 400-foot zone from the edge of

mean high water along sovereign submerged lands of the Santa Fe River. Where emergent wetland vegetation exists, the zone extends waterward 400 feet beyond the vegetation. In effect, harvest of wildlife, with the exception of fish, is prohibited along the length of the Santa Fe River where it passes through or runs along the boundary of O'Leno and River Rise Preserve state parks.

Suwannee cooters and Suwannee alligator snapping turtles have been the subjects of several studies within the parks. Dr. Jerry Johnston of Santa Fe College has conducted most of the research, working with students from Santa Fe College and the University of Florida. Trapping and observational studies have dealt with questions about Suwannee cooter density and distribution as well as the effects of disturbance (Johnston et al. 2011; Kornilev 2008; Kornilev et al. 2010).

In 2012, District 2 staff initiated surveys for the southern dusky salamander (*Desmognathus auriculatus*). There are historical records from 1954 for this salamander along the Santa Fe River near or within O'Leno State Park. However, this species has suffered dramatic declines in Florida over recent decades (Dodd 1998; Means and Travis 2007).

The Bachman's sparrow (*Peucaea aestivalis*), although technically not imperiled, is considered a Species of Greatest Conservation Need by the FWC, and it is an indicator species for well-managed sandhills (FWC 2005). District 2 biologists have conducted annual breeding season surveys for territorial males in the sandhills at O'Leno/River Rise since 2009.

The southeastern kestrel (*Falco sparverius paulus*), although not a confirmed nester at O'Leno/River Rise, does occur in the region. In fact, it breeds regularly at Ichetucknee Springs State Park 12 miles to the west. Lack of nesting cavities in suitable habitat, however, may be a limiting factor for kestrels at O'Leno/River Rise even when adequate foraging areas exist. Consequently, a number of years ago, staff at O'Leno/River Rise attempted to increase the number of cavities available for kestrel nesting in the parks by erecting nest boxes in appropriate locations in hopes of establishing a breeding population of kestrels. The effort was not successful.

Wildlife mortality along roads, while harmful to nearly all animal species, can be particularly detrimental to imperiled species that already suffer from reduced population levels. Florida pine snakes and Sherman's fox squirrels have been documented as road kills at O'Leno in the past. The gopher tortoises in the parks are also at risk since many burrows are located along road shoulders. Monitoring of road kills is an important part of the management of imperiled species and other wildlife. Documenting road kills can help define wildlife-crossing zones and can provide records for rare species that otherwise would have gone unnoticed. Park staff should continue to document road kills of imperiled species within the parks and on adjacent roadways, including gopher tortoises, pine snakes and Sherman's fox squirrels.

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						
Incised agrimony *Agrimonia incisa*			LE	G3,S2	1,6,7	Tier 1
Modest spleenwort *Asplenium verecundum*			LE	G1,S1	4,10	Tier 2
Southern lady fern *Athyrium filix-femina*			LT		4,10	Tier 1
Woodland poppymallow *Callirhoe papaver*			LE	G5,S2	1,6,7	Tier 1
Sand butterfly pea *Centrosema arenicola*			LE	G2Q, S2	1,6,7	Tier 1
Autumn coralroot *Corallorhiza odontorhiza*			LE	G5,S1		Tier 2
Angularfruit milkvine *Gonolobus suberosus*			LT		1	Tier 1
Spiked crested coralroot *Hexalectris spicata*			LE			Tier 2
Pine lily *Lilium catesbaei*			LT		1	Tier 1
Florida spiny pod *Matelea floridana*			LE	G2,S2	1	Tier 1
Plume polypody *Pecluma plumula*			LE	G5,S2	4,10	Tier 2
Rosebud orchid *Pogonia divaricata*			LT	G4,S1	1,6	Tier 2
Giant orchid *Pteroglossaspis ecristata*			LT	G2, G3, S2	1,6,7, 10	Tier 2
Florida mountain-mint *Pycnanthemum floridanum*			LT	G3,S3	1,6	Tier 1
Longlip ladiestresses *Spiranthes longilabris*			LT		1,6	Tier 2

Table 2. Imperiled Species Inventory						
Common and *Scientific* Name	**Imperiled Species Status**				**Management Actions**	**Monitoring Level**
	FWC	**USFWS**	**FDACS**	**FNAI**		
October ladiestresses *Spiranthes ovalis* var. *erostellata*			LE			Tier 2
Little ladiestresses *Spiranthes tuberosa*			LT			Tier 2
Threebirds orchid *Triphora trianthophoros*			LT			Tier 2
INVERTEBRATES						
Seminole Texan crescent *Anthanassa texana seminole*				G5T3 T4, S2S3	1	Tier 2
Sweader's juniper hairstreak *Callophrys gyrneus sweadneri*				G5T2, S2	1	Tier 2
Suwannee moccasinshell *Medionidus walkeri*				G1,S1	4,9	Tier 2
North peninsular mycotrupes beetle *Mycotrupes gaigei*				G2,S2	1	Tier 1
Smoky shadowfly *Neurocordulia molesta*				G4,S1	4	Tier 2
Oval pigtoe *Pleurobema pyriforme*	FE	LE		G2, S1S2	4,9	Tier 2
Pallid cave crayfish *Procambrus pallidus*				G2G3, S2S3	4	Tier 1
King's hairstreak *Satyrium kingi*				G3G4, S2	1	Tier 2
AMPHIBIANS						
Southern dusky salamander *Desomognathus auriculatus*				G4, S1S2	4	Tier 2
Florida gopher frog *Lithobates capito*	SSC			G3,S3	1,4,7	Tier 1
REPTILES						
American alligator *Alligator mississippiensis*	FT(S/A)	SAT		G5,S4	4,10, 13	Tier 1

Table 2. Imperiled Species Inventory						
Common and *Scientific* Name	**Imperiled Species Status**				**Management Actions**	**Monitoring Level**
	FWC	**USFWS**	**FDACS**	**FNAI**		
Eastern indigo snake *Drymarchon cooperi*	FT	LT		G3,S3	1,6, 7, 13	Tier 1
Gopher tortoise *Gopherus polyphemus*	ST			G3,S3	1,6,7, 10,13	Tier 2
Southern hognose snake *Heterodon simus*				G2,S2	1,6	Tier 1
Suwannee Alligator Snapping Turtle *Macrochelys suwanniensis*	SSC			G1G2, S1S2	4,9, 13	Tier 3
Florida pine snake *Pituophis melanoleucus mugitus*	SSC			G4T3, S3	1,6	Tier 1
Suwannee cooter *Pseudemys suwanniensis*	SSC			G5T3, S3	4,13	Tier 3
BIRDS						
Limpkin *Aramus guarauna*	SSC			G5,S3	4	Tier 2
Short-tailed hawk *Buteo brachyurus*				G4G5, S1		Tier 2
Little blue heron *Egretta caerulea*	SSC			G5,S4	4	Tier 2
Snowy egret *Egretta thula*	SSC			G5,S3	4	Tier 2
Tricolored heron *Egretta tricolor*	SSC			G5,S4	4	Tier 2
Swallow-tailed kite *Elanoides forficatus*				G5,S2	1	Tier 2
White ibis *Eudocimus albus*	SSC			G5,S4	4	Tier 2
Merlin *Falco columbarius*				G5,S2		Tier 2
Wood stork *Mycteria americana*	FE	LE		G4,S2	4	Tier 2
Red-cockaded woodpecker [x] *Picoides borealis*	FE	LE		G3,S2	1,6	Tier 2
Roseate spoonbill *Platalea ajaja*	SSC				4	Tier 2

Table 2. Imperiled Species Inventory						
Common and *Scientific* Name	**Imperiled Species Status**				**Management Actions**	**Monitoring Level**
	FWC	**USFWS**	**FDACS**	**FNAI**		
MAMMALS						
Sherman's fox squirrel *Sciurus niger shermani*	SSC			G5T3, S3	1,6,7	Tier 1
Florida black bear *Ursus americanus floridanus*	ST			G5T2, S2	1,10	Tier 1

[x] Extirpated

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 raccoons, venomous snakes 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.

O'Leno State Park and River Rise Preserve State Park are fortunate in that they have relatively few acres infested with invasive exotic plants at the present time. The challenge is to continue to keep the park as free of exotic plants as possible. To accomplish this, staff will need to be vigilant in familiarizing themselves with exotic plant identification, surveying for invasive exotics, and treating them as soon as possible when they are found.

The primary means by which exotic plants gain a foothold in O'Leno/River Rise are escape from adjacent private properties, dispersion by birds, and spreading by flood events. Camphor-tree (*Cinnamomum camphora*) and Chinese tallowtree (*Sapium sebiferum*), in particular, owe their dispersal to frugivorous birds. Japanese climbing fern is most often spread by flooding or by contaminated equipment and soil. Cogongrass (*Imperata cylindrica*) sources typically include infested logging equipment, mowers, tractors and contaminated soil or limerock.

All management zones at O'Leno/River Rise have been surveyed for invasive exotic plants, and staff will continue to survey for them on a regular basis. Management of exotics has focused on treating known infestations and routinely looking for highly invasive species such as Chinese tallowtree in wetland and riverine areas. Since 2003, about 194 acres of invasive exotic plants have been treated at O'Leno/River Rise.

In addition to Florida Exotic Pest Plant Council (FLEPPC) Category I and Category II exotic species, both parks have centipedegrass (*Eremochloa ophiuroides*). This species has invaded some of the sandhill restoration areas and will need to be treated on a regular basis.

The most significant exotic animal at O'Leno/River Rise is the feral hog (*Sus scrofa)*. Fortunately, hog population levels in the two parks are currently low. The parks have an established trapping program that is activated when hog numbers show a significant increase. A population of South American capybaras (*Hydrochoerus hydrochaeris*) is apparently established in the Santa Fe River basin, and individuals occasionally range into O'Leno State Park along the river floodplain. The capybara population will continue to be monitored to determine if any management actions are needed. Feral cats and dogs occasionally take up residence in the two parks 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 2007 and 2008, the disease was discovered in Alachua County and Columbia County, respectively. Since that time, most 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 O'Leno/River Rise, 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 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	1	RR-3Cs
		2	RR-2E
Camphor-tree *Cinnamomum camphora*	I	2	RR-3D, RR-3Ge, RR-3Gw
Cogongrass *Imperata cylindrica*	I	2	OL-1M, OL-1U

Table 3. Inventory of FLEPPC Category I and II Exotic Plant Species			
Common and Scientific Name	**FLEPPC Category**	**Distribution**	**Management Zone(s)**
Japanese climbing fern *Lygodium japonicum*	I	1	OL-1T, RR-2Cw, RR-2Gn, RR-3D
		2	OL-1B, OL1E, OL-1Qw, OL-1U, RR-2Dn, RR-2M
		3	RR-2E
Nandina *Nandina domestica*	I	1	OL-1B
Chinese tallowtree *Sapium sebiferum*	I	1	OL-1U
		2	RR-2Fw, RR-2Gn
Chinese wisteria *Wisteria sinensis*	II	1	RR-3D
		2	RR-3Cs

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

The Santa Fe River and its major karst features, including the River Sink, Natural Bridge, and River Rise, are the most obvious special natural features in the two parks. Many smaller solution features and an array of sinkhole lakes also occur in the area. Most of the sinks are relatively small, but several of the lakes exceed an acre in size. Some of the formations, including the Ravine Sinks, are elongate crevices; however, the majority of the sinks are circular to oblong in shape. Most of the larger sinkhole lakes contain karst windows, actual openings through the roof of limestone that overlays the subterranean river below. In several of these lakes, groundwater flow may enter at one side and exit the other.

As a testament to the dynamic nature of the Natural Bridge, a new sinkhole lake formed over a period of several days in the early 1990s. Named New Sink, it is located immediately south of Parener's Branch Sink and was observed as it gradually enlarged, toppling large canopy trees and eroding away surficial soils into

subterranean spaces. In 2011, an existing sink near Parener's Branch Road doubled in size in a similar fashion, and in 2012, another sinkhole opened within the footprint of Parener's Branch Road very close to New Sink.

At least two insurgences, commonly known as "suck holes," occur in the channel of the Santa Fe River within O'Leno/River Rise; both siphon water from the river. One insurgence point is located in the bed of the river west of U.S. Highway 441, while the other lies along the north bank of the river near Vinzant Landing, above the River Sink. These features are visible when Santa Fe water levels are low.

A series of natural levees have formed along various stretches of the Santa Fe River. These levees are most prominent just upstream of the suspension bridge. Numerous limestone outcrops occur within and along the upper edges of the river floodplain and within the Natural Bridge area. These outcrops provide microhabitats conducive to the abundant growth of several different ferns and other unusual plants. One of the larger exposures contains several small terrestrial caves.

A number of champion trees have been discovered in the two parks. These include pop ash (*Fraxinus caroliniana*), a national co-champion; green haw (*Crataegus viridis*) and diamondleaf oak (swamp laurel oak), both Florida champions; winged elm (*Ulmus alata*), a Florida challenger; water locust (*Gleditsia aquatica*), a former state record holder; and bluff oak, a state honorable mention (Ward and Ing 1997).

Not only is the Natural Bridge unique geologically, it is also an area with a long and diverse history of human use. It has served as a land bridge and corridor between the Santa Fe's River Sink and River Rise for native peoples, early Europeans, and Florida pioneers, as discussed in the Cultural Resources section below.

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 use in 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 the two parks. 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: The lands that now comprise O'Leno State Park and River Rise Preserve State Park have a rich and extensive history of human occupation from at least the Early Archaic period through the historic periods of Florida settlement, the

WPA/CCC era in the 1930s, and the early years of development of the Florida Park Service in the mid-20th century. The two parks combined have 83 archaeological sites and five resource groups (historic road sites) recorded with the FMSF, as well as several unrecorded sites. Because of the nature, diversity and number of sites, the entire area encompassed by these parks has archaeological significance and has the potential to yield more information about prehistoric settlement patterns, not only within the parks but also in the surrounding region.

The Santa Fe River, the River Sink and River Rise, and the natural land bridge that connects them are significant natural features that have drawn humans to the area for thousands of years. Prehistoric as well as modern humans used the Natural Bridge (AL3520, CO50) as a convenient route for crossing the Santa Fe drainage without having to ford the river. Bellamy Road (AL5666, CO57), which generally followed the Spanish Mission Trail and was the first federally funded road in Florida, also used the Natural Bridge along part of its route between St. Augustine and Tallahassee, Florida.

The pre-European or early colonial signs of human presence identified at the parks' archaeological sites, e.g. campsites, village sites and prehistoric and historic quarry or extractive sites, represent the Late Archaic (3000–500 BCE), Cades Pond (300 BCE–800 AD), Hickory Pond (800–1250 AD), and Alachua (1250 – 1600 AD) periods. In many cases, the assemblage of artifacts at the sites is insufficient to determine cultural period. Several historic era archaeological sites occur in the parks as well. One example is the town of Keno, or Leno (CO51), established in the late 1800s on the banks of the Santa Fe River just above the River Sink. Another is a mill (CO32) associated with the town. According to local lore, O'Leno may have also been the site of a Seminole War fort, or possibly a cantonment, built by General Winfield Scott, the exact location of which is currently unknown.

A limited amount of archaeological research has taken place in the two parks. The most intensive systematic study to date was conducted as part of the Old Bellamy Road historic landscape restoration project, during which the segment of historic road that passes through the park was thoroughly surveyed (Duever et al. 1997). Part of that survey included shovel testing and excavation of the section of road that crosses the low boggy terrain of the Natural Bridge, which was constructed using a corduroy road technique common in the early 1800s. During the Bellamy Road survey, 31 archaeological sites were discovered within the 1.3-mile study area.

Weisman and Newman (1992) conducted an archaeological survey in River Rise Preserve in 1991. This survey encompassed the entire preserve, whereas the Bellamy Road survey focused on an area about 160 acres in size. Several other, much smaller surveys have taken place within the parks in preparation for projects that might involve ground disturbance.

A Predictive Model has been completed for O'Leno/River Rise (Collins et al. 2012). Some site locations were corrected during this process. Other sites need to have their location and boundaries confirmed.

Condition Assessment: All of the archaeological sites are in good condition with three exceptions. AL179 is in poor condition, while AL5664 and CO409 are in fair condition. These three sites have experienced looting in the past. All sites in the parks that have experienced looting need more frequent monitoring. Staff should be careful not to inadvertently create trails to sites during the monitoring process.

Level of Significance: O'Leno State Park and River Rise Preserve State Park contain numerous archaeological sites. Most are prehistoric sites consisting primarily of lithic scatters of varying density. The soft sands in the region that have been so highly susceptible to natural and human disturbance over the years, plus the lack of diagnostic specimens, have rendered most of these sites ineligible for the National Register of Historic Places, in the opinion of professional consultants and the State Historic Preservation Office (SHPO). The prolific stone tool production and maintenance that occurred in the area is directly tied to the region's karst topography, particularly its limestone outcrops. O'Leno/River Rise contains four recorded quarry sites utilized by prehistoric people as a chert source. The Monroe Quarry (AL1016), now submerged by the Santa Fe River due to the higher water table prevalent today, is still littered with lithic debitage, and it possesses undisturbed deposits that contain organic material. This site is noteworthy because it demonstrates the importance of local lithic resources to prehistoric subsistence and because it provides data about prehistoric procurement of those resources. For those reasons, it may be eligible for the National Register under Criteria A and D. It has not been evaluated by the SHPO; neither have the O'Leno Lithic Quarry (AL5628), Vinzant Landing Quarry (AL5629), and Santa Fe Quarry (AL131). Further research is required to evaluate their significance, including consideration of a multiple property nomination.

An exception to the lithic scatters is Sweetwater Village (AL2886), a prehistoric Weeden Island or Cades Pond village site with at least one associated sand burial mound – Sweetwater Mound A (AL179). Archaeological testing has revealed that the village site retains excellent integrity and that artifact patterning may be related to discrete activity areas associated with daily village life. The site appears to be eligible for the National Register under Criterion D for the information it can yield about prehistoric adaptation, settlement patterns, and resource utilization. The SHPO has not yet evaluated it.

Ogden Pond Mounds A (AL3067) and B (AL3068), both possible Weeden Island sand mounds, are locally significant in the opinion of SHPO archaeologists for information they can yield about prehistoric settlement patterns, mound construction and use, resource utilization, mortuary behavior, disease, and nutrition. The integrity of Mound A has been seriously compromised by past looting activity. Mound B, a confirmed burial mound, has had minor disturbance from looting. Neither site has been formally evaluated by the SHPO.

The Santa Fe River was once reported to contain numerous submerged fossil and artifact concentrations, much of it subsequently collected. These sites represented a mix of inundated terrestrial sites, sunken watercraft, refuse deposits, and eroded material from nearby uplands. The Santa Fe Fish Weir (AL2926), however, appears

to have been intentionally constructed by prehistoric people to facilitate fishing by holding nets or deliberately shunting fish to specific collection areas. The site consists of twelve somewhat evenly spaced wooden stakes driven into clay-filled crevices that have been dated to the Deptford period (500 B.C. – A. D. 200). The preservation of organic material at the site, the rare site type, and the fact that the site is *in situ*, appear to make it eligible for the National Register. While it has not been formally evaluated by the SHPO, a SHPO archaeologist is of the opinion that the site can yield information about prehistoric technology and subsistence practices.

The Santa Fe River disappears underground in O'Leno State Park and reappears about three miles to the south in River Rise Preserve State Park. This three-mile wide natural land bridge has been recorded as an archaeological site, Natural Bridge (AL3520/CO50). A preliminary survey in 1971 by the SHPO noted its 19th century significance in the area of communications for serving as a primary conduit for travel across the Santa Fe River. It is unusual for a natural landform to be recorded as an archaeological site. The SHPO has not formally evaluated the site.

The Bellamy Road (AL5666/CO57), which passes through southern Columbia County, crosses the Natural Bridge. This 19th century road essentially follows the course of the Royal Road, an old Spanish road from St. Augustine to Tallahassee, which in turn followed an older Native American trail. A 1995-96 archaeological survey of a 7,210-foot long section of the Bellamy Road determined that the historic component of the road could be differentiated from its modern counterpart. The historic part included multiple discrete deposits, soil disturbance related to horse traffic, narrow rutting from wagon traffic, and wooden segments of a now buried corduroy road. The Bellamy Road is a linear resource that appears eligible for the National Register for the role it played in transportation and communication. It has not been formally evaluated by the SHPO. The 1995-96 survey also resulted in the recording of 31 new archaeological sites, primarily the prehistoric lithic scatters mentioned above. It may be better to classify the Natural Bridge as an archaeological district that would include the Bellamy Road and various prehistoric artifact scatters.

O'Leno (CO51) is the historic remnants of the 19th century town of Keno (name later changed to Leno). Leno was a small settlement located near the important Bellamy Road and the natural bridge over the Santa Fe River. It appears to have had just a few, primarily transient or short-term residents, initially associated with a military post and way station for travelers in the mid-19th century, and then with industries related to local agriculture and timbering enterprises in the late 19th century. There are unconfirmed reports that Leno was the site of the first telegraph office in Florida as well. The only documented remnants of the old town are three separate mill and dam features associated with an old cotton gin, grist mill, and saw mill. The mill locales contain milled timbers and limestone rocks used to dam the river. The site of O'Leno also includes a prehistoric lithic scatter, and may include artifacts related to the construction of the WPA/CCC forestry camp in the 1930s. A preliminary survey done by the SHPO in 1971 noted the site's 19th century significance in the area of commerce, an example of the rise and fall of boomtowns

associated with the unsustainable exploitation of local resources. The SHPO has not formally evaluated the site.

General Management Measures: One significant site, Sweetwater Lake Mound A (AL179), may need to be brought to Desired Future Condition. Recent attempts to locate this site again were unsuccessful (Collins et al. 2012). The site should be located and its condition assessed before planning rehabilitative treatments.

One other site, AL5664, should be evaluated for rehabilitation. It may be possible to place a protective barrier over the disturbed portion of this site and backfill it. Staff will regularly monitor sites that either have experienced looting or are in proximity to a looted site.

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: O'Leno is one of nine parks now in the Florida state park system that were built by Civilian Conservation Corps (CCC) and Works Progress Administration (WPA) workers in the 1930s and early 1940s during the New Deal era under President Franklin Delano Roosevelt. The New Deal was a series of domestic programs enacted between 1933 and 1936 in response to the Great Depression. The CCC and WPA programs were components of the New Deal, providing jobs to unemployed workers in the conservation of natural resources and construction of public works. O'Leno was at that time a WPA/CCC forestry camp that first provided employment to laborers from the High Springs area, and later to a CCC company from Olustee as well. Because young men from both the CCC and WPA worked at the O'Leno Forestry Camp during overlapping periods, it is difficult to attribute construction of any particular structure to one group or the other.

There are 61 historic structures (comprising 64 FMSF sites) still in existence at O'Leno, including 56 buildings, three roads (comprising five FMSF resource groups), and two bridges (comprising three FMSF sites). Not one structure remains from the old town of Keno (Leno), however, even though the town occupied approximately the same location near the River Sink on the Santa Fe River from the mid to late 1800s. All the historic structures at the park (except for roads) derive from either the New Deal era or the period of early park development during the late 1950s and early 1960s.

Historic structures from the New Deal/WPA/CCC period at O'Leno number about 16 (comprising 17 FMSF sites), including bridges (Historic Property Associates, Inc. 1989). The WPA/CCC buildings that remain today reflect O'Leno's original purpose as a forestry camp. Most of these buildings and the historic layout of the O'Leno Forestry Camp are still in place as the WPA/CCC designed them. Several good examples of historic buildings constructed in the rustic architectural style of the era are still in use at the park, including the Tower House (CO385), Cypress Log Pavilion (CO386), Craft Building, BL060011 (CO1140), Recreation Hall (CO387),

and Canteen (CO1142). The latter is of added interest because of the historic graffiti found inside; staff should document the graffiti before they are inadvertently destroyed. The Fire Tower (CO392) is another WPA/CCC structure built as part of the O'Leno Forestry Camp, but it is located just outside the northwest boundary of the park.

The WPA/CCC also constructed rock terraces and other walls at O'Leno, including the River Amphitheater (CO1178), Buzzard's Roost Creek Rock Wall (CO1175), and Swimming Area Amphitheater (CO1174), all located near the Santa Fe River. The limestone used in the buildings, walls, terracing and amphitheater was all quarried within the park.

Many of the other historic structures at O'Leno are associated with the period of early park development in the 1950s and 1960s. Cabins, picnic shelters, a park manager's residence, office, and other park support structures were built during this time. The buildings are clustered near the river and are integrated into the original area of WPA/CCC development. The cabins and most of the other structures from that period are still used for their original intent.

There are at least two historic bridges (comprising three FMSF sites) within O'Leno/River Rise. The CCC O'Leno Suspension Bridge (AL5654 and CO1177), which crosses the Santa Fe River near the day-use area, is an icon of O'Leno State Park and the WPA/CCC presence there. The Flatwoods Bridge (CO1203), which connects the Youth Camp with a flatwoods area, dates from at least the WPA/CCC era, possibly earlier. A third bridge, located on Alligator Road, may also be historic. The park has at least partially rebuilt that bridge several times, and further research is needed to determine its actual age.

The three historic roads within O'Leno/River Rise comprise five resource groups, each with its own FMSF number. Two of the historic roads, namely Alligator Road or Wire Road (AL5665 and CO1204) and Bellamy Road (AL5666 and CO57), predate the WPA/CCC era. An 1849 surveyor's map of the area shows that both these roads, as well as a third road, were already in existence. The third road (CO1176), yet to be surveyed, runs south from the approximate location of the town of Keno on the Santa Fe River and connects with Bellamy Road and Alligator Road. All sites within O'Leno/River Rise known to be historic have been recorded with the FMSF with the exception of one bridge.

Bellamy Road became the first federally funded highway in Florida when the Congressional Act of 1824 authorized its construction. Built between 1824 and 1826 as part of the St. Augustine to Pensacola road (Duever et al. 1997), the Bellamy Road followed the path of what was known as the Old Spanish Trail (Mission Trail or Old Indian Trail) and used the natural bridge at O'Leno/River Rise to cross the Santa Fe drainage. Sections of the road used the old "corduroy" construction technique to cross wet areas. In the 17th century, the Mission Trail was the major route from St. Augustine across north Florida to Apalachee, passing by several Spanish Missions en route (Milanich and Hudson 1993). This trail is depicted on the 18th-century Stuart–Purcell map. The section of Bellamy Road passing through

River Rise Preserve is one of only a very few such stretches contained within a state park, and as such, is quite significant.

Condition Assessment: Almost all the historic structures at O'Leno are in good condition with the exception of the Cypress Log Pavilion (CO386), Recreation Hall (CO387), and Craft Building (CO1140), all of which are in fair or poor condition, and the O'Leno State Park Entrance Sign (CO1173), which is in poor condition. Eight cabins are in good condition, but they need new metal roofs.

The Craft Building, Cypress Log Pavilion, and Recreation Hall have termite infestations and need prompt attention. Although all have been fumigated in the past, termite issues persist. Most critical is the Recreation Hall, which is in poor condition. It has termite damage in the logs of the west wall and perhaps in the flooring and the support beams as well. There are also rotting timbers underneath the building, and the front wooden steps need replacement regularly, particularly after flood events. The Cypress Log Pavilion and the Craft Building also have termite damage, but are in fair condition. The Craft Building will need a new metal roof within 10 years. The Cypress Log Pavilion has tree roots that are damaging the concrete floor of the building, and it will need a new roof within 10 years. All the other buildings only need routine maintenance. However, since termites are a persistent threat not only to WPA/CCC buildings but also to other historic structures, regular termite preventative treatments will be a necessity.

The O'Leno State Park Entrance Sign has a structurally sound base, but the top of the sign is rotting. The CCC O'Leno Suspension Bridge is presently in good condition, but it will need to have supports for the bridge decking replaced within two to five years due to impacts from Tropical Storm Debby. No historic structures are planned for demolition at this time**.**

Level of Significance: The majority of the historic structures in the park derive their significance from their association with a forestry training and education camp, Camp O'Leno (i.e., O'Leno Forestry Camp), initiated in 1935 by what is now the Florida Forest Service. The construction of the camp first utilized unemployed laborers from the High Springs area through the Works Progress Administration (WPA). The WPA laborers were later supplemented with workers from Civilian Conservation Corps (CCC) Company 418, Camp P-67, which was initially stationed at Olustee. The 1935 - 1936 WPA/CCC structures, identified as "New Deal" in Table 4 below, are considered eligible for the National Register mainly for their association with the Great Depression and resulting work relief programs, the WPA and CCC. Their rustic design, which was the standard for much of state and national park development in the mid to late 1930s and became a model for later park development, is a contributing factor to their eligibility.

Several historic structures, built during the operation of Camp O'Leno from 1938 through 1939 and later during early development of the state park (1939, 1940), mimicked the architectural design of the earlier WPA/CCC structures, often making it difficult to determine when and by whom they were constructed. Although these structures cannot be considered eligible as part of the WPA or CCC collection since

both groups ceased working at O'Leno in 1936, they may potentially be eligible for the National Register in their own right as early park structures that reflect the planning and design principles of the earlier WPA/CCC structures.

Park development saw another wave of concentrated activity in the first half of the 1960s with the construction of new overnight cabins and associated bathhouses. While these structures do not reflect the architecture of the WPA/CCC-period or early Florida Park Service buildings, they may be potentially eligible for the National Register as representatives of a second wave of park development constructed to meet the need for group camping, a popular recreational and social activity at Florida state parks in the mid-20th century. These structures may also be considered significant for the central role they played in the history of the Florida Park Service itself. Ranger Academy, an agency program that has been responsible for training hundreds of new park service staff, was held at O'Leno State Park from its inception in 1972 until it outgrew the park's facilities and was transferred to Wekiwa Springs State Park in 1977.

General Management Measures: Because so many of the WPA/CCC structures that comprised the O'Leno Forestry Camp (Camp O'Leno) are still present in their original locations and condition, the entire group is potentially eligible for the National Register. The DRP will manage them in such a way as to maintain their original integrity. Even the WPA/CCC Fire Tower (CO392) is still intact, although it is on state property that is contiguous with O'Leno State Park and is currently operated by the Florida Forest Service. As these structures need repair, they will likely receive preservation treatment rather than rehabilitative treatment.

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: O'Leno State Park has two types of collections: cultural material and natural history items. River Rise Preserve State Park does not have any collections.

O'Leno's cultural collection scope encompasses the territorial era as well as the early 20th-century Civilian Conservation Corps (WPA/CCC) period and the initial development period of the Florida Park Service. The collection, which is used for interpretive purposes, consists of a WPA/CCC monument statue and multiple items from the town of Leno and from the WPA/CCC and early park days. Collection items include components of the town's grist mill, old tools, photographs, documents and uniforms from the WPA/CCC, and some pre-Columbian stone points on loan from the Division of Historic Resources. All of the WPA/CCC material was donated to the park by the Gainesville Chapter of the Civilian Conservation Corps Alumni.

The Leno grist mill displayed at the park is a gift from the Traxler family. In 1998, a descendant of the Traxler family from Traxler, Florida, northeast of High Springs, notified the park that the family retained one of the two original Town of Leno grist

mills. The family had purchased it from Colonel Mike Whetstone, the developer of Leno, Florida, after the town's demise in the late 1890s. These claims were corroborated by the Park Manager, and the Traxler family descendants then donated the mill to the park. In the early 2000s, the Friends of O'Leno completed a pavilion for the outside display of the grist mill. In 2007, the multiple items were treated and preserved before being put on permanent display in the pavilion. The Friends of Dudley Farm also developed additional interpretive signage to complete the Grist Mill Pavilion project in 2008. The grist mill pavilion interprets and displays the machinery used by the residents of Leno in the mid to late 1800s, which made that agricultural community successful during its short lifespan.

In 2008, the local chapter of the CCC Alumni Association approached the park about their desire to erect a "CCC Boy" monument to represent the contributions of the CCC workers from 1936 to 1938, when the park was being established. The site chosen for the monument was next to the park museum, which is the WPA/CCC Training Fire Tower (Tower House CO385) structure. A donor from that CCC Alumni Chapter paid for the monument. This same chapter has supported the park since the 1980s with other donations to the park museum representing the history of the WPA/CCC. The monument commemorates the two years the African-American Company of CCC workers, in concert with WPA workers, built assorted buildings, retaining walls, and other structures at O'Leno. After 2009, the local CCC chapter incorporated into the CCC Legacy Association, which includes descendants of CCC workers.

The cultural collection contains fewer than 200 items, most of which are displayed in the park museum. The grist mill and machinery, however, are displayed in an outdoor pavilion. Additional cultural collection material is housed in a two-foot by three-foot collections storage box in the Nature Center.

The natural history portion of the collection, entirely housed in the Nature Center, contains about 200 taxidermied and live animals. The various live animals in the collection are native to the park and include assorted snakes, lizards, box turtles and frogs used to interpret the park's natural history. The Nature Center is air conditioned and is about 15 feet by 30 feet in size.

Condition Assessment: The condition of the O'Leno collections is good. Most of the cultural collection is housed in the park museum, which is a 10-foot by 30-foot WPA/CCC structure known as the Tower House (CO385). The small portion of the cultural collection that is kept in the storage box in the Nature Center is used for interpretative purposes.

The park's Nature Center, which houses the natural history collection, is a WPA/CCC structure that served as the original entrance station to the O'Leno Forestry Camp (CO1152). Both the park museum and the Nature Center are lockable and have air conditioning and pest control.

The primary curatorial concern is the long-term preservation of the WPA/CCC uniforms and gear. These were recently treated and their condition is checked at

least once a year. They are scheduled for retreatment in 2018. All taxidermied animals should be checked regularly for bugs and other evidence of deterioration.

Level of Significance: All of the cultural and natural history collections are from the park or directly related to the WPA/CCC era of the Forestry Camp. The significance of the WPA/CCC material is its pertinence to O'Leno as one of Florida's nine WPA/CCC parks. The material also provides supporting documentation for the history of WPA/CCC park development in Florida.

General Management Measures: O'Leno State Park currently has a Scope of Collections Statement. All items have been inventoried and catalogued. The park does not have a housekeeping manual. No collection management assessments have been completed.

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
AL1 NN	Prehistoric	Archaeological Site	NE	G	P
AL131 Santa Fe Quarry	Unknown	Archaeological Site	NE	G	P
AL179 Sweetwater Lake Mound A	Weeden Island	Archaeological Site	NR	P	P
AL180 Sweetwater Lake Mound B	Prehistoric unspecified	Archaeological Site	NE	G	P
AL2608 NN	Prehistoric	Archaeological Site	NS	G	P

Table 4. Cultural Sites Listed in the Florida Master Site File					
Site Name and FMSF #	**Culture / Period**	**Description**	**Significance**	**Condition**	**Treatment**
AL2886 Sweetwater Village	Weeden Island	Archaeological Site	NR	G	P
AL2926 Santa Fe Fish Weir	Deptford	Archaeological Site	NR	G	P
AL3067 Ogden Pond Mound A	Prehistoric unspecified	Archaeological Site	NE	G	P
AL3068 Ogden Pond Mound B	Prehistoric unspecified	Archaeological Site	NE	G	P
AL3245 Bellamy Road 18	Prehistoric unspecified	Archaeological Site	NS	G	P
AL3246 Bellamy Road 19	Alachua	Archaeological Site	NS	G	P
AL3247 Bellamy Road 20	Prehistoric unspecified	Archaeological Site	NS	G	P
AL3248 Bellamy Road 21	Cades Pond	Archaeological Site	NS	G	P
AL3249 Bellamy Road 22	Prehistoric unspecified	Archaeological Site	NS	G	P
AL3250 Bellamy Road 23	Alachua, 1st Spanish	Archaeological Site	NS	G	P
AL3251 Bellamy Road 24	Cades Pond	Archaeological Site	NS	G	P
AL3252 Bellamy Road 25	Late Archaic	Archaeological Site	NS	G	P

Table 4. Cultural Sites Listed in the Florida Master Site File					
Site Name and FMSF #	**Culture / Period**	**Description**	**Significance**	**Condition**	**Treatment**
AL3253 Bellamy Road 26	Prehistoric unspecified	Archaeological Site	NS	G	P
AL3254 Bellamy Road 27	Prehistoric unspecified	Archaeological Site	NS	G	P
AL3255 Bellamy Road 28	Alachua, late Archaic	Archaeological Site	NS	G	P
AL3256 Bellamy Road 29	Prehistoric unspecified	Archaeological Site	NS	G	P
AL3257 Bellamy Road 30	Prehistoric unspecified	Archaeological Site	NS	G	P
AL3258 Bellamy Road 31	Prehistoric unspecified	Archaeological Site	NE	G	P
AL3520 Natural Bridge	Prehistoric to 19th Century	Archaeological Site	NE	G	P
AL5628 O'Leno Lithic Quarry	Prehistoric	Archaeological Site	NE	G	P
AL5629 Vinzant Landing Quarry	Prehistoric	Archaeological Site	NE	G	P
AL5654 CCC O'Leno Suspension Bridge	CCC New Deal	Bridge	NR	G	RS
AL5664 Spivey's Road Island	Prehistoric Unknown	Archaeological Site	NE	F	P
AL5665 Wire Road	Mid-1800s or earlier	Resource Group	NE	G	P

Table 4. Cultural Sites Listed in the Florida Master Site File					
Site Name and FMSF #	**Culture / Period**	**Description**	**Significance**	**Condition**	**Treatment**
AL5666 Bellamy Road also Old Spanish Trail or Old Indian Trail	Historic/ Spanish/Prehistoric	Resource Group	NE	G	P
CO19 Register Field	Prehistoric unspecified	Archaeological Site	NE	G	P
CO21 Davidson's Field	Unspecified	Archaeological Site	NE	G	P
CO23 Columbia Springs	Weeden Island	Archaeological Site	NE	G	P
CO28 Trestle	Unspecified	Archaeological Site	NE	G	P
CO31 Snipe's Point	Unspecified	Archaeological Site	NE	G	P
CO32 O'Leno Mill	Prehistoric unspecified	Archaeological Site	NE	G	P
CO34 NN	Unknown	Archaeological Site	NE	G	P
CO44 Buzzard's Roost Prairie	Archaic	Archaeological Site	NE	G	P
CO50 Natural Bridge	Prehistoric to 19th Century	Archaeological Site	NE	G	P
CO51 O'Leno - also Old Leno (Keno)	19th Century	Archaeological Site	NE	G	P
CO57 Bellamy Road - also Old Spanish Trail or Old Indian Trail	Historic/ Spanish/Prehistoric	Resource Group	NE	G	P

Table 4. Cultural Sites Listed in the Florida Master Site File					
Site Name and FMSF #	**Culture / Period**	**Description**	**Significance**	**Condition**	**Treatment**
CO69 NN	Prehistoric unspecified	Archaeological Site	NE	G	P
CO234 Bellamy-O'Leno Lithics	Prehistoric unspecified	Archaeological Site	NE	G	P
CO385 Tower House	New Deal, 1937	Historic Structure	NE	G	RS
CO386 Cypress Log Pavilion	New Deal, 1937	Historic Structure	NR	F	RS
CO387 Recreation Hall	New Deal, 1936	Historic Structure	NR	P	RS
CO388 Stone Storage Building	New Deal, 1938	Historic Structure	NR	G	RS
CO389 Smokehouse	New Deal, Circa 1940	Historic Structure	NR	G	RS
CO390 Barn	New Deal, Circa 1940	Historic Structure	NR	G	RS
CO391 Infirmary	New Deal, 1938	Historic Structure	NR	G	RS
CO409 River Bend	Middle Archaic & possibly earlier	Archaeological Site	NE	F	P
CO659 North Black Lake	Unknown	Archaeological Site	NE	G	P
CO660 River Rise	Prehistoric unspecified	Archaeological Site	NE	G	P
CO661 North Downing Lake	Prehistoric unspecified	Archaeological Site	NE	G	P
CO662 Limestone Holes	Weeden Island	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**
CO720 Bellamy Road 1	Possible Archaic	Archaeological Site	NS	G	P
CO721 Bellamy Road 2	Prehistoric unspecified	Archaeological Site	NS	G	P
CO722 Bellamy Road 3	Prehistoric unspecified	Archaeological Site	NS	G	P
CO723 Bellamy Road 4	Alachua, Cades Pond	Archaeological Site	NS	G	P
CO724 Bellamy Road 5	Prehistoric unspecified	Archaeological Site	NS	G	P
CO725 Bellamy Road 6	Prehistoric unspecified	Archaeological Site	NS	G	P
CO726 Bellamy Road 7	Prehistoric unspecified	Archaeological Site	NS	G	P
CO727 Bellamy Road 8	Prehistoric unspecified	Archaeological Site	NS	G	P
CO728 Bellamy Road 9	Cades Pond	Archaeological Site	NS	G	P
CO729 Bellamy Road 10	Alachua, Cades Pond	Archaeological Site	NS	G	P
CO730 Bellamy Road 11	Cades Pond	Archaeological Site	NS	G	P
CO731 Bellamy Road 12	Prehistoric unspecified	Archaeological Site		G	P

Table 4. Cultural Sites Listed in the Florida Master Site File					
Site Name and FMSF #	**Culture / Period**	**Description**	**Significance**	**Condition**	**Treatment**
CO732 Bellamy Road 13	Alachua, Hickory Pond	Archaeological Site	NS	G	P
CO733 Bellamy Road 14	Alachua, Cades Pond	Archaeological Site	NS	G	P
CO734 Bellamy Road 15	Prehistoric unspecified	Archaeological Site	NS	G	P
CO735 Bellamy Road 16	Prehistoric unspecified	Archaeological Site	NS	G	P
CO736 Bellamy Road 17	Prehistoric unspecified	Archaeological Site	NS	G	P
CO882 Head 1	Prehistoric and historic unspecified	Archaeological Site	NE	G	P
CO1016 Monroe Quarry	Early Archaic	Archaeological Site	NE	G	P
CO1105 Vinzant Landing Quarry	Prehistoric	Archaeological Site	NE	G	P
CO1138 Leader Cabin # 3, BL060004	1961	Historic Structure	NR	G	RH
CO1139 Leader Cabin # 1, BL060005	1961	Historic Structure	NR	G	RH
CO1140 Craft Building, BL060011	CCC New Deal	Historic Structure	NR	F	RS
CO1141 Warehouse, BL060012	CCC New Deal, 1940	Historic Structure	NR	G	RS

Table 4. Cultural Sites Listed in the Florida Master Site File					
Site Name and FMSF #	**Culture / Period**	**Description**	**Significance**	**Condition**	**Treatment**
CO1142 Canteen, BL060018	CCC New Deal, 1938	Historic Structure	NR	G	RS
CO1143 Olustee Cabin, BL060029	1961	Historic Structure	NR	G	RH
CO1144 San Felasco Cabin, BL060030	1961	Historic Structure	NR	G	RH
CO1145 Torreya Cabin, BL060031	1961	Historic Structure	NR	G	RH
CO1146 Wakulla Cabin, BL06032	1961	Historic Structure	NR	G	RH
CO1147 Garage & Laundry, BL060033	1961	Historic Structure	NR	G	RH
CO1148 Assist. Manager Residence, BL060035	1961	Historic Structure	NR	G	RH
CO1149 Office, BL060036	1961	Historic Structure	NR	G	RH
CO1150 Sawmill Shelter, BL060038	1961	Historic Structure	NR	G	RH
CO1151 Old Men's Restroom, BL060039	1961	Historic Structure	NR	G	RH

Table 4. Cultural Sites Listed in the Florida Master Site File					
Site Name and FMSF #	**Culture / Period**	**Description**	**Significance**	**Condition**	**Treatment**
CO1152 Original Entrance Station, BL060040	1957	Historic Structure	NR	G	RS
CO1153 Truck Shelter, BL060044	1961	Historic Structure	NR	G	RH
CO1154 Garage & Laundry BL060045	1961	Historic Structure	NR	G	RH
CO1155 Barn/Old Chicken House, BL060047	1961	Historic Structure	NR	G	RH
CO1156 Fire Truck Shelter, BL060048	1961	Historic Structure	NR	G	RH
CO1157 Lumber Shelter, BL060060	1961	Historic Structure	NR	G	RH
CO1158 4 Table Pavilion, BL060067	1961	Historic Structure	NE	G	RH
CO1159 Cook's Cabin, BL060069	1961	Historic Structure	NR	F	RH
CO1160 Girls' Bathhouse, BL060071	1963	Historic Structure	NR	G	RH

Table 4. Cultural Sites Listed in the Florida Master Site File					
Site Name and FMSF #	**Culture / Period**	**Description**	**Significance**	**Condition**	**Treatment**
CO1161 Anastasia Cabin, BL060073	1965	Historic Structure	NR	G	RH
CO1162 Bahia Honda, BL060074	1965	Historic Structure	NR	G	RH
CO1163 Cayo Costa Cabin, BL060075	1965	Historic Structure	NR	G	RH
CO1164 Fakahatchee Cabin, BL060076	1965	Historic Structure	NR	G	RH
CO1165 Gold Head Cabin, BL060077	1965	Historic Structure	NR	G	RH
CO1166 Hillsborough Cabin, BL060078	1965	Historic Structure	NR	G	RH
CO1167 Ichetucknee Cabin, BL060079	1965	Historic Structure	NR	G	RH
CO1168 Manatee Cabin, BL060080	1965	Historic Structure	NR	G	RH
CO1169 Myakka River, BL060081	1965	Historic Structure	NR	G	RH
CO1170 Block Cabin, BL060086	1967	Historic Structure	NS	NE	RH

Table 4. Cultural Sites Listed in the Florida Master Site File					
Site Name and FMSF #	**Culture / Period**	**Description**	**Significance**	**Condition**	**Treatment**
CO1171 Park Manager Residence, BL060090	1961	Historic Structure	NR	G	RH
CO1172 Riverside Picnic Shelter BL060062	1950s	Historic Structure	NR	G	RH
CO1173 O'Leno State Park Entrance Sign	1960	Historic Structure	NR	P	RH
CO1174 Swimming Area Amphitheater	CCC New Deal	Historic Structure	NR	G	RS
CO1175 Buzzard's Roost Creek Rock Wall	CCC New Deal	Historic Structure	NR	G	RS
CO1176 Santa Fe River to Bellamy Road Historic Road	1849 or earlier	Resource Group	NE	G	P
CO1177 CCC O'Leno Suspension Bridge	CCC New Deal	Bridge	NR	G	RS
CO1178 River Amphitheater	CCC New Deal	Historic Structure	NR	G	RS
CO1179 Rock Steps to Rec Hall	CCC New Deal	Historic Structure	NR	G	RS

Table 4. Cultural Sites Listed in the Florida Master Site File					
Site Name and FMSF #	**Culture / Period**	**Description**	**Significance**	**Condition**	**Treatment**
CO1180 Riverside Picnic Shelter BL060063	1958	Historic Structure	NR	G	RH
CO1181 Riverside Picnic Shelter BL060064	1958	Historic Structure	NR	G	RH
CO1182 Riverside Picnic Shelter BL060068	1958	Historic Structure	NR	G	RH
CO1183 Riverside Picnic Shelter BL060065	1958	Historic Structure	NR	G	RH
CO1184 Riverside Picnic Shelter BL060066	1958	Historic Structure	NR	G	RH
CO1185 Park Sign 441 South	Pre-1961	Historic Structure	NE	G	RH
CO1186 Park Sign 441 North	Pre-1961	Historic Structure	NE	G	RH
CO1187 Park Sign Sprite Rd	Pre-1961	Historic Structure	NE	G	RH
CO1200 Bible Camp Road	Prehistoric non-ceramic	Archaeological Site	NS	F	P
CO1202 New Dining Hall BL060041	1958	Historic Structure	NE	G	RH
CO1203 Flatwoods Bridge	New Deal or earlier	Bridge	NE	F	P

Table 4. Cultural Sites Listed in the Florida Master Site File					
Site Name and FMSF #	**Culture/Period**	**Description**	**Significance**	**Condition**	**Treatment**
CO1204 Alligator Road or Wire Road	Mid-1800s or earlier	Resource Group	NE	G	P
CO1337 River Rise West Quarry	Middle Archaic, prehistoric non-ceramic	Archaeological Site	NE	G	P
CO1338 River Rise Turpentine Camp	American 20th Century	Archaeological Site	NE	G	P
CO1339 3C Home Site	American 20th Century	Archaeological Site	NE	G	P
CO1340 1Lw Fence Line	Prehistoric non-ceramic, prehistoric unspecified	Archaeological Site	NE	G	P
CO1341 Youth Area 2 Sinkhole	Prehistoric non-ceramic, prehistoric unspecified	Archaeological Site	NE	G	P
CO1342 Day Use Restroom	Prehistoric non-ceramic, prehistoric unspecified	Archaeological Site	NE	F	P
CO1343 Burn Pile Site	Prehistoric non-ceramic, prehistoric unspecified	Archaeological Site	NE	F	P
CO1344 Bible Camp Culvert	Prehistoric non-ceramic, prehistoric unspecified	Archaeological Site	NE	G	P
CO1345 Forestry Pump House	Prehistoric non-ceramic, prehistoric unspecified	Archaeological Site	NE	G	P

Significance:
NRL National Register listed
NR National Register eligible
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 O'Leno State Park and River Rise Preserve 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 these two parks.

While the DRP utilizes the ten-year management plan to serve as the basic statement of policy and future direction for each park, a number of annual work plans provide more specific guidance for DRP staff to accomplish many of the resource management goals and objectives of the park. Where such detailed planning is appropriate to the character and scale of the park's natural resources, annual work plans are developed for prescribed fire management, exotic plant management and imperiled species management. Annual or 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.

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

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

Natural Resource Management

Hydrological Management

Goal: Protect water quality and quantity in the two parks, 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. Following are hydrological management objectives recommended for O'Leno State Park and River Rise Preserve State Park.

Objective A: Conduct/obtain an assessment of the two parks' hydrological restoration needs.

Significant hydrological features within O'Leno/River Rise include a major river (the Santa Fe), a first magnitude spring (Santa Fe Rise), aquatic caves such as the Old Bellamy Cave System, and multiple karst windows scattered about. Preservation of surface water/groundwater quality and control of erosion and sedimentation along riverbanks and within the numerous karst features will remain top DRP priorities. Hydrological assessment actions recommended for O'Leno/River Rise are listed below.

Action 1	Continue to cooperate with various agencies in hydrological research and monitoring programs within the parks and on the Santa Fe River, and encourage and facilitate additional research in these areas. [Continuous]
Action 2	Continue to monitor permit requests and land use/zoning changes in the region and offer comments as appropriate. [Continuous]
Action 3	Encourage hydrological research and conduct dye trace studies to delineate the River Rise Springshed and to determine groundwater sources for springs and aquatic cave systems in both parks. [Unfunded Need]
Action 4	Work closely with the SRWMD to ensure that MFLs established for the Upper Santa Fe River are carefully monitored and that historic flows are protected. [Continuous]
Action 5	Establish a monitoring program within O'Leno along the Santa Fe River above the River Sink to document ecological impacts of low flows. [Short Term]

The DRP will continue its tradition of close cooperation with state and federal agencies and independent researchers engaged in hydrological research and monitoring programs within the two parks and on the Santa Fe River, and it will encourage and facilitate additional research in those areas. Agencies such as the SRWMD, USGS, and FDEP will be relied upon to keep the DRP apprised of any declines in surface water quality or any suspected contamination of groundwater in the region.

Staff of District 2 will continue to monitor Environmental Resource Permit (ERP) and Water Use Permit (WUP) requests for the region in order to provide timely and

constructive comments that promote protection of the parks' 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. DRP staff will also continue to monitor land use or zoning changes within lands bordering the two parks. Major ground disturbances on neighboring properties, or inadequate treatment of runoff into local streams, could ultimately cause significant degradation of park resources. When appropriate, District 2 staff will provide comments to other agencies regarding proposed changes in land use or zoning that may affect the parks. In addition, District 2 staff will closely monitor major mining operations or large consumptive use permits in the Santa Fe Basin for significant changes that may adversely affect park resources.

In order for water managers to adequately protect water quality at O'Leno/River Rise and potentially restore spring flows to their historic volumes, they will have to know the extent of the springsheds involved. However, the proximal sources of flow to the Bellamy Cave system from the Floridan aquifer are still unknown, and up-gradient sources for the portion of the Lower Santa Fe River that runs through the two parks have not yet been fully identified. To remedy that, the DRP will encourage hydrological research, including dye trace studies, designed to delineate the entire springshed of the River Rise, particularly the conduits coming in from the east (as discussed in the Hydrology section above). The DRP will also conduct dye trace studies (subject to availability of funding) to determine groundwater sources for springs and aquatic cave systems throughout O'Leno/River Rise. Previous dye trace studies in the region (e.g., Cellon Creek/Lee Sink connection to the Hornsby Spring Group) have provided DRP management with invaluable information about the various sources of springs and the timing of surface to groundwater interactions.

The DRP will continue to work closely with the SRWMD to ensure that the MFLs developed for the Upper Santa Fe River are monitored conscientiously and that historic river flows are protected. As another protective measure, the DRP will continue efforts to preserve Columbia Spring, located on private property adjacent to River Rise Preserve. One potential activity worthy of DRP support is establishment of a monitoring program along the Santa Fe River above the River Sink at O'Leno State Park to document the short and long term ecological impacts of low flow events.

Objective B: Restore natural hydrological conditions and functions to approximately 23 acres of blackwater stream natural community.

Hydrological restoration actions recommended for the two parks are listed below.

Action 1	Monitor the Bible Camp Road restoration project. [Long Term]
Action 2	Evaluate other sites within the two parks where natural hydrology may have been altered, and initiate corrective actions as needed. [Long Term]

The Santa Fe River near the boat ramp at the terminus of Bible Camp Road endured years of sedimentation derived from surface water runoff that was laden with soils scoured from the unpaved road. Park and district staffs worked closely with Columbia County and FWC officials in implementing the long-term restoration plan designed for the site. The project goal is to achieve effective erosion control that protects water quality and helps conserve two federally endangered mussels in the Santa Fe River. Future monitoring will include assessments of erosion and sedimentation. Staff will work with FWC to facilitate continued surveys for the imperiled mussel species.

DRP staff will also evaluate other sites within O'Leno/River Rise where the natural hydrology may have been altered. If necessary, staff will initiate corrective actions that improve natural hydrology, such as installing low water crossings or culverts in appropriate locations.

Objective C: Evaluate and mitigate the impacts of soil erosion in the two parks.

Several areas in O'Leno/River Rise that are popular with visitors, particularly River Sink and River Rise, continue to experience some erosion despite past corrective measures. Additional erosion control actions recommended for the two parks are listed below.

Action 1	Investigate best management options for additional mitigation of erosion at public access points in the parks. [Short Term]
Action 2	Regularly monitor other park areas that are subject to significant erosion and implement corrective measures as necessary, complying with best management practices for maintenance of surface water and groundwater quality. [Continuous]
Action 3	Identify unauthorized trails along river levees and other vulnerable areas in the parks and eliminate visitor access where necessary. [Long Term]

The DRP will investigate best management options for additional mitigation of erosion at public access points such as hiking trails along the Santa Fe River shoreline, the Bible Camp Road boat ramp area, and the River Sink and River Rise areas. Staff will regularly monitor areas within the parks that are prone to significant erosion. Wherever necessary, park staff will implement corrective measures that reduce the impacts of soil erosion on water resources. For example, the parking area at River Rise may need additional water bars designed to minimize erosion during strong storm events by diverting storm water into surrounding woodlands to encourage natural infiltration.

DRP staff will identify unauthorized trails along river levees elsewhere in the two parks and eliminate visitor access to them where necessary. In the O'Leno swimming area, despite significant progress in mitigating key erosion issues, certain spots may require additional stabilization measures. Staff will continue to

monitor points of significant erosion along the entire trail system within the parks and mitigate erosion in problem areas as needed.

Objective D: Monitor changes within the aquatic cave system.
Cave survey/monitoring actions recommended for the two parks are listed below.

Action 1	Coordinate with aquatic cave experts, including members of the Springs Management team, in developing and implementing baseline surveys and long-term monitoring programs that assess physical and biological conditions in the Old Bellamy Cave System, including troglobite population status. [Continuous]
Action 2	Examine the possibility that data obtained in the O'Leno/River Rise cave assessments may be useful in establishing science-based carrying capacities at recreational cave-diving locations in other state parks. [Long Term]
Action 3	Obtain professional recommendations from the Springs Management Team regarding the proper use and management of the cave systems at O'Leno/River Rise. [Long Term]

District 2 and park staffs will continue to coordinate with aquatic cave experts in obtaining condition assessments and recording disturbance issues within the cave systems at O'Leno/River Rise. Among the experts should be members of a to-be-established Springs Management Team, including certified cave divers from the North Florida Springs Alliance, who will provide recommendations for use and management of the Old Bellamy Cave System. Also included will be professionals with relevant expertise in aquatic cave biology and representatives from FDEP. Cave management decisions made by DRP will be based on team recommendations, adaptive management, and a detailed knowledge of the resources.

With assistance from the Springs Management Team, the DRP will continue to develop and implement baseline surveys and monitoring programs for the Old Bellamy Cave System, assessing biological and physical conditions. District and park staffs will work closely with the team to develop and establish standardized photo points at select areas within the cave system. These photo point locations will be monitored on a regular basis to track the condition of certain passages and rooms. The DRP may be able to use data from the Bellamy Cave System as a control to help establish science-based carrying capacities at dive locations in other state parks.

A comprehensive management program for the cave system should include regular surveys for troglobite fauna as well as monitoring of hydrologic events to determine their effects on troglobite populations. Survey data could be used to generate recommendations for improving protection of troglobites.

Natural Communities Management

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

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 O'Leno State Park and River Rise Preserve 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 Forestry Service (FFS). Wildfire suppression activities in the park are coordinated with the FFS.

Objective A: Within 10 years, have 2,100 acres of the two parks maintained within the optimum fire return interval.

Action 1	Develop/update an annual burn plan. [Continuous]
Action 2	Manage fire dependent communities by burning between 775 and 1,275 acres annually, as identified by the annual burn plan. [Continuous]
Action 3	Increase the frequency of burning in zones threatened by hardwood invasion. [Long Term]

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)**
Sandhill	300	2-3
Mesic Flatwoods	545	2-3
Upland Pine	506	2-3
Upland Mixed Woodland	391	2-5
Scrubby Flatwoods	256	3-8
Depression Marsh	17	2-3
Successional Hardwood Forest	452	2-3
Abandoned Field/ Abandoned Pasture	118	2-3
Restoration Natural Community	52	2-3
Clearing/Regeneration	2	2-3
Annual Target Acreage	775 - 1275	

The park is partitioned into management zones including those designated as burn zones (see Management Zones Table and Map). Prescribed fire is planned for each burn zone on the appropriate interval. The park's burn plan is updated annually because fire management is a dynamic process. To provide adaptive responses to changing conditions, fire management requires careful planning based on annual and very specific burn objectives. Each annual burn plan is developed to support and implement the broader objectives and actions outlined in this ten-year management plan.

O'Leno and River Rise Preserve state parks contain a wide diversity of fire-dependent natural communities ranging from sandhills to scrubby flatwoods, upland pine, upland mixed woodland, mesic flatwoods and depression marshes. Although the sandhills at O'Leno have been burned for many years, many of the other fire-dependent natural communities have not been so fortunate. Most of the upland pine and upland mixed woodland communities were either lost to agricultural development or succeeded towards upland hardwood forest due to fire suppression over the past century (refer to the Altered Landcover Types section). The mesic flatwoods have also suffered some degree of fire suppression and hardwood invasion. Restoration of the fire-dependent communities at O'Leno/River Rise has accelerated in the past 25 years due to an aggressive prescribed burn program. Much progress has been made where zones have been burned multiple times in the past decade.

Fire return intervals for the natural communities in the two parks are based on the intervals recommended by the Florida Natural Areas Inventory (2010). Any given zone may contain multiple natural communities with different average fire return intervals. For example, several zones at O'Leno/River Rise, including OL-1C and OL-

1R, consist mainly of sandhills that typically burn every two to three years, but those zones also contain pockets of scrubby flatwoods that may not burn but every five to eight years. In most cases, the scrubby flatwoods will only burn well under extreme conditions, while the sandhills will burn under milder ones. Generally, the desired fire return interval for any zone containing multiple communities will be that of the community having the shortest fire return interval. For zones such as those described above, the standard fire return interval for the whole zone would be the same as the fire return interval for the sandhill community within it. Fire return intervals may be shortened during the early stages of natural community restoration to speed restoration efforts. The annual target burn acreage for O'Leno/River Rise is 775 to 1275 acres.

The park manager and district staff revise the O'Leno/River Rise burn plan on an annual basis and determine annual priorities based on a variety of parameters. Several areas within the two parks will require additional effort to further restoration goals. For example, the flatwoods and sandhills that lie east of the River Rise will need additional attention. Other areas in particular need of more frequent burning include the upland pine and upland mixed woodland communities in zones RR-2Cw, RR-2Dn, and RR-2Fe; the sandhill, upland pine, and upland mixed woodland communities along Bellamy Road; the former southern pine beetle control areas in the two parks; and the more recent land acquisitions. Some of the pine beetle clear-cuts will require burning and additional replanting with appropriate pine and groundcover species to prevent a recurrence of loblolly pine domination of the sites and an associated increase in vulnerability to pine beetle infestations in the future.

Among the standard practices for staff at O'Leno/River Rise relative to prescribed burning should be the monitoring of possible future restrictions on prescribed fire in the region. Park staff should contact residences near or adjacent to the park before conducting prescribed burns in the vicinity. Public education about the benefits of prescribed fire should be an integral part of interpretive programs at the parks to ward off possible future efforts to restrict prescribed burning of natural areas.

Many of the imperiled species recorded at O'Leno/River Rise are dependent on fire-adapted natural communities, including orchid species that rely on periodic prescribed fires as part of their life cycle. Periodic fires maintain an open canopy that benefits native groundcover species and wildlife. The gopher tortoise, indigo snake, Sherman's fox squirrel, and southern hognose snake all require open sandhills or upland pine areas. In the absence of fire, these species may quickly be extirpated from their natural habitats.

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/ experience, backlog, if burn objectives have been met, etc. The database is also used for annual 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 natural community *Desired Future Condition*s 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, under Objectives B and C, are the natural community/habitat restoration and maintenance actions recommended to create the Desired Future Conditions in upland pine, upland mixed woodland, and sandhill communities at O'Leno/River Rise (see Desired Future Conditions Map below).

Objective B: Conduct habitat/natural community restoration activities on 67 acres of upland pine and upland mixed woodland communities.

Action 1	Develop a restoration plan for upland pine and upland mixed woodland communities in zones just north and south of Bellamy Road. [Short Term]
Action 2	Implement the restoration plan. [Long Term]

Upland pine and upland mixed woodland areas both north and south of Bellamy Road need substantial restoration work, including multiple herbicide treatments to remove invasive offsite hardwoods. The western edge of zone RR-2Aw south of Bellamy Road contains a series of push piles running north-south along the park's west boundary road. The piles alter the natural topography, creating obstacles to effective burning of the zone. The piles also create microhabitats that facilitate colonization by offsite hardwoods such as laurel oak and sweetgum, which then invade the interior of the zone.

District 2 and park staffs will develop and implement a restoration plan that includes specifications for removal of the piles along the west boundary of zone RR-2Aw and eradication of offsite hardwoods in zones both north and south of Bellamy Road. The offsite hardwoods will require mechanical and chemical treatment. It

probably will be necessary to plant wiregrass and other native groundcover species in areas disturbed during the push pile removal, but restocking would likely be needed anyway since the groundcover in those areas is very sparse.

Once the push piles and hardwoods are removed, staff will need to monitor the hardwoods for re-sprouting and chemically treat emerging sprouts as needed. Staff will also need to monitor the success or failure of efforts to reestablish the native groundcover, and conduct supplemental plantings as needed. Supplemental plantings of longleaf pine may also be required.

This is the highest priority natural community restoration project at O'Leno/River Rise. The project will benefit additional communities in zone RR-2Aw as well (e.g., scrubby flatwoods and sandhill). Additional restoration of upland pine and upland mixed woodland may be conducted depending on the availability of funds and time.

Objective C: Conduct habitat/natural community restoration activities on 44 acres of sandhill community.

Action 1	Continue to implement restoration plans for 15 acres of sandhill in zone OL-1Jn and 29 acres of sandhill in zone RR-3A. [Long Term]
Action 2	Monitor the progress of offsite hardwood control and native groundcover propagation in both zones. [Continuous]

Native groundcover reintroduction, offsite hardwood removal, and possibly some loblolly pine removal are needed in the ongoing restoration of 15 acres of sandhill in zone OL-1Jn in O'Leno State Park. Monitoring requirements will include checking for native groundcover survival and for the reestablishment of offsite hardwoods. Hardwood sprouts will likely require retreatment. Prescribed fire is an integral part of this restoration project, particularly growing season fire. Staff should burn the zone every two to three years, but no sooner than two years after any direct seeding of native groundcover.

In zone RR-3A of River Rise Preserve State Park, 29 acres of sandhill community is also undergoing restoration. The zone still needs a substantial amount of mechanical and chemical treatment of offsite hardwood species such as laurel oak, sweetgum and others. Other necessary restoration actions include the planting of longleaf pines and appropriate native groundcover species.

District 2 staff will need to monitor the progress of the offsite hardwood removal efforts. Supplemental chemical and mechanical treatments will occur as needed to achieve effective control of the offsite hardwoods. Staff will also have to monitor the germination and survival of native groundcover species. Both of these sandhill restoration projects are second priority in comparison with the upland pine/upland mixed woodland restoration projects that are planned.

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, under Objectives D, E and F, are the natural community/habitat improvement actions recommended to create the Desired Future Conditions in upland pine, upland mixed woodland, sandhill and scrubby flatwoods communities at O'Leno/River Rise.

Objective D: Conduct natural community/habitat improvement activities on 265 acres of upland pine and upland mixed woodland communities.

Action 1 Continue habitat improvement activities in upland pine/upland mixed woodland communities in zones RR-3Cn, RR-3D, and RR-3Ge. [Long Term]

Action 2 Monitor habitat improvement sites for native groundcover recovery, longleaf pine seedling survival, and reappearance of invasive hardwoods. [Long Term]

This is the highest priority habitat improvement project at O'Leno/River Rise. An initial community restoration treatment has already been completed in zones RR-3Cn, RR-3D, and RR-3Ge, and 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 2004 and 2007, 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. Native groundcover may need enhancement in some areas through direct seeding or planting of plugs. Because of years of fire suppression, the true boundary between upland pine and upland mixed woodland can be difficult to determine in these areas. The different community types in the zones will become more clearly delineated as restoration progresses.

Prescribed fire is an extremely important maintenance activity for these zones. During this active phase of habitat improvement, the zones should be burned on the short end of the fire return interval and during the growing season to aid in the control of hardwood sprouts.

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.

Objective E: Conduct natural community/habitat improvement activities on 49 acres of sandhill community.

Action 1 Mechanically and/or chemically treat offsite hardwoods in sandhills in zones OL-1A, OL-1C, and OL-1De (higher priority) and in zones OL-1R and OL-1S (lower priority). [Long Term]

Legend

- MF - Mesic Flatwoods 300.87 ac.
- MEH - Mesic Hammock 190.83 ac.
- SH - Sandhill 206.83 ac.
- SCF - Scrubby Flatwoods 186.24 ac.
- SK - Sinkhole 16.21 ac.
- UHF - Upland Hardwood Forest 255.40 ac.
- UMW - Upland Mixed Woodland 386.45 ac
- UP - Upland Pine 253.28 ac.
- AF - Alluvial Forest 134.31 ac.
- BS - Basin Swamp 48.40 ac.
- BF - Bottomland Forest 157.36 ac.
- DM - Depression Marsh 12.74 ac.
- DS - Dome Swamp 3.60 ac.
- FS - Floodplain Swamp 119.06 ac.
- SKLK - Sinkhole Lake 8.68 ac.
- SWLK - Swamp Lake 0.59 ac.
- BST - Blackwater Stream 29.36 ac.
- DV - Developed 60.36 ac.

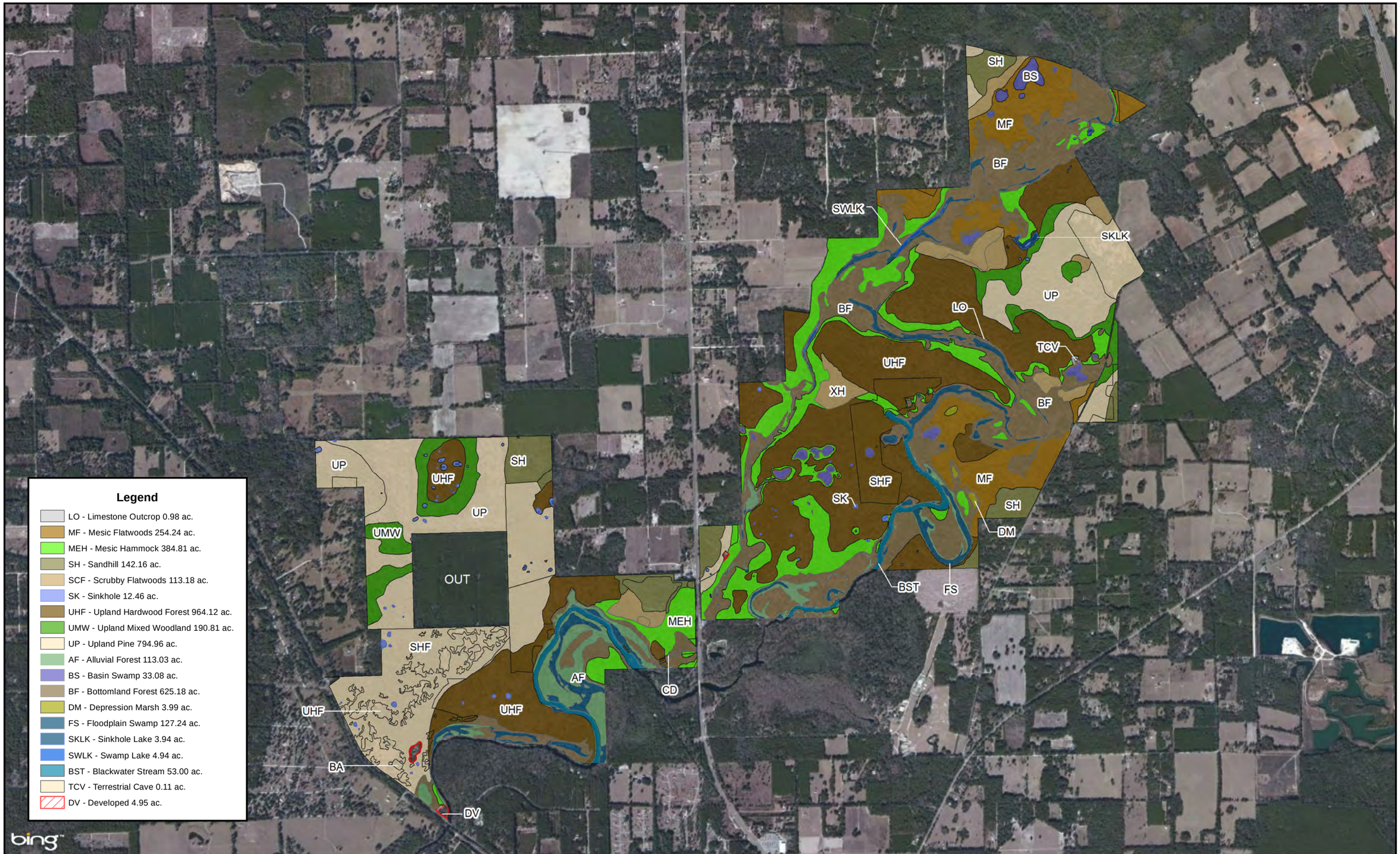
O'LENO STATE PARK

N

0 1,000 2,000 4,000 Feet

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

NATURAL COMMUNITIES MAP
DESIRED FUTURE CONDITIONS



RIVER RISE PRESERVE STATE PARK

N

0 0.5 1 2 Miles

Florida Department of Environmental Protection
Division of Recreation and Parks
Date of aerial: 2010

NATURAL COMMUNITIES
DESIRED FUTURE CONDITIONS MAP

Action 2 Monitor sandhill improvement sites for native groundcover recovery, longleaf pine regeneration, and re-sprouting of invasive hardwoods. [Continuous]

The sandhill strip along the north edge of zone 1De and some sandhill areas in zones OL-1A and OL-1C, approximating 29 acres total, are experiencing encroachment from offsite hardwoods. To reverse that trend, invasive hardwoods such as laurel oak will be treated mechanically and chemically. For the first ten years after treatment, the zone should be burned frequently and at the shortest end of the fire return interval in order to achieve better control of hardwood sprouts. Staff will monitor hardwood re-sprouting in the treatment areas and will repeat treatments as necessary. Staff will also monitor groundcover recovery and supplement natural regeneration with direct seeding or planting as needed. It may be necessary to plant longleaf pines in some areas. This project is second in priority among the habitat improvement activities planned for O'Leno/River Rise.

Hardwood encroachment is also occurring in about 20 acres of sandhill community in zones OL-1R and OL-1S. Invasive hardwoods such as laurel oak will be treated mechanically and chemically. For the first ten years after treatment, the zone should be burned as frequently as it will carry fire, with the purpose of controlling hardwood sprouts. Staff will monitor hardwood re-sprouting in the treatment areas and treat again as necessary. This project is third in priority among the habitat improvement activities planned for O'Leno/River Rise.

Objective F: Conduct natural community/habitat improvement activities on 15 acres of scrubby flatwoods community.

Action 1 Mechanically treat scrub oaks in zones OL-1De, OL-1E, and OL-1K. [Short Term]
Action 2 Plant longleaf pines in scrubby flatwoods after successful burns and monitor pine survival. [Long Term]

Scrubby flatwoods in zones OL-1De, OL-1E and OL-1K need mechanical treatment to reduce the stature of scrub oak species. The park should mow at least the edges of the scrub to enhance the ability to burn the areas safely. Mowing should be followed by burning within six months. Longleaf pines will be planted in areas that respond well to the treatment. Staff will monitor longleaf pine survival. After the mowing and initial prescribed burn treatments, the fire return interval for the scrubby flatwoods should be three to eight years, depending on the fire frequency of other fire-type communities in the zone. This project is fourth in priority among the habitat improvement activities planned for O'Leno/River Rise.

Imperiled Species Management

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

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 Conduct additional surveys for imperiled plant and animal species in both parks. [Long Term]

O'Leno State Park and River Rise Preserve State Park need additional surveys for imperiled plant and animal species to ensure that all imperiled species are documented. Although Tan conducted a comprehensive floristic study of O'Leno State Park and a small part of River Rise Preserve in 1989-1991 (Tan 1991), much of River Rise has not been subject to comprehensive plant inventory. To improve documentation of imperiled plant and animal species at O'Leno/River Rise, the DRP will enlist the assistance of academic researchers and staff from other agencies during development of species occurrence inventory lists for both parks, especially where necessary for certain taxonomic groups.

Objective B: Monitor and document 6 selected imperiled animal species in the two parks.

Action 1	Coordinate with the North American Butterfly Association (NABA) and FNAI in monitoring three imperiled butterfly species. [Long Term]
Action 2	Monitor the oval pigtoe, an endangered mussel, in cooperation with FWC and USFWS as part of the Bible Camp Road Restoration Project. [Long Term]
Action 3	Implement a monitoring protocol for the southern dusky salamander in coordination with FWC and FLMNH. [Long Term]
Action 4	Conduct additional surveys for Sherman's fox squirrels, documenting color patterns as well as date and location observed. [Continuous]

Although park staff will continue to document imperiled animals as they are seen at O'Leno/River Rise, six species have been identified as needing additional monitoring. These include the three imperiled butterfly species (King's hairstreak, Sweadner's juniper hairstreak, and Seminole Texan crescent) that are specifically sought during the North American Butterfly Association's Annual 4th of July Butterfly Count at the parks. District 2 staff will continue to coordinate with the association as well as with FNAI to monitor these species closely.

Monitoring of the oval pigtoe, a state and federally endangered mussel, will continue in cooperation with FWC and USFWS as part of the Bible Camp Road Restoration Project. The southern dusky salamander has also been targeted for additional monitoring. The District 2 staff has compiled historical records for this species in the region, and developed and implemented a survey protocol in the spring of 2012. Surveys for the southern dusky salamander and other imperiled amphibian species are typically coordinated with FWC and the Florida Museum of Natural History (FLMNH).

Sightings of Sherman's fox squirrels in the two parks have traditionally been recorded. Additional surveys will be implemented that will document color patterns of the animals as well as date and location observed. These descriptions will help the DRP estimate the number of individual squirrels that may be frequenting the parks.

Objective C: Monitor and document 3 selected imperiled plant species in the two parks.

Action 1	Develop monitoring protocols for three imperiled plant species (incised agrimony, modest spleenwort, and plume polyplody) in cooperation with FNAI. [Short Term]
Action 2	Implement monitoring protocols for the three imperiled plant species listed in Action 1. [Long Term]

Three imperiled plant species known to have extant populations at O'Leno/River Rise will be monitored periodically. These include incised agrimony, an indicator species of upland pine and upland mixed woodland natural communities, and two fern species found on limestone outcrops, modest spleenwort and plume polypody. Specific protocols will be developed and implemented for these species in cooperation with the Florida Natural Areas Inventory.

Exotic Species Management

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

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

Objective A: Annually treat 6 acres of exotic plant species in the parks.

Action 1 Treat all known infestations of invasive exotic plants annually, preferably before reproduction occurs. [Continuous]
Action 2 Survey for and map new invasive exotic plants in every zone at least twice within the next 10 years. [Long Term]

Because O'Leno/River Rise has relatively few exotic plants, annual treatment of all known infestations should be feasible. Park staff will attempt to treat all invasive exotic species before they begin to reproduce each year. All staff should be familiar with the species of exotics that actually occur within the two parks, as well as with other exotic species known to occur in the region.

To help the parks remain relatively exotics free and prevent new exotic plant populations from expanding, park staff will survey for and map new invasive exotics in every zone at least twice within the next 10 years. It is important to know what exotic species are present within the two parks, where they are located, and how severe the infestations are. It is also very important to know what zones or communities are currently free of exotics so that those areas can be kept exotics free. This is particularly true for high quality or ecologically important habitats.

By regularly surveying exotics-free zones, staff can discover new infestations at an early stage and eliminate them before they increase in size significantly. Areas that serve as sources of particularly aggressive species, or of species that can dramatically change ecosystem function, may need to be scouted more frequently. Finding new populations of invasive exotic plants before they become established will help prevent larger infestations from happening. The focus should be on FLEPPC Category I and II species and on centipede grass that is invading restoration areas. At the same time, staff should watch out for occurrences of new exotic species that exhibit aggressive tendencies.

Objective B: Develop and implement measures to prevent the accidental introduction or further spread of invasive exotic plants in the parks.

Action 1 Develop and implement preventative measures, including a protocol for equipment inspection and decontamination, designed to limit the accidental introduction and spread of invasive exotic plants. [Short Term]

Exotic plants often invade an area accidentally through preventable methods of entry. To limit accidental introduction and movement of exotic species, park staff will develop and practice preventative measures, including a protocol for equipment inspection and decontamination. Activities such as mowing, logging, fire line preparation and road building can introduce or redistribute exotics through contaminated equipment. Fill dirt, lime rock, potted horticultural plants and mulch are all potentially contaminated by exotics even if they are not readily visible at the time of entry into the park. Some new infestations of exotics may be preventable by ensuring that contractors clean their equipment before entering the park. The further spread of exotics already established in the park may be avoided by making sure that staff and contractors do not move equipment from a contaminated area to an exotics-free area within the park without first cleaning their equipment.

Objective C: Implement control measures on 3 nuisance and exotic animal species in the parks.

Action 1 Remove feral hogs as resources permit, focusing on the most damaged areas. [Continuous]

Action 2 Coordinate with Alachua County or Columbia County Animal Services in removing feral or stray cats and dogs from the parks. [Continuous]

Action 3 Monitor the presence of capybaras in the parks. [Continuous]

Feral hogs have become increasingly noticeable at O'Leno State Park and River Rise Preserve State Park in recent years. Feral hog control activities will focus on areas where hogs are causing the most damage, including any threatened cultural resources. Authorized staff and contractors will participate in the feral hog removal program as resources permit. Park staff will also occasionally ask for assistance from Alachua County or Columbia County Animal Services in removing feral or stray cats and dogs from the park.

Capybaras occur occasionally in O'Leno/River Rise as they move along the Santa Fe River corridor. While capybaras are not being removed from the parks at this time, staff should continue to monitor their presence.

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 is implementing the following goals, objectives and actions, as funding

becomes available, to preserve the cultural resources found in O'Leno State Park and River Rise Preserve State Park.

Goal: Protect, preserve and maintain the cultural resources of the two parks.

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, 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 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 the DRP consider the reuse of historic buildings in the park in lieu of new construction and must undertake a cost comparison of new development versus rehabilitation of a building before electing to construct a new or replacement building. This comparison must be accomplished with the assistance of DHR.

Objective A: Assess and evaluate 128 of 128 recorded cultural resources in the parks.

Action 1	Develop a protocol for tracking changes at each archaeological site. [Short Term]
Action 2	Complete assessments/evaluations of 64 archaeological sites, 5 resource groups, 56 historic structures, and 3 historic bridges, prioritizing sites that are in need of preservation and stabilization. [Long Term]
Action 3	Develop a plan for more frequent surveillance of archaeological sites that have been looted in the past; implement the plan. [Short Term, Continuous]
Action 4	Complete Historic Structures Reports (HSRs) for 17 CCC/WPA structures, including one on public land adjacent to O'Leno; prioritize projects identified by the HSRs for stabilization, restoration, or rehabilitation. [Long Term]

Park personnel currently visit all cultural sites on a regular basis. However, establishment of a more formalized process would generate baseline and comparative information for each site, particularly the archaeological sites. The park will develop a simple, repeatable protocol for tracking changes at each archaeological site, preferably consisting of a geocoded baseline photograph and a

condition checklist sheet. Photographs would only need to be retaken if a change in condition occurred at a site. The park will also develop and implement a plan for more frequent surveillance of all archaeological sites that have been looted in the past.

A Historic Structures Report (HSR) is recommended for each of the WPA/CCC structures: AL5654, CO385, CO386, CO387, CO388, CO389, CO390, CO391, CO392, CO1140, CO1141, CO1142, CO1174, CO1175, CO1177, CO1178 and CO1179. CO392 is actually outside O'Leno State Park, but it is on public land contiguous to the park. It is possible that it may be incorporated into O'Leno at some point. For this reason, it is included in the HSR list. Projects identified by the HSR will need to be prioritized for action.

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

Action 1	Ensure all sites, including newly found ones, are recorded or updated in the Florida Master Site File. [Short Term]
Action 2	Relocate with GPS and map archaeological sites whose exact locations are currently unknown, and update FMSF forms as needed. [Long Term]
Action 3	Conduct a comprehensive Level 1 archaeological survey of O'Leno State Park, covering more than the high probability areas identified by the predictive model. [Unfunded Need]
Action 4	Determine which areas in River Rise Preserve State Park identified by the predictive model should receive Level 1 archaeological survey; conduct the survey. [Long Term]
Action 5	Conduct additional research to determine if O'Leno was the location of a Seminole War fort or Cantonment Winfield Scott. [Unfunded Need]
Action 6	Accurately survey and obtain additional information about historic road CO1176 that connects Wire Road with Bellamy Road. [Unfunded Need]
Action 7	Determine the age of the historic wooden bridge on Wire Road. [Long Term]
Action 8	Conduct additional research about prehistoric settlement patterns within the two parks and how they relate to broader settlement patterns in the surrounding area. [Unfunded Need]
Action 9	Conduct additional research into the settlement of Leno (Keno) to determine if the community was a town or a small industrial area. [Long Term]
Action 10	Continue to document the period of CCC/WPA development and early park service administrative history and construction at O'Leno; promptly document historic graffiti in the interior of one CCC/WPA structure, the Canteen (CO1142). [Long Term, Short Term]

Action 11 Develop a housekeeping manual for the collection items at O'Leno; implement procedures outlined in the manual. [Short Term, Continuous]

Action 12 Develop a Scope of Collections Statement for River Rise Preserve State Park. [Long Term]

Several archaeological sites at O'Leno/River Rise need to be located again using GPS technology. If the sites are found, their boundaries will be mapped. As this information is compiled, staff will update the FMSF forms for the sites and send them to the FMSF. Sites that are a high priority for locating and mapping are AL179, AL180, AL178, CO19 and CO21. New sites will be recorded with the FMSF as they are discovered.

A predictive model for both parks has been completed. This model will be consulted when any ground disturbing activities or archaeological studies are planned for the parks. O'Leno State Park has never had a thorough archaeological survey. The park needs a comprehensive Phase 1 survey that encompasses more than just the high probability areas indicated by the predictive model. The nature of O'Leno is such that lithic scatters are present in much of the park, but are not recorded as discrete sites. At River Rise Preserve State Park, the DRP needs to determine which areas identified by the predictive model actually merit Level 1 archaeological survey.

It is rumored that a Seminole War fort, or possibly Cantonment Winfield Scott, once existed in what is now O'Leno State Park. This possibility needs further investigation. An 1849 map of the River Sink area depicts another historic road, CO1176, running southward from the approximate location of the town of Keno on the Santa Fe River. The map shows the road connecting historic Alligator Road with Bellamy Road to the south. The road has been recorded with the FMSF but has not been accurately surveyed. Additional information about the history of this road is needed. If feasible, the road's actual footprint should be surveyed. If a Seminole War fort (or Cantonment Winfield Scott) was once located within O'Leno, it is possible that this road was associated with it.

A historic wooden bridge is located on Alligator Road (i.e., Wire Road) between the day-use area of the park and the flatwoods to the east. It has been at least partially rebuilt several times and needs further research to determine its age.

More research about prehistoric settlement patterns within the two parks and how they relate to broader settlement patterns in the region is needed. Several important archaeological sites that exist on private property in the immediate area of the parks could contribute valuable information to such a study.

It is unclear if the settlement of Leno (or Keno) was actually a town or perhaps more of a mid-1800s industrial area consisting of mills, cotton gins and a more transient population. DRP staff will investigate the community's history since more information about it would help the park more accurately portray the community for which it was named.

O'Leno staff will continue to document the period of WPA/CCC development and early park service administrative history and construction at the park. For example, the Canteen (CO1142) is a WPA/CCC structure with the interesting addition of historic graffiti on the interior. Documentation of the graffiti needs to occur before it is inadvertently destroyed.

O'Leno State Park has a Scope of Collections Statement and an inventory, but not a manual of housekeeping. The park will develop and implement a manual of housekeeping for the collection items. River Rise Preserve does not have any collections. To guide future park management, a Scope of Collections Statement should be prepared for River Rise indicating that the park does not have a collection and does not accept or acquire items for any collection.

Objective C: Bring 5 of 128 recorded cultural resources into good condition.

Action 1	Document the parks' cyclical maintenance and site monitoring programs. [Continuous]
Action 2	Treat three historic structures (Cypress Log Pavilion, Recreation Hall, and Craft Building) for termites. [Short Term]
Action 3	Obtain an engineering assessment of damages to all three buildings and conduct repairs as needed. [Long Term]
Action 4	Replace roofs on the Cypress Log Pavilion and the Craft Building. [Short Term, Long Term]
Action 5	Evaluate the Spivey's Road Island site (AL5664) for maintenance/protection needs. [Short Term]
Action 6	Identify other historic structure repair needs as determined by HSRs, and prioritize repairs based on urgency and availability of funding. [Long Term, Unfunded Need]
Action 7	Develop a historic building maintenance plan for the non-CCC/WPA historic structures that are in regular use by park visitors; implement the maintenance plan. [Short Term, Continuous]

Most of the cultural sites at the park are in good condition. However, the DRP will have to address maintenance or repair needs, both immediate and long-term, that are described below.

Three historic structures, the Cypress Log Pavilion (CO386), Recreation Hall (CO387), and Craft Building (CO1140) have termites and need fumigation treatment quickly. The termite problem at the Recreation Hall (CO387) is worse than previously thought and needs immediate action. In addition to termite damage, the building has rotting timbers underneath and the front wooden steps need regular replacement, particularly after flood events. The Cypress Log Pavilion (CO386) has tree roots that are damaging the concrete floor of the building, and it will need a new roof within 10 years. The Craft Building (CO1140) will need a new tin roof within 10 years. DRP staff will obtain an engineering assessment of damages to the three structures and implement a plan to repair them.

Additional concerns include the following:

The base of the O'Leno State Park Entrance Sign (CO1173) is structurally sound but the top needs to be repaired.

The Spivey's Road Island (AL5664) site may need some attention. If so, DRP staff will develop and implement a maintenance/protection plan for the site. A geo-fiber barrier may need to be installed over damaged portions, followed by backfilling with appropriate soil.

The park needs to develop a standard means of documenting its cultural resource monitoring and cyclical maintenance programs.

The HSR may determine that other historic structures at O'Leno/River Rise need repairs; these maintenance needs will be prioritized based on urgency and availability of funding.

In addition to WPA/CCC buildings, the park has many historic structures from the late 1950s and early 1960s that are in regular use by visitors. Park staff will develop and implement a historic building maintenance plan for these structures.

Special Management Considerations

Timber Management Analysis

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

The Florida Forest Service conducted a timber assessment at O'Leno State Park and River Rise Preserve State Park in August 2013 (see Addendum 8: Timber Management Assessment). The primary zones where timber management might be needed to facilitate natural community restoration at O'Leno/River Rise are RR-3Cs, RR-2Ce, OL-1Jn, OL-1M, OL-1N, and OL-1Qw. Timber management actions may include removal of offsite hardwoods such as laurel oak and sweetgum, removal of offsite loblolly pines, and planting of longleaf pines.

Arthropod Control Plan

All the 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. No Arthropod Control Plan has been developed for O'Leno/River Rise.

Additional Considerations

The DRP has management authority over a 400-foot zone from the edge of mean high water along the Santa Fe River where it passes through or alongside the park and preserve. Where emergent wetland vegetation exists, the zone extends waterward 400 feet beyond the vegetation. Within this zone, the park staff will enforce the 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.

O'Leno State Park and River Rise Preserve State Park were subject to a land management review on November 9, 2012. 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.

O’Leno State Park and River Rise Preserve State Park are located within Alachua and Columbia County about 30 miles north of Gainesville, 25 miles south of Lake City, and less than 5 miles west of Interstate 75 in the north central part of the state. Approximately 414,600 people live within 30 miles of the park (U.S. Census 2010).

The population of Columbia and Alachua County are relatively diverse. According to the U.S. Census data (2013), approximately one-fifth of residents in Columbia County and Alachua County identify as black, Hispanic or Latino or another minority group. Half of residents can be described as youth or seniors

in both counties (U.S. Census 2010). In 2013, Columbia County's per capita personal income was $29,315 and Alachua County's was $38,225 (below the statewide average of $41,497) (U.S. Bureau of Economic Analysis 2013).

There are numerous resource-based recreation opportunities within fifteen miles of O'Leno and River Rise Preserve State Park. Dudley Farm Historic State Park, listed on the National Register of Historic Places, provides birding and hiking trails. San Felasco Hammock Preserve offers hiking, biking, equestrian trails, and nature study, while Ichetucknee Springs State Parks provides trails and opportunities for tubing, paddling, and swimming. Paddling and boating are also allowed in the Santa Fe River Fort White Wildlife and Environmental Area. Poe Springs Park, managed by Alachua County, provides swimming, snorkeling, kayaking/canoeing, and nature trails on site. The Santa Fe River, flowing along the Alachua-Columbia county line is one of Florida's Designated Paddling Trails. A portion of the paddling trail also runs through the nearby Ichetucknee River.

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% of domestic visitors to Florida visited this region. Roughly, 95% 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%), 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 and 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

O'Leno and River Rise Preserve State Parks both fall within two jurisdictions: Alachua County and Columbia County. U.S. 441 runs through River Rise Preserve and west of O'Leno State Parks. U.S. 27 runs along the western boundary of River Rise Preserve, and Interstate 75 runs to the east of both parks. The Santa Fe River serves as a boundary to the south. Surrounding property is primarily low- density, rural, and agricultural in nature.

Planned Use of Adjacent Lands

Alachua and Columbia County are both within the North Central Florida Planning District. Gainesville is the regional base for retail and government services due to the presence of the University of Florida. The region's population was

approximately 500,000 in 2010 (Census 2010). Gainesville and Alachua County account for half of the region's total population. Tourism is a major economic driver in the region because of the abundant natural resources the area has to offer. Interstate 75, which runs through the counties, also serves as a large economic growth contributor. There are no major improvements planned for Interstate 75. Plum Creek is proposing several residential and commercial developments throughout Alachua County. None of the proposed developments are expected to effect the parks.

Medium estimates project that Alachua County's population will exceed 300,000 residents in 2040 (BEBR 2014). Columbia County's population is anticipated to reach 83,000 in that time. Alachua County's growth is mainly due to the presence of the University of Florida and Santa Fe College, as well as a robust health services industry. The county and university have made efforts to attract diverse industries to the region.

Alachua County's future land use for lands adjacent to both state parks is Rural/Agricultural in order to retain the open space and rural character. The maximum residential density is one unit per 5 acres (Alachua County 2011). In High Springs, surrounding lots near River Rise Preserve are designated for Conservation (C-1). Development within this district must be in accordance with natural and historic resource protections established by the county. To the south of River Rise, in the City of High Springs, lots are specified for Residential Suburban (RS) use. This category includes low density residential development allowing one to 4 dwelling units per gross acre (City of High Springs 2015).

Columbia County's surrounding lots are designated for agricultural activities, such as crop cultivation, silviculture activities, and specialty farms (Columbia County 1991). To the north of each park, parcels are specified as environmentally sensitive lands. Adjacent parcels along the Santa Fe River also carry this classification. Adjacent lands in Alachua County are all zoned for agricultural uses to retain the open space and rural character of the area. Lands in High Springs are within a single-family residential zoning district. To the north, Columbia County neighboring lands are zoned for agricultural uses. Parcels following the Santa Fe River are zoned as environmentally sensitive lands and may be used for non-intensive agriculture and allows one dwelling unit per 10 acres.

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

O'Leno State Park and River Rise Preserve State Park contain an impressive diversity of community types, with 21 of Florida's natural communities represented on these properties. The developed use areas at O'Leno State Park are located primarily in the former upland pine community adjacent to the Santa Fe River, a short distance upstream from the River Sink. The main use area along the Santa Fe River is the former location of the park's namesake—the mid-nineteenth century town of Leno.

Wetland communities are generally not amenable to recreational development due to difficulties of access and resource sensitivity. Upland communities within the units, however, provide a range of opportunities for recreational use. The large size of the combined properties provides a resource base ideal for the development of an extensive system of hiking, off-road biking, equestrian trails, and primitive camping opportunities.

Water Area

A number of sinkholes, swamp lakes, and a portion of the Santa Fe River combine for over 100 acres of water area at the parks. Portions of the sinkholes and swamp lakes are appropriate for fishing and nature study. The river also provides opportunities for swimming, boating, and canoeing.

Shoreline

O'Leno State Park contains about 3 miles of shoreline on the Santa Fe River. River Rise Preserve State Park contains nearly 6 miles of shoreline on the Santa Fe River downstream from River Rise. The adjacent alluvial forest and floodplain swamp communities limit access along much of the river. The relatively undisturbed character of the shoreline, particularly within River Rise Preserve, provides an ideal setting for fishing, canoeing, and nature study. To preserve that character, future development of the shoreline should be limited to access points for boaters, paddlers, and anglers. Pedestrian traffic on the river shoreline, particularly near the River Sink and River Rise, has contributed to erosion, soil compaction, vegetation damage, and littering. However, closure of social trails and access improvements has served to address most of the problems in these areas.

Natural Scenery

One important visual resource of these units is the unique nature of the Santa Fe River as it disappears and reappears in the karst topography of the region. Human disturbance and fire suppression over the last century have created enclosed viewsheds in which thick vegetation screens out all but the immediate viewing area. For this reason, the vistas available along the river, especially from the suspension bridge, the River Sink overlook, and at the River Rise, are all the more impressive. As restoration activities continue, the characteristic openness of the surrounding fire-adapted communities will be re-established and the visual resources of these units greatly improved.

Significant Habitat

The high number of natural community types provides habitat for an abundant and diverse wildlife population. Deer are quite common and are frequently seen within the main use areas of O'Leno State Park. A number of imperiled species are associated with the sandhill and upland pine communities, including gopher tortoise, Sherman's fox squirrel, eastern indigo snake, Florida pine snake, Southern hognose snake, and gopher frog. The river also provides habitat for a variety of aquatic species and is an important source of freshwater for park wildlife.

Natural Features

The Santa Fe River has been designated an Outstanding Florida Water and the River Sink and the River Rise are designated State Natural Feature Sites. Other natural features to note are the sinkholes and limestone outcrops, with their associated plant communities found throughout both properties. These features provide important opportunities for interpretation and nature study, but are relatively fragile in nature and must be protected from overuse through education and protective structures or barriers, where appropriate. The parks also contain a number of champion trees that provide botanical interest.

Archaeological and Historical Features

In addition to an abundance of natural features and community types, the parks contain numerous archaeological and historic features. The river and natural bridge have served to concentrate human use in this area as evidenced by the concentration of recorded sites. Fifty-six archaeological sites have been recorded dating from the Archaic Period (7500-500 BC) through the 1960s. The historic CCC/WPA structures, the former town of Leno, and the Bellamy Road corridor provide significant opportunities for interpretation. The Recreation Hall, Cypress Log Pavilion, Tower House, and suspension bridge provide visitors with a firsthand look at the engineering and design skills of the CCC, and an opportunity to learn about their contribution to the Florida State Parks system.

While little evidence remains of the town of Leno, the fact that the main use area at O'Leno State Park is believed to be situated in the same general location presents a unique opportunity to educate visitors to the colorful history of this settlement. The historic Bellamy Road corridor provides a unique cultural landscape that includes a remnant of the first federally funded road in Florida and an impressive number of archaeological sites.

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

Park lands have a rich history of human use. The construction of roads and clearing of land for human settlement, logging, turpentining, limerock mining, and farming have altered the landscape and created a mosaic of pasture lands, old fields, successional forests, and remnant natural community types. Evidence of these past uses will remain well into the future at both parks. The CCC and the WPA constructed the park's early facilities, many of which are still in use today. The shaping of the landscape from human use offers unique focal points for interpretation.

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 permit typical state park uses and facilities necessary for the provision of resource-based recreation.

O'Leno and River Rise Preserve State Park boundaries fall within Alachua and Columbia County. Property in Alachua County is designated as Preservation (P) future land use. This designation recognizes natural resources within publically owned lands (Alachua County 2011). The current zoning category for Alachua County property is Conservation (C-TDR), which is intended to limit development on environmentally sensitive lands (Alachua County 2005). The transfer of development rights are also implemented within this district to allow limited residential development if resources can be protected. River Rise Preserve State Park property in Columbia County is designated for conservation uses in the future land use element. O'Leno State Park is specified for recreational and open space uses with the southernmost parcel designated for conservation (Columbia County 1991).

The current zoning for Columbia County is conservation with environmentally sensitive areas along the Santa Fe River. Environmentally sensitive areas are not preservation or conservation districts, but are recognized as making valuable contributions to the local economy and thus, require special planning

and treatment for land development (Columbia County 2015). 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

Recreational uses at O'Leno State Park and River Rise Preserve State Park include picnicking, swimming, fishing, canoeing/kayaking, hiking, biking, developed and primitive camping, cabins and nature study. Horseback riding is permitted at River Rise Preserve State Park. O'Leno State Park and River Rise Preserve State Park are both a part of the Great Florida Birding and Wildlife Trail.

O'Leno State Park recorded 82,106 visitors in FY 2014/2015. By DRP estimates, the FY 2014/2015 visitors contributed $7,845,437 in direct economic impact, the equivalent of adding 126 jobs to the local economy (FDEP 2015). River Rise Preserve State Park recorded 7,597 visitors in FY 2014/2015. By DRP estimates, contributing $642,176 in direct economic impact, the equivalent of adding 10 jobs to the local economy (FDEP 2015).

Other Uses

Other than utility easements necessary for park water, electric and telephone service, Bible Camp Road, which is leased to Columbia County, is the only non-recreation related use of park property.

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 O'Leno and River Rise Preserve State Parks basin swamp, blackwater stream, bottomland forest, depression marsh, alluvial forest, limestone outcrop, upland mixed woodland, upland pine, dome, floodplain swamp, sandhill, sinkhole, sinkhole lake, and swamp lake natural communities have been designated as protected zones. The locations of known cultural sites are also included in the parks' protected zones. However, these locations are not shown on the Conceptual Land Use Plan as a precaution against disturbance.

Existing Facilities

O'Leno State Park and River Rise Preserve State Park provides a unique opportunity for visitors to experience the Santa Fe River. Recreational facilities

at both parks include group camps, swimming areas, camping areas, and trails (see Base Map).

Recreational facilities are concentrated in 4 main areas at O'Leno State Park and 2 main areas at River Rise Preserve State Park:

O'Leno State Park

Day Use Area
Playground
Museum
Nature Center
Kiosk
Small Pavilion (6)
Medium Pavilion
Large Pavilion
Canoe/Kayak Launch
Floating Dock
Restrooms (3)
Parking Area (199 spaces)

Bellamy Road
Paved Parking Lot
Composting Restroom
Interpretive Panels

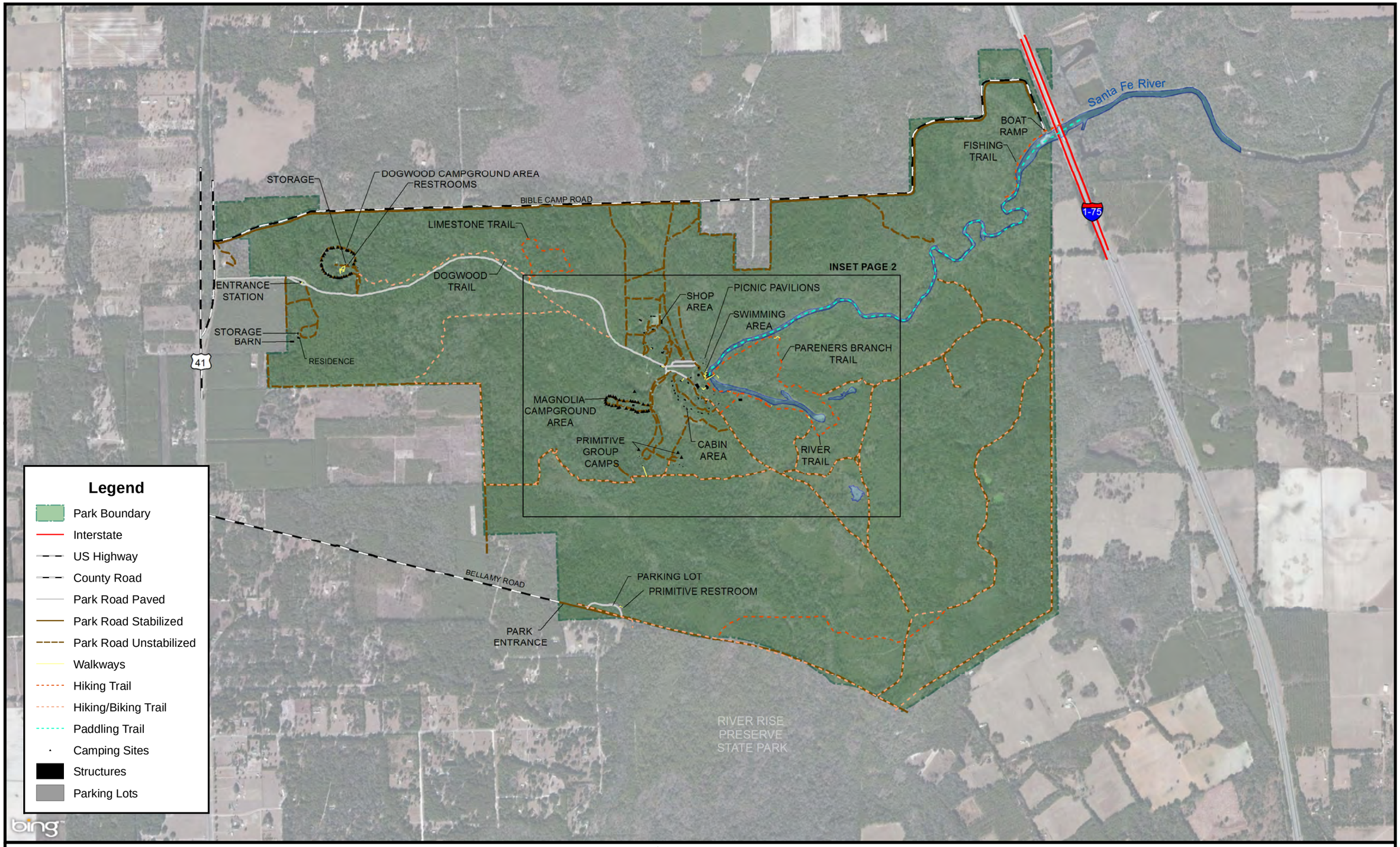
Group Camping Area
Infirmary
Dining Hall
Recreation Hall
Campfire Circle
BBQ Shelter
Restrooms (2)
Leader Cabin (3)
Craft Building
Canteen
Cook's Cabin
Cabins (14)

Magnolia Camping Area
Campsites (31)
Playground
Bathhouse

Dogwood Camping Area
Campsites (30)
Bathhouse

Parkwide
Primitive Group Camps (3)
Kiosk
Interpretive Panels (3)
Observation Platforms (2)
Amphitheater (2)
Hiking Trail (5.67 miles)
Biking Trail (0.40 miles)
Shared Use Trail (8.58 miles)

Support Areas
Residence
Entrance Station
Shop
Storage (4)
Barn
Administrative Office
Law Enforcement Office
Smokehouse
Dump Station



O'LENO STATE PARK

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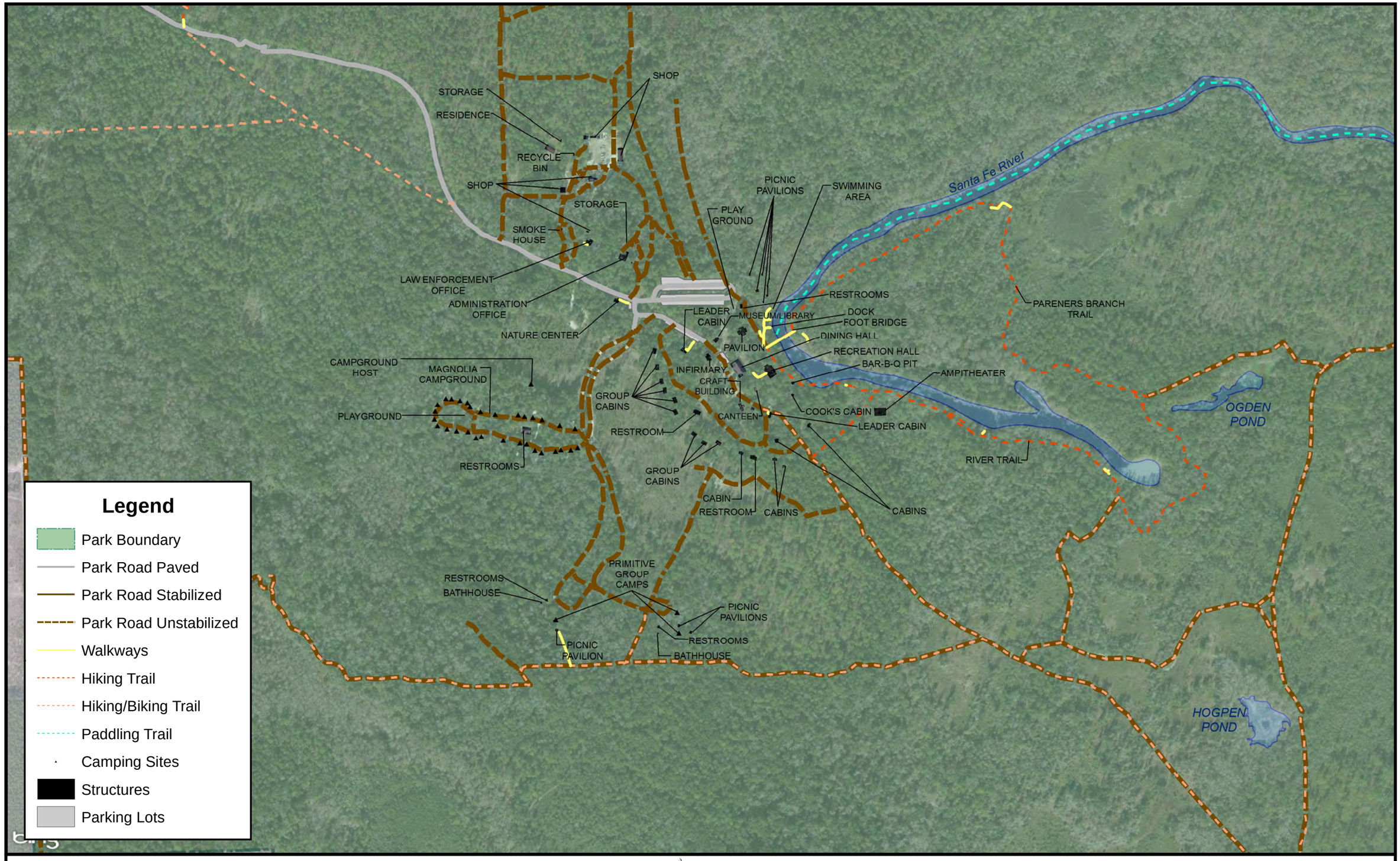
Florida Department of Environmental Protection
Division of Recreation and Parks
Date of aerial: 2011

BASE MAP
PAGE 1 of 2



O'LENO STATE PARK

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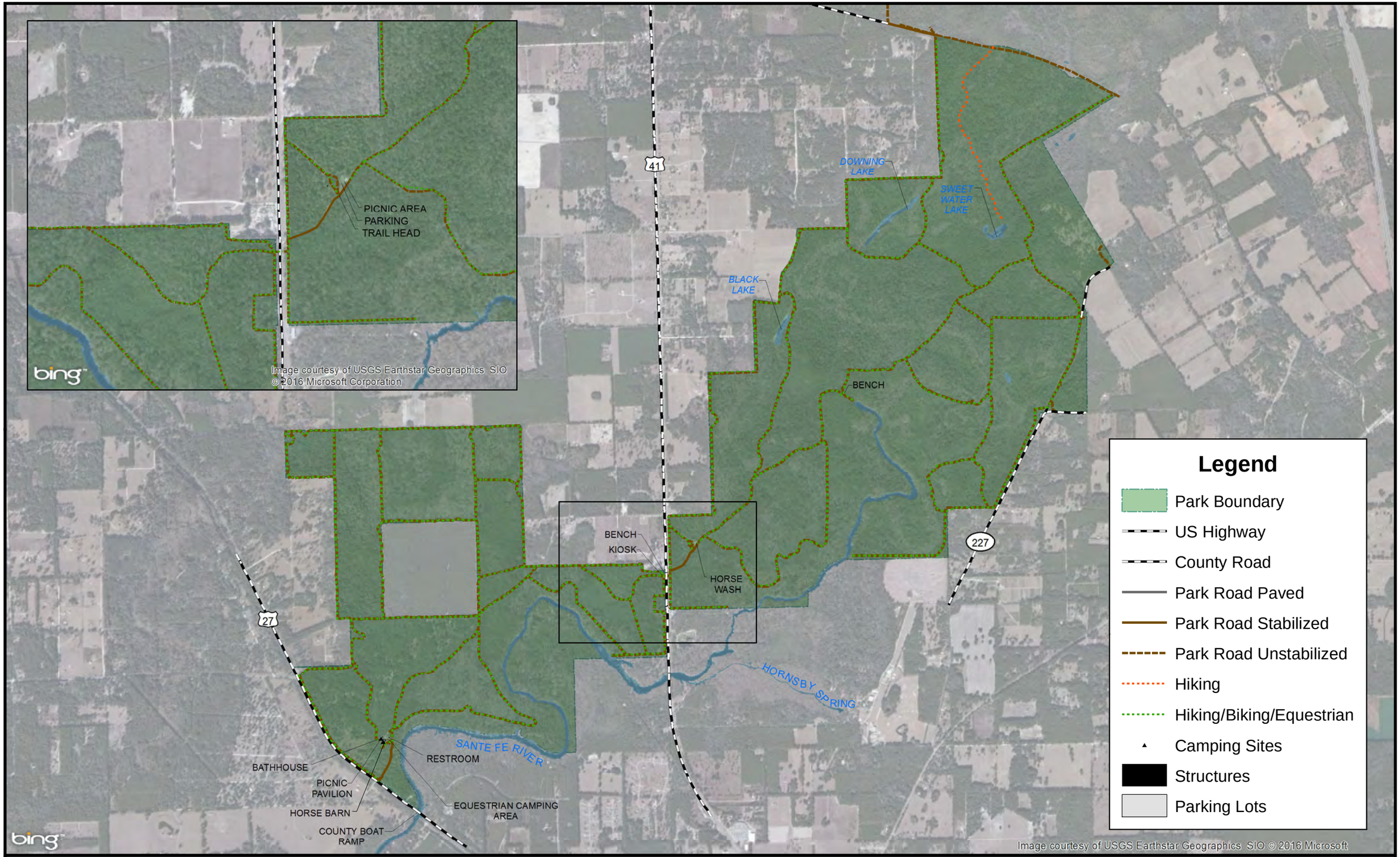
Florida Department of Environmental Protection
Division of Recreation and Parks
Date of aerial: 2011

BASE MAP
PAGE 2 of 2



RIVER RISE PRESERVE STATE PARK

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

BASE MAP

River Rise Preserve State Park

River Rise East
Small Pavilion
Benches
Parking Lot
Interpretive Panels (5)

River Rise West
Medium Pavilion
Bathhouse
Equestrian Campground (30 sites)
Campfire Circles (2)
Stable (20 stalls)
Trailer Parking (40 spaces)

Sweetwater Lake
Primitive Campsite
Campfire Circle
Restroom

Parkwide
Shared Use Trail (7.95 miles)
Hiking Trail (4.10 miles)
Equestrian Trail (12.73 miles)

Conceptual Land Use Plan

The following narrative represents the current conceptual land use proposal for these park. The conceptual land use plan is the long-term, optimal development plan for the parks, 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 both 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 in order 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 2,425 users per day.

The park will continue to provide the current range of recreational day use opportunities. Visitors predominantly travel to the park for camping, hiking, and swimming opportunities located at both O'Leno and River Rise Preserve State Parks. River Rise Preserve is also a popular location for equestrian camping, offering a range of day use and overnight equestrian amenities.

Objective: Expand the park's recreational carrying capacity by 126 users per day.

The addition of primitive and developed camping sites, interpretation, and a trailhead will increase the recreational carrying capacity and expand popular recreational activities at the park. The park should consider opportunities to utilize the dining hall and other facilities for events and catering. Canoe/kayak, bike, and horse rentals could also be included at River Rise Preserve State Park through concessions.

Objective: Continue to provide the current repertoire of 20 interpretive, educational and recreational programs on a regular basis.

O'Leno State Park and River Rise Preserve State Park currently offer 20 education, recreational, and interpretive programs and events. The goal of these programs is to facilitate an appreciation and understanding of the natural and cultural resources within the parks. Current programs include the *Alligator Warrior Festival*, *Snakes of North Florida, The Floridan Aquifer System, Literacy Day, National Public Lands Day Event*, and various Junior Ranger events. In addition, the parks host scavenger hunts, wildlife encounters, and crafting events for children.

Recreational programming offered at the park gives visitors a chance to have outdoor adventures and learn about potential new hobbies and activities. Currently, the park's recreational programs include guided river walks, canoeing trips, and bird walks.

Objective: Develop 4 new interpretive, educational and recreational programs.

An interpretive pavilion will be added to serve as a primary informational center for the park. Kiosks will be located in the main day use area and act as a directional guide for visitors, orienting visitors from one point of interest to the next.

Creating public awareness of the resources and recreational activities at River Rise Preserve and O'Leno will increase visitation. An interpretive plan should be created to identify appropriate locations for interpretive displays and kiosks.

With the assistance of various cave-diving organizations, an interpretive program will be designed to educate the public about cave diving and conservation. Park and district staffs will work with the North Florida Springs Alliance, National Association of Cave Divers, and the National Speleological Society Cave Diving Section to gather information about aquatic caves and cave diving.

A marketing program should be undertaken to increase exposure to park resources and recreational activities, particularly at River Rise Preserve State Park. An interpretive plan should be developed to identify appropriate locations for interpretive displays and kiosks. Interpretation should also be considered along existing hiking trails, especially Parener's Loop, to educate visitors about hydrology and geology.

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/or new facilities needed to implement the conceptual land use plan for O'Leno State Park and River Rise Preserve 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 10 existing facilities.

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 discussion of other recommended improvements and repairs are organized by use area within the park.

O'Leno State Park Use Areas

Group Camp Area

Various cabins throughout the group camp area need renovations to update heat and air conditioning units. A consideration should be made to update the designation of the group camp area so that cabins can be rented individually more times during the year. The Recreation Hall should be analyzed for flexible uses including individual rentals, events/catering concession opportunities, and adding interpretive exhibits outside of the building educating visitors on the history of the Civilian Conservation Corps at O'Leno.

Day Use Area

An accessible route should be constructed from the ADA parking spaces to the playground and picnic pavilion, as well as to the Recreation Hall for use by day use visitors. A kiosk should be added with interpretive panels to interpret cultural resources at the park, such as Wire Road and Bellamy Road. The day use area should be planned for wayfinding, accessibility, and interpretation improvements in order to accommodate school groups and day visitors. The bridge across the river needs to be rehabilitated about every 20 years due to seasonal flooding. Likewise, erosion issues in the day use area need to be addressed.

Dogwood Family Camping Area

The Dogwood Family Camping Area should be redesigned in order to slightly enlarge campsites. This campground loop will be reorganized as a tent and pop-up area only.

Magnolia Family Camping Area

The Magnolia Family Camping Area needs electrical service upgrades to 50 amps.

Shop Area

The park should identify a location for a volunteer village near the shop area to host park volunteers. This will open up sites in both campground loops and create a designated area for volunteers.

Parkwide

Developing a master plan is recommended for the Day Use Area and CCC Group Camping Area in order to identify circulation, wayfinding opportunities, interpretive areas, accessibility improvement needs, and help create an identity to differentiate the day use and group camp area. Further, the master plan will assist in identifying a location for a Visitor Center utilizing existing facilities. The Visitor Center should interpret park history and natural resources, including the underground water resources and cave system.

Restrooms should up upgraded throughout the park to satisfy accessibility needs and the interior fixtures should be renovated. Family restrooms should also be added throughout the park.

Sites for mobile food vendors or a camping shop should be identified at O'Leno State Park for campers. Additionally, opportunities should be considered to partner with Ichetucknee Springs State Park, such as a shuttle transporting visitors to and from the park during the off-seasons.

River Rise Preserve Use Areas

River Rise West
The development of an equestrian campground will include an area for day use parking, a cement dump pad for horse manure, new restroom and bathhouse facilities, a dump station located conveniently for equestrian camping area users, hosting campsites, designated equestrian campsites, and an area for tent-only sites. A study is also recommended to research carrying capacities for horse camping areas and facility needs to support this use. An archaeology survey was conducted to identify the boundaries of the archaeological sites and protection needs.

River Rise East
The River Rise Area will be developed with an ADA-compliant parking space, in addition to an accessible trailhead and interpretive kiosk.

Sweetwater Lake
The existing restroom at the primitive campsite should be removed.

Parkwide
A primitive campsite will be constructed between Sweetwater Lake and the River Rise East trailhead area off of U.S. 441.

Fencing should be added along the west side of the park to eliminate unauthorized access to the park. Potential mobile concessions sites for canoe/kayak, horse, and bike rentals should be considered at River Rise Preserve State Park.

Objective: Construct 1 new facility.

East Trailhead Area (US 441)
The East Trailhead Area on the east side of U.S. 441 will be developed as a regular day use area with an honor box, restroom, and improved parking where the current interpretive kiosk and horse wash is located. This would facilitate increased visitor access to River Rise Preserve State Park without requiring a gate code. Visitors will be able to drive into the trailhead and then access park trails on bike, horse, or foot. This would also provide an opportunity to access primitive campsites within the park. A park residence should be added to the East Trailhead Area within Management Zone 3A.

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:

O'Leno State Park

Day Use Area
Interpretive kiosks
Accessible route

Group Camping Area
Cabin renovations
Interpretive kiosks (2)

Dogwood Family Camping Area
Redesign campground

Magnolia Family Camping Area
Electrical upgrades

Shop Area
Develop volunteer village

Parkwide
Develop master plan
Upgrade restrooms
Family restrooms (2)

River Rise Preserve State Park

River Rise West
Equestrian campsites
Tent-only sites
Unisex restroom
Bathhouse
Parking lot
Dump station
Electrical/water service

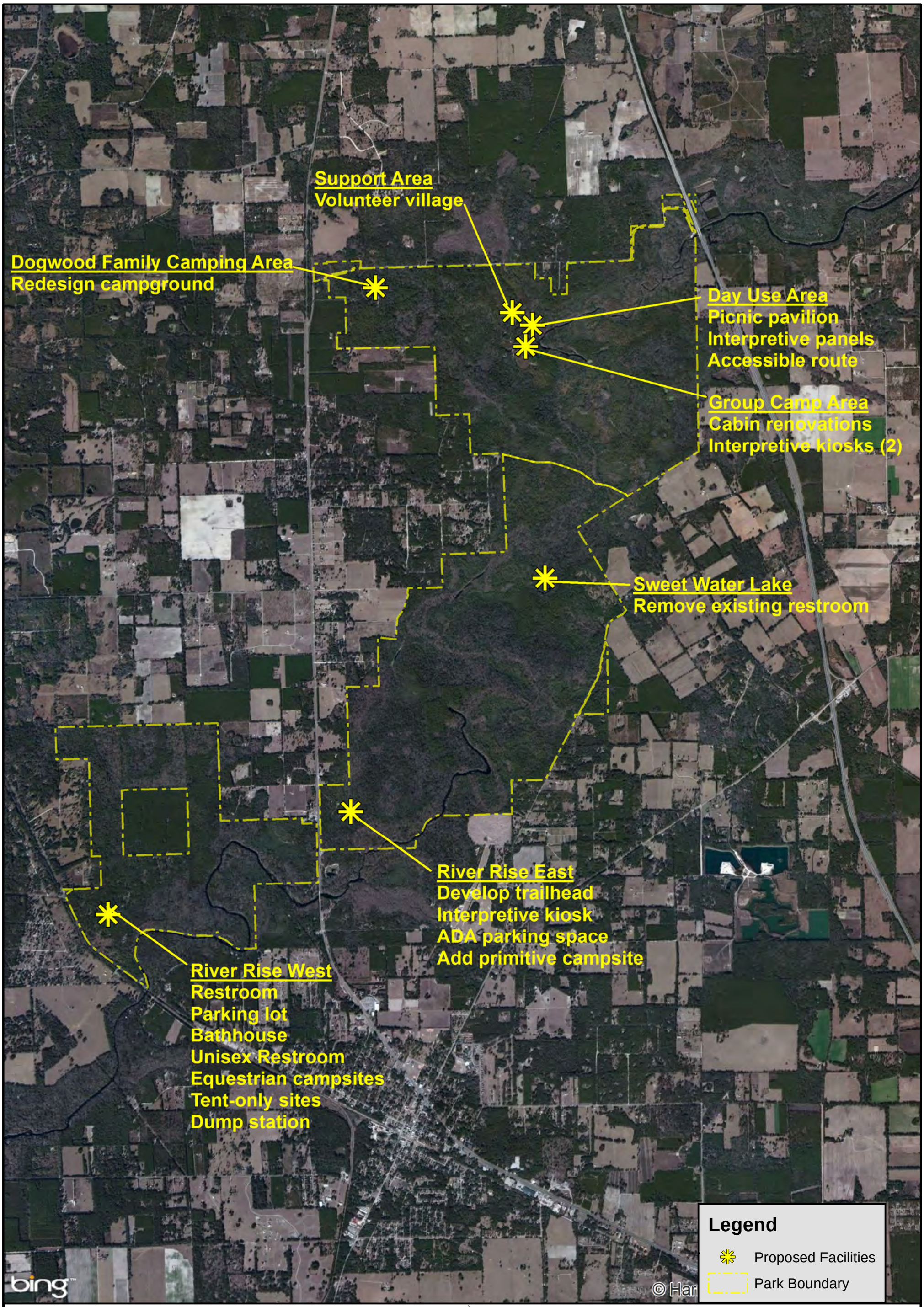
River Rise East
ADA parking space
Trailhead
Interpretive kiosk

Sweetwater Lake
Remove existing restroom

Parkwide
Add primitive campsite
Fencing

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 6).



O'LENO STATE PARK &
RIVER RISE PRESERVE STATE PARK

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Florida Department of Environmental Protection
Division of Recreation and Parks
Date of aerial; 2014

CONCEPTUAL LAND USE PLAN

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 6.

Table 6. Recreational Carrying Capacity

	Existing Capacity*		Proposed Additional Capacity		Estimated Recreational Capacity	
Activity / Facility	One Time	Daily	One Time	Daily	One Time	Daily
Trails						
Hiking	49	195			49	195
Biking	4	16			4	16
Shared Use	165	661			165	661
Equestrian	127	255			127	255
Picnicking	136	272	24	96	160	368
Shoreline Fishing	20	40			20	40
Swimming	120	240			120	240
Camping					0	0
Standard	488	488	10	10	498	498
Primitive Group Camp	75	75	10	10	85	85
Primitive Camping	10	10	10	10	20	20
Equestrian	48	48			48	48
Group Camp	125	125			125	125
TOTAL	**1,367**	**2,425**	**54**	**126**	**1,421**	**2,551**

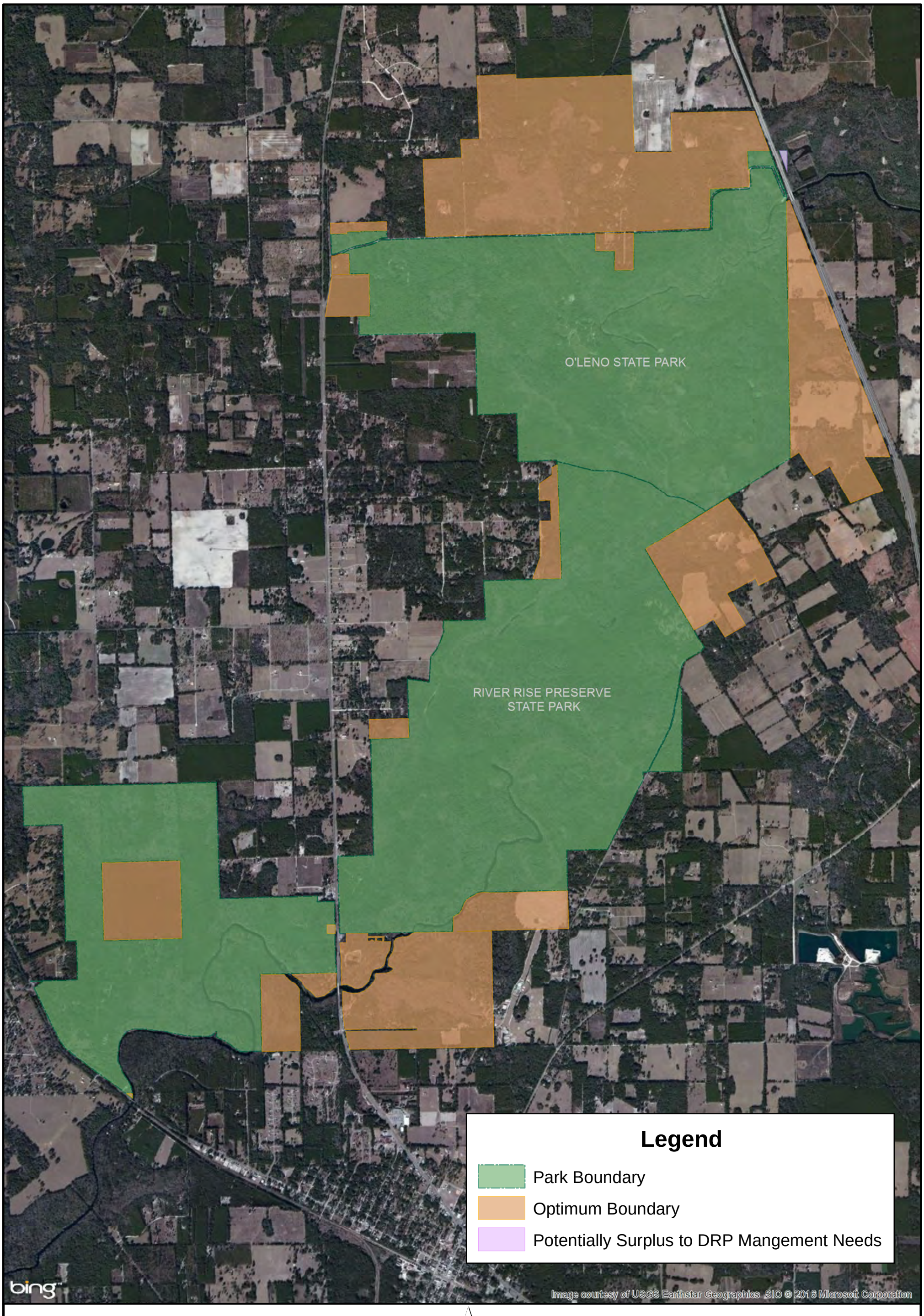
*Existing capacity revised from approved plan according to DRP guidelines.

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.

Parcels identified adjacent to O'Leno State Park would provide buffering from potential development and ensure protection of Buzzard Roost Prairie, an extensive wetland with hydrological connections to the park. Parcels adjacent to River Rise Preserve State Park would provide additional protection of the Santa Fe River and important drainage and karst features, eliminate a significant outparcel in the southwest portion of the preserve, and expand recreational opportunities. The triangle of land in the northeast corner of O'Leno State Park, on the east side of Interstate 75, should be considered for surplus due to management issues as a result of fragmentation from the main park property.



O'LENO STATE PARK &
RIVER RISE PRESERVE STATE PARK

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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 O'Leno State Park and River Rise Preserve State Park in 2003, significant work has been accomplished and progress made towards meeting the DRP's management objectives for the park. These accomplishments fall within three of the five general categories that encompass the mission of the park and the DRP.

Acquisition

- Reestablished accurate boundary lines along management zones 1M and 1L, 3GE and 3F, and 1S with contracted survey teams.
- Park management has promoted and prioritized the future purchase of the Fitzgerald Property (Columbia Spring) totaling 19 acres south of the current River Rise Preserve State Park (West Parcel) boundary to protect the spring and the cultural remains there. It is located between the existing south boundary, the Santa Fe River, and U.S. 441.

Park Administration and Operations

- Between 2004 and 2015, over 111,000 volunteer hours have been donated to O'Leno and River Rise Preserve State Parks.
- To promote the park to the public, increase visitation and revenue, and to generate memberships in the Friends of O'Leno, the park has sponsored the following special annual events: Race the Tortoise 5K, Chili Cook-off with Springs Festival, "Where Tales Meet Trails" for Literacy Day, Alligator Warrior Festival, National Public Lands Day, and equestrian events at River Rise PSP.
- The park also hosts High Springs Chamber of Commerce Meetings, Santa Fe River Working Group, and Suwannee Valley Marketing Group (TDC) Meetings.
- Park Management works with the Suwannee Valley Marketing Group, Visit Florida, and Visit Gainesville to improve marketing opportunities.

- In 2009, the park created a Nature Center in the historic 1942 Ranger Station. Funding for this project was provided by donations to the Friends of O'Leno. The Nature Center interprets the natural and cultural resources through educational programs, animal exhibits, a research library and children's learning area. This center hosts over 4,000 visitors a year.
- The park has established a partnership with Rompus International which has rented the Group Camp facilities annually since the 1960's. As of 2013, donations from Rompus for improvements to the Group Camp have totaled around $18,000.

Resource Management

Natural Resources

- The park has increased the annual burn acreage goals from 300 acres to over 1,000 acres annually since 2008 to improve natural community restoration. Additions to the park prescribed fire program include a PSS designated as the Burn Coordinator, 12 high band radios, new generation fire shelters for all burn crew members, and the loan of a Type 7 Fire Truck from FFS in 2008.
- Park Management initiated cooperation with PFTC, TNC, UF SAFE, and NMU burn teams to serve as a site for burn training in Florida in 2007. These cooperators have been essential to the success of the park's prescribed fire program and will continue in the future. The park has also improved relations with and cooperates with FFS, FFWCC, and Alachua County DEP burn crews at the parks.
- The park has increased treatment, locating, surveying, and mapping of its exotic plant species since 2006. This has been accomplished with staff, volunteers, interns, and AmeriCorps Team, IP, and ANT members. Treatment goals of 80% or higher have been reached since 2009.
- Feral hogs were observed in the parks beginning in 2009. Staff and Volunteers have trapped and removed over 25 of these exotic animals to date using a variety of methods. It is a high priority to eradicate these destructive animals from the park, as was previously done in the 1980s.
- The Southern Pine Beetle Outbreak of 2007/8 in four small pine sections of both parks was treated and the infected trees harvested. Since 2010 park management has replanted these areas with LLP's from donations and volunteer work from interested park patrons.
- The park implemented a phased restoration project at Bible Camp Road with the cooperation of Columbia County, FWC, Army Corps of Engineers, USFWS, USGS and SRWMD to remove sediments from the Santa Fe River, improve habitat conditions for imperiled mussel species, and improve boat ramp facilities.
- District and park staff worked with FWC to survey the Santa Fe River at Bible Camp Road for federally-listed mussels.
- Park completed vegetation restoration and soil stabilization at the River Rise to address erosion issues in 2008.

- The park continues to facilitate aquatic cave mapping by a team of research scuba divers working in the Old Bellamy Cave System. This project has continued for over 30 years and has mapped nearly 8 miles of conduits.
- Park and District Staff cooperated with LAKEWATCH beginning in 2015 to collect water quality data at three locations within the parks.
- Mechanical restoration of 8 management zones was initiated in 2013 to facilitate prescribed burning.
- The park continues to host 30 to 40 scientific research permittees each year for various scientific studies.
- Park and District staff cooperated with SRWMD to implement a new water level monitoring station for the Santa Fe River at Bible Camp Road.
- The park has and will continue to work with FWC law enforcement to limit wildlife poaching within both parks.

Cultural Resources

- In 2007, all known cultural site files were compiled for both parks. Staff were provided with site maps to facilitate monitoring.
- Staff have monitored archaeological sites on a quarterly basis for disturbance and looting since 2008. The park manager monitors all sites on a biannual basis.
- Park staff, volunteers, and interns have located another 12 cultural sites since 2009 and have completed Master Site Files for each.
- In 2011, park history files were organized and cataloged for better research potential for New Deal Era, Forestry period and early FPS development.
- The Park History brochure that is given out to the public was improved in 2007 and 2010.
- Historic and Significant structures have been identified and surveyed in 2009 and again in 2013. Maintenance plans for each of these structures were established in 2013. They are checked quarterly by Park Management and weekly by park staff for damage and repair needs.
- Park Collections have been identified, cataloged, and added to in both 2007 and 2013. In 2013 they were added to the Past Perfect system in their entirety.
- The CCC era Suspension bridge is maintained with repairs and restoration done on the handrails, flooring, and metal treatment every 2 years. The bridge was rebuilt in 2013 after sustaining water damage in 2012 and 2007 floods.
- Plan to rehabilitate and correct flaws in the 1936 Recreation Hall by park, BDC, and BNCR after flooding and termite damage of 2012.
- Park staff have worked with law enforcement to apprehend artifact looters in both parks, resulting in 3 arrests since 2006.

- Research has located the likely site of Cantonment Winfield Scott, a US Army cavalry fortification from 1838 to 1842 on park property. This work was done by volunteers, interns, and park management over the past 7 years. This fortification is the likely starting point for settlement of this area resulting in creation of town of Leno in later 1800's.
- Improvements were made to the Park Museum (CCC Fire Tower building) in 2007 and 2011 for better historic interpretation of park development, New Deal Era, and Leno town site.
- Completion of 1990s project of displaying the historic Traxler Grist Mill (previously attributed to the Leno town site), by Friends of O'Leno in 2008. Grist Mill artifacts were treated, restored, displayed, and interpreted in pavilion created for this purpose in 2004.
- Display of new DeSoto Trail Kiosk to improve understanding of the explorer's travels through the park's Natural Bridge in 2011.
- Accepted the donation by the CCC Alumni/Legacy of the "CCC Boy" statue and monument in 2008 to identify the work of CCC members in the creation of Camp O'Leno in 1938.

Recreation and Visitor Services

- The park has improved and upgraded its ability to accommodate ADA visitors with the addition of sidewalks, campsites, beach wheelchairs, restroom facilities, Youth Camp Facilities, Cell Phone Tour Sites, and UTAP trails since 2006.
- The park initiated the weekly Saturday morning interpretive program in 2007 which gathers 10 to 50 visitors each program. The programs cover natural resources and extends interpretation directly to the visitors each weekend.
- The park has improved equestrian access by allowing equestrian day riders and campers to "call in" their visitation and reservations by credit card over the phone. "Pass-through" gates were established on both sides of U.S. 441 at River Rise PSP since 2013. River Rise also added 15 more miles of multi-use trails and the Eastside Trailhead pavilion, parking lot, and 3 stall equestrian wash rack to further attract equestrian use in 2007.
- All park brochures, maps, and interpretive handouts were redesigned and updated as needed in 2006, 2009 and 2012 for accuracy.
- Flood Stage Marker was installed by staff in 2008 and an interpretive map and kiosk display was created in 2012 to explain flooding in the parks with the help of SRWMD and park volunteers.

Park Facilities

- Improvements to both Family Campgrounds (Magnolia and Dogwood) have included improved roads, extending campsites to fit current use, new restroom facilities, and fencing around existing sites to protect buffer zones in Magnolia (Dogwood is uncompleted) since 2010.

- New Camper Restrooms were added to both the Magnolia and Dogwood Family Campgrounds in 2003 and 2004 respectively, offering better accommodations for those campers.
- Youth Camps 1, 2A and 2B have also been refurbished and upgraded to better serve our visitors by adding fencing, improved outdoor showers, restroom rehabilitation, and improved pavilions.
- Trails within both parks were marked, mapped, and blazed for ease of use in 2008 and in 2011. Map kiosks with trail signage were added at all 3 public entrances to River Rise Preserve State Park in 2009. Trail benches were added to O'Leno trails in 2006 and replaced in 2013.
- All park facilities requiring new paint color scheme were begun in 2008 and completed by 2012. Only those structures dating to the New Deal Era were left either unpainted or in FPS Heritage Brown to maintain their historic integrity.
- The historic O'Leno State Park entrance sign at the front gate was replaced in 2012 after rot no longer made retention of it practical. A current sand blasted FPS sign was added to the historic holder and base as replacement.
- Both campgrounds' water tanks for public water consumption were replaced in 2011 and 2012 to meet current DEP standards.
- As of 2013, all cabins, restrooms, and Dining Hall (14 in all) roofs in the Group Camp except three remaining Sleeper Cabins have been replaced with period tin roofs. These replaced the older shingle roofs done in the 1980's and 1990's which replaced older tin roofs.
- As of 2010 all boardwalks, bridges, and scenic overlook platforms on both the River Trail and Wire Road have been replaced and repaired to mitigate the 2004 flooding damage.
- The New Deal Era Warehouse and Barn in the Shop Compound were repaired and restored in 2012 by park staff to replace rotten wood.
- All park facilities in both parks were marked with property number signage in 2009 for property audits and inspection purposes.

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 7) 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 7 may need to be adjusted during the ten-year management planning cycle.

Table 7
O'Leno State Park and River Rise Preserve 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	**$874,428**
Objective B	**Expand administrative support as new lands are acquired, new facilities are developed, or as other needs arise.**	Administrative support expanded	C	**$45,434**
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 two parks' hydrological needs.**	**Assessment conducted**	**ST, LT**	**$42,800**
Action 1	Continue to cooperate with various agencies in hydrological research and monitoring programs within the parks and on the Santa Fe River, and encourage and facilitate additional research in these areas.	Cooperation ongoing	C	$3,500
Action 2	Continue to monitor permit requests (Environmental Resource Permits, Water Use Permits, mining/consumptive use permits) and land use/zoning changes in the region and offer comments as appropriate.	Monitoring ongoing	C	$2,600
Action 3	Pursue funding sources to conduct dye trace studies to delineate the River Rise Springshed and to determine groundwater sources for springs and aquatic cave systems in both parks.	Funding acquired	UFN	$1,000
Action 4	Encourage hydrological research and conduct dye trace studies to delineate the River Rise Springshed and to determine groundwater sources for springs and aquatic cave systems in both parks.	Study implemented	UFN	$30,000
Action 5	Work closely with the SRWMD to ensure that MFLs for the Upper Santa Fe River are carefully monitored and that historic flows are protected.	Monitoring conducted	C	$2,000
Action 6	Establish a monitoring program within O'Leno along the Sante Fe River above the River Sink to document ecological impacts of low flow events.	Monitoring program established	ST	$3,700
Objective B	**Restore natural hydrological conditions and functions to approximately 23 acres of blackwater stream natural community.**	**# acres restored or with restoration underway**	**LT**	**$5,000**
Action 1	Monitor the Bible Camp Road restoration project.	Plan completed	LT	$2,000
Action 2	Evaluate other sites within the two parks where natural hydrology may have been altered, and initiate corrective actions as needed.	# evaluations conducted; # corrective measures taken.	LT	$3,000
Objective C	**Evaluate and mitigate the impacts of soil erosion in the two parks.**	**Soil erosion sites evaluated & mitigated**	**ST, LT**	**$3,500**
Action 1	Investigate best management options for additional mitigation of erosion at public access points in the parks.	# of best management practices identified	ST	$1,500
Action 2	Regularly monitor other park areas that are subject to significant erosion; implement corrective measures as necessary, complying with best management practices for maintenance of surface water and groundwater quality.	Monitoring conducted; corrective measures taken	C	$1,500
Action 3	Identify unauthorized trails along river levees and other vulnerable areas in the parks; eliminate visitor access where necessary.	Unauthorized trails identified; access eliminated where needed	LT	$500
Objective D	**Monitor changes within the aquatic cave system.**	**Monitoring conducted**	**LT**	**$3,900**

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Action 1	Coordinate with aquatic cave experts, including members of the Springs Management Team, in developing and implementing baseline surveys and long-term monitoring programs that assess physical and biological conditions in the Old Bellamy Cave System, including troglobite population status.	Baseline surveys & monitoring programs implemented	C	$2,400
Action 2	Examine the possibility that data obtained in the O'Leno/River Rise cave assessments may be useful in establishing science-based carrying capacities at recreational cave diving locations in other state parks.	Data reviewed & possible use in other parks examined	LT	$500
Action 3	Obtain professional recommendations from the Springs Management Team regarding proper use and management of the cave systems at O'Leno/River Rise.	Professional recommendations obtained	LT	$1,000
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 2,100 acres of the park maintained within optimal fire return interval.**	# Acres within fire return interval target	**LT**	**$1,475,000**
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 775-1275 acres annually, as identified by the annual burn plan.	Average # acres burned annually	C	$1,400,000
Action 3	Increase the frequency of burning in zones threatened by hardwood invasion.	Shorter fire return interval in SHF	LT	$59,000
Objective B	**Conduct habitat/natural community restoration activities on 67 acres of upland pine and upland mixed woodland communities.**	# Acres restored or with restoration underway	**ST or LT**	**$48,750**
Action 1	Develop a restoration plan for upland pine and upland mixed woodland communities in zones just north and south of Bellamy Road	Plan developed/updated	ST	$1,500
Action 2	Implement the restoration plan.	# Acres with restoration underway	LT	$47,250
Objective C	**Conduct habitat/natural community restoration activities on 44 acres of sandhill community.**	# Acres improved or with improvements underway	**ST or LT**	**$36,000**
Action 1	Continue to implement restoration plans for 15 acres of sandhill in zone 1Jn and 29 acres of sandhill in zone 3A.	# Acres with improvement activities underway	LT	$35,000
Action 2	Monitor the progress of offsite hardwood control and native groundcover propagation in both zones.	# Acres with improvement activities underway	C	$1,000
Objective D	**Conduct natural community/habitat improvement activities on 265 acres of upland pine and upland mixed woodland community.**	# Acres with improvement activities underway	**C**	**$88,600**
Action 1	Continue habitat improvement activities in upland pine/upland mixed woodland communities in zones 3Cn, 3D, and 3Ge.	# Acres with improvement activities underway	LT	$82,600
Action 2	Monitor habitat improvement sites for native groundcover recovery, longleaf pine seedling survival, and reappearance of invasive hardwoods.	# Acres with improvement activities underway	LT	$6,000

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Objective E	**Conduct natural community/habitat improvement activities on 49 acres of sandhill community.**	# Acres with improvement activities underway		**$15,000**
Action 1	Mechanically and/or chemically treat offsite hardwoods in sandhills in zones 1A, 1C, and 1De (higher priority) and in zones 1R and 1S (lower priority).	# Acres with improvement activities underway	LT	$12,000
Action 2	Monitor sandhill improvement sites for native groundcover recovery, longleaf pine regeneration, and re-sprouting of invasive hardwoods.	# Acres with improvement activities underway	C	$3,000
Objective F	**Conduct natural community/habitat improvement activities on 15 acres of scrubby flatwoods community.**	# Acres with improvement activities underway	**LT**	**$5,000**
Action 1	Mechanically treat scrub oaks in zones 1De, 1E, and 1K.	# Acres with improvement activities underway	ST	$2,500
Action 2	Plant longleaf pines in scrubby flatwoods after successful burns and monitor pine survival.	# Acres with improvement activities underway	LT	$2,500
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 developed/updated	**C**	**$2,000**
Action 1	Conduct additional surveys for imperiled plant and animal species in both parks.	Survey completed	LT	$2,000
Objective B	**Monitor and document 6 selected imperiled animal species in the park.**	# Species monitored	**C**	**$6,000**
Action 1	Coordinate with the North American Butterfly Association (NABA) and FNAI in monitoring three imperiled butterfly species.	# Species monitored	C	$1,500
Action 2	Monitor the oval pigtoe, an endangered mussel, in cooperation with FWC and USFWS as part of the Bible Camp Road Restoration Project	# Species monitored	C	$1,500
Action 3	Implement a monitoring protocol for the southern dusky salamander in coordination with FWC and FLMNH.	# Species monitored	C	$1,500
Action 4	Conduct additional surveys for Sherman's fox squirrels, documenting color patterns as well as date and location observed.	# Surveys conducted	C	$1,500
Objective C	**Monitor and document 3 selected imperiled plant species in the park.**	# Species monitored	**C**	**$2,000**
Action 1	Develop monitoring protocols for 3 imperiled plant species (incised agrimony, modest spleenwort, and plume polyplody) in cooperation with FNAI.	Protocol developed	ST	$200
Action 2	Implement monitoring protocols for the three imperiled plant species listed in Action 1.	# Species monitored	C	$1,800
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 6 acres of exotic plant species in the park.**	# Acres treated	C	**$27,760**

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Action 1	Treat all known infestations of invasive exotic plants annually, preferably before reproduction occurs.	# Acres treated	C	$14,480
Action 2	Survey for and map new invasive exotic plants in every zone at least twice within the next 10 years.	# Surveys conducted	C	$13,280
Objective B	**Develop and implement measures to prevent the accidental introduction or further spread of invasive exotic plants in the park.**	# Species for which control measures implemented	C	**$7,000**
Action 1	Develop and implement preventative measures, including a protocol for equipment inspection and decontamination, to limit accidental introduction and movement of exotic species.	# Protocols developed	C	$7,000
Objective C	**Implement control measures on 3 exotic and nuisance animal species in the park.**	# Species for which control measures implemented	C	**$26,000**
Action 1	Remove feral hogs as resources permit, focusing on areas where hogs are causing the most damaged areas.	# Hogs removed	C	$24,000
Action 2	Coordinate with Alachua County or Columbia County Animal Services in removing feral or stray cats and dogs from the parks.	# Cats/dogs removed	C	$1,000
Action 3	Monitor presence of capybaras in the park.	# Species monitored	C	$1,000
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 128 of 128 recorded cultural resources in the park.**	Documentation complete	**LT**	**$269,500**
Action 1	Develop a protocol for tracking changes at each archaeological site.	# Protocols developed	ST	**$2,000**
Action 2	Complete assessments/evaluations of 64 archaeological sites, 5 resource groups, 56 historic structures, and 3 historic bridges, prioritizing sites that are in need of preservation and stabilization.	# Assessments completed	LT	$10,000
Action 3	Develop a plan for more frequent surveillance of archaeological sites that have been looted in the past; implement the plan.	Surveillance plan developed and implemented.	ST, C	$2,500
Action 4	Complete Historic Structures Reports (HSRs) for 17 CCC/WPA structures, including one on public land adjacent to O'Leno; prioritize projects identified by the HSRs for stabilization, restoration, or rehabilitation.	# Reports completed and lists prioritized.	LT	$255,000
Objective B	**Compile reliable documentation for all recorded historic and archaeological sites.**	Documentation complete	**LT**	**$63,200**
Action 1	Ensure all sites, including newly found ones, are recorded or updated in the Florida Master Site File.	# Sites relocated	ST	**$5,000**
Action 2	Relocate with GPS and map archaeological sites whose exact locations are currently unknown, and update FMSF forms as needed.	# Sites recorded or updated	LT	$2,000
Action 3	Conduct a comprehensive Level 1 archaeological survey of O'Leno State Park, covering more than the high probability areas identified by the predictive model.	Site file updated	UFN	$5,785
Action 4	Determine which areas in River Rise Preserve State Park identified by the predictive model should receive Level 1 archaeological survey; conduct the survey.	Research completed.	LT	$9,415
Action 5	Conduct additional research to determine if O'Leno was the location of a Seminole War fort or Cantonment Winfield Scott.	Research and survey completed.	UFN	$12,000

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Action 6	Accurately survey and obtain additional information about historic road CO1176 that connects Wire Road with Bellamy Road.	Research conducted.	UFN	$3,000
Action 7	Determine the age of the historic wooden bridge on Wire Road.	Research conducted.	LT	$3,000
Action 8	Conduct additional research about prehistoric settlement patterns within the two parks and how they relate to broader settlement patterns in the surrounding area.	Research conducted.	UFN	$12,000
Action 9	Conduct additional research into the settlement of Leno (Keno) to determine if the community was a town or a small industrial area.	Documentation completed.	LT	$5,000
Action 10	Continue to document the period of CCC/WPA development and early park service administrative history and construction at O'Leno; promptly document historic graffiti in the interior of one CCC/WPA structure, the Canteen (CO1142).	Survey completed	LT, ST	$2,000
Action 11	Develop a housekeeping manual for the collection items at O'Leno; implement procedures outlined in the manual.	Areas identified; survey completed.	ST, C	$2,000
Action 12	Develop a Scope of Collections Statement for River Rise Preserve State Park.	Document completed	LT	$2,000
Objective C	**Bring 5 of 128 recorded cultural resources into good condition.**	# Sites in good condition	**LT**	**$272,000**
Action 1	Document the parks' cyclical maintenance and site monitoring programs.	Document completed	C	$2,000
Action 2	Treat three historic structures (Cypress Log Pavilion, Recreation Hall, and Craft Building) for termites.	Maintenance completed.	ST	**$27,000**
Action 3	Obtain an engineering assessment of damages to all 3 buildings and conduct repairs as needed.	Assessment conducted; Maintenance completed.	LT	**$23,000**
Action 4	Replace roofs on the Cypress Log Pavilion and the Craft Building.	Project completed.	ST, LT	**$16,000**
Action 5	Evaluate Spivey's Road Island Site (AL5664) rehabilitative work.			**$4,000**
Action 6	Identify other historic structure repair needs as determined by HSRs, and prioritize repairs based on urgency	Programs documented.	LT, UFN	$75,000
Action7	Develop a historic building maintenance plan for the non-CCC/WPA historic structures that are in regular use by park visitors; implement the maintenance plan.	Projects completed	ST, C	$125,000
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 2,425 users per day.**	# Recreation/visitor opportunities	**C**	**$1,748,857**
Objective B	**Expand the park's recreational carrying capacity by 126 users per day.**	# Recreation/visitor opportunities	**ST or LT**	**$90,868**
Objective C	**Continue to provide the current repertoire of 20 interpretive, educational and recreational programs on a regular basis.**	# Interpretive/education programs	**C**	**$100,000**

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Objective D	**Develop 4 new interpretive, educational and recreational programs.**	# Interpretive/education programs	**ST or LT**	**$28,000**
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**	**$2,040,333**
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	**LT**	**$75,000**
Objective C	**Improve and/or repair 10 existing facilites as identified in the Land Use Component.**	# Facilities/Miles of Trail/Miles of Road	**LT**	**$54,026,770**
Objective D	**Construct 1 new facility as identified in the Land Use Component.**	# Facilities/Miles of Trail/Miles of Road	**LT**	**$285,000**
Objective E	**Expand maintenance activities as existing facilities are improved and new facilities are developed.**	Facilities maintained	**C**	**$106,013**

Summary of Estimated Costs

Management Categories		**Total Estimated Manpower and Expense Cost* (10-years)**
Resource Management		**$2,290,410**
Administration and Support		**$919,863**
Capital Improvements		**$391,013**
Recreation Visitor Services		**$54,026,770**
Law Enforcement Activities[1]	Note: Law 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

Purpose of Acquisition:

The Trustees of the Internal Improvement Trust Fund of the State of Florida (Trustees) purchased O'Leno State Park primarily for public outdoor recreation and park.

Sequence of Acquisition:

On November 9, 1934, the Trustees purchased a 40-acre property constituting the initial area of O'Leno State Park. The name *O'Leno* comes from the name of a town by the name of *Old Leno* that occupied the original site of this state park. The Trustees purchased the property from Alice L. Hurner.

On September 16, 1949, Florida Board of Forestry, predecessor in interest to the Florida Board of Parks and Historic Memorials (FBPHM), transferred title and other interests it had in O' Leno State Park to FBPHM. On September 28, 1967, FBPHM, predecessor in interest to the State of Florida Department of Environmental Protection, Division of Recreation and Parks (DRP), transferred all its interest in O'Leno State Park to the Trustees.

Since the November 9, 1934, initial purchase, Trustees and different successor state agencies have acquired several parcels and added them to O'Leno State Park. Presently the park has 1,741.16 acres.

Management Leases:

On January 23, 1968, the Trustees leased O'Leno State Park to FBPHM under a ninety-nine (99) year generic lease, Lease No. 2324. Lease No. 2324 was meant to expire on January 22, 2067. However, on March 28, 1984, the Trustees changed the term of Lease No. 2324 as it related to O'Leno State Park to fifty (50) years.

On August 24, 1988, the Trustees assigned a new lease number, Lease No. 3638, to O'Leno State Park without changing any of the conditions of Lease No. 2324. The term of this new lease, Lease No. 3638, will expire on August 23, 2038, unless sooner terminated.

According to Lease No. 3638, DRP manages O'Leno State Park for the purposes of developing, improving, operating, maintaining and otherwise managing said land for public outdoor recreational, park, historic, conservation and related purposes.

Title Interest:

The Trustees holds fee simple title to O'Leno State Park.

Special Conditions on Use:

O' Leno State Park is designated as a single-use property to provide resource-based public outdoor recreation and other park related uses. Uses such as water resource development projects, water supply projects, storm-water management projects, and linear facilities and sustainable agriculture and forestry are not consistent with the purposes for which DRP manages O'Leno State Park.

Outstanding Reservations:

Following is a listing of outstanding issues that apply to O'Leno State Park.

Instrument:	Warranty Deed
Grantors:	Margaritte Davidson McLeod and A.P. McLeod et al.
Grantee:	Trustees
Beginning Date:	September 3, 1974
Ending Date:	Perpetuity
Outstanding Reservations:	The warranty deed is subject to a reservation to the State of Florida for rights-of-way for roads and highways.

Instrument:	Deed
Grantor:	Trustees
Grantee:	Florida Board of Forestry and Parks
Beginning Date:	November 6, 1945
Ending Date:	Perpetuity
Outstanding Reservations:	On this day (November 6, 1945), Trustees deeded several parcels to the Board of Forestry and reserved to itself an easement for State road right-of-way.

Sequence of Acquisition:

On September 3, 1974, the Board of Trustees of the Internal Improvement Trust Fund of the State of Florida (Trustees) acquired approximately 4,172-acre property constituting the initial area of River Rise Preserve State Park. The Trustees purchased this property from Margaritte Davidson McLeod et al for $4,598,957. This purchase was funded under the Environmentally Endangered Lands (EEL) program.

Since the 1974 initial purchase, the Trustees has acquired several parcels mainly under Land Acquisition Trust Fund (LATF), the Preservation 2000/Additions and Inholdings (P2000/A&I), and Florida Forever/Additions and Inholdings (Florida Forever/A&I) programs and added them to River Rise Preserve State Park. Presently the park has 4,481.73 acres.

On June 2, 1975, the Trustees leased River Rise Preserve State Park to the State of Florida Department of Natural Resources, predecessor in interest to the State of Florida Department of Environmental Protection, Division of Recreation and Parks (DRP), under Amendment No. 2 to the Trustees' generic lease, Lease No. 2324. Lease No. 2324 was for a period of ninety-nine (99) years.

River Rise Preserve State Park does not have its own lease. DRP manages this park under the O'Leno State Park's lease. On January 23, 1968, the Trustees leased O' Leno State Park to the Florida Board of Parks and Historic Memorials (FBPHM), predecessor in interest to DRP, under a ninety-nine (99) year generic lease, Lease No. 2324. Lease No. 2324 as related to O' Leno State Park was to expire on January 22, 2067. However, on March 28, 1984, the Trustees changed the term of Lease No. 2324 as it related to O'Leno State Park to fifty (50) years.

On August 24, 1988, the Trustees assigned a new lease number, Lease No. 3638, to O'Leno State Park without changing any of the conditions of Lease No.2324. The term of this new lease, Lease No. 3638, will expire on August 23, 2038, unless sooner terminated. This means that the current lease for River Rise Preserve State Park is Lease No. 3638, and the lease will expire on August 23, 2038.

According to Lease No. 3638, DRP manages River Rise Preserve State Park for the purposes of developing, improving, operating, maintaining and otherwise managing said land for public outdoor recreational, park, historic, conservation and related purposes.

Title Interest:

The Trustees holds fee simple title to River Rise Preserve State Park.

Special Conditions on Use:

River Rise Preserve State Park is designated as a single-use property to a provide resource-based public outdoor recreation and other park related uses. Uses such as water resource development projects, water supply projects, storm-water management projects, and linear facilities and sustainable agriculture and forestry are not consistent with the purposes for which DRP manages River Rise Preserve State Park.

Outstanding Issues:
Following is a listing outstanding issues that apply to River Rise Preserve State Park.

Instrument:	Warranty Deed
Grantors:	Margaritte Davidson McLeod and A.P. McLeod et al.
Grantee:	Trustees
Beginning Date:	September 3, 1974
Ending Date:	Perpetuity
Outstanding Reservations:	The warranty deed is subject to a reservation to the State of Florida for rights-of-way for roads and highways.

Addendum 2—Advisory Group Members and Report

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{Report}

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Addendum 4—Soil Descriptions

Soils classification units denoted with a #-C or #-A correspond with Columbia and Alachua Counties, respectively.

(1C) Albany fine sand, 0 to 5 percent slopes - This is a somewhat poorly drained nearly level to gently sloping soil on broad flats bordering poorly defined drainageways and in undulating areas. The areas of this soil range from about 4 to more than 200 acres.

Typically, the surface layer is grayish brown fine sand about 7 inches thick. The subsurface layer is fine sand and extends to a depth of 55 inches. In the upper 8 inches, it is pale brown; in the next 15 inches, it is pale brown mottled with yellow and white; and in the next 25 inches, it is white with brownish yellow mottles. The upper 10 inches of the subsoil is pale yellow loamy fine sand and has yellowish brown and white mottles. Below that, the subsoil is gray sandy clay loam with yellowish brown mottles to a depth of 80 inches or more.

Included with this soil in mapping are small areas of Blanton, Chipley, Ocilla, and Plummer soils. Also included are small areas of somewhat wetter soils that have deposits of colluvial material over the original surface layer. These soils make up less than 15 percent of the map unit.

This Albany soil has a water table at a depth of 12 to 30 inches for 1 to 4 months in most years. The water table is at a depth of 30 to 50 inches most of the time and below a depth of 50 inches in the dry months. The available water capacity is low in the subsurface layer and in the lower part of the subsoil. It is medium in the surface layer and in the upper part of the subsoil. Permeability is rapid in the surface and subsurface layers, moderate in the lower part of he subsoil. Natural fertility is low. The content of organic matter is moderate in the surface layer and low in the subsurface layer and subsoil.

(2C) Albany fine sand, occasionally flooded - This is a somewhat poorly drained, nearly level to gently sloping soil on broad flats and low-lying, undulating terrain in flood-prone areas. This soil is flooded occasionally for long periods after intense, heavy rainfall, and it has been flooded in March or April about once every 10 years. The areas of this soil range from 10 to 40 acres. The slope ranges from 0 to 5 percent.

Typically, the surface layer is grayish brown fine sand about 7 inches thick. The subsurface layer is fine sand and extends to a depth of 55 inches. In the upper 8 inches, it is pale brown; in the next 15 inches, it is pale brown with yellow and white mottles; and in the lower 25 inches, it is white with brownish yellow mottles. The subsoil is gray sandy clay loam with yellowish brown mottles, and it extends to a depth of 80 inches or more.

Included with this soil in mapping are small areas of occasionally flooded Blanton and Plummer soils. Also included are small areas of soils that are similar to the Albany soil but have stratified layers of sand or are underlain by

clay. These soils make up about 20 percent of the map unit.

This Albany soil has a water table at a depth of 12 to 30 inches for 1 to 4 months in most years. The water table is at a depth of 30 to 50 inches most of the time and is below 50 inches in the driest months. The available water capacity is very low in the surface and subsurface layers, low in the upper part of the subsoil, and medium in the lower part of the subsoil. Permeability is rapid in the layers of sand and moderate in the subsoil. Natural fertility and the organic matter content are low.

(3A) Arrendono fine sand, 0 to 5 percent slopes - This nearly level to gently sloping, well-drained soil is in both small and large areas of uplands. Slopes are smooth to convex. The areas are irregular in shape and range from about 10 to 160 acres in size.

Typically, the surface layer is dark grayish brown fine sand about 8 inches thick. The subsurface layer is fine sand to a depth of 49 inches. The upper 23 inches is yellowish brown, and the lower 18 inches is brownish yellow. The subsoil extends to a depth of 86 inches or more. The upper 5 inches is yellowish brown loamy sand; the next 10 inches is yellowish brown sandy clay loam, and the lower 22 inches is dark yellowish brown sandy clay and sandy clay loam.

Included with this soil in mapping are small depressional areas of soils that have a very dark gray or black surface layer 8 to 24 inches thick. This layer overlies gray sandy material. Also included are small areas of Fort Meade, Gainesville, Kendrick, and Millhopper soils. A few areas of this soil include Arredondo soils that have 5 to 8 percent slopes. Some areas of this soil in the western part of the county have small spots of strongly acid to medium acid soil material 40 to 70 inches deep to calcareous limestone. Limestone boulders, fragments of limestone, and sinkholes are in some areas of this soil, mainly the limestone plain sections of the western part of the county. Most of these boulders are siliceous. Total included areas are about 15 percent.

In this Arredondo soil, the available water capacity is low in the sandy surface and subsurface layers and low to medium in the loamy subsoil. Permeability is rapid in the surface and subsurface layers and moderately slow to moderate in the loamy subsoil. Natural fertility is low in the sandy surface and subsurface layers and medium in the finer textured subsoil. Organic matter content is low. The water table in this soil is at a depth of more than 72 inches. Surface runoff is slow.

(3C) Alpin fine sand, 0 to 5 percent slopes - This is an excessively drained, nearly level to gently sloping soil on broad slightly elevated ridges. The areas of this soil range from 4 to about 2,000 acres and are circular to irregularly elongated.

Typically, the surface layer is grayish brown fine sand about 6 inches thick. The subsurface layer is fine sand and extends to a depth of 52 inches. In the

upper 9 inches, it is pale brown; in the next 12 inches, it is pale brown with common uncoated sand grains; in the next 11 inches, it is very pale brown with few uncoated sand grains; and in the lowermost 14 inches, it is very pale brown with light yellowish brown mottles. The subsoil extends to a depth of 80 inches or more. It is very pale brown fine sand and has common uncoated sand grains and common yellowish brown horizontal bands of loamy fine sand 0.1 to 0.5 inch thick.

Included with this soil in mapping are small areas of Blanton, Lakeland, Chipley and Albany soils. Also included are small areas of soils that have limestone at a depth of 80 inches. These soils make up less than 20 percent of the map unit.

This Alpin soil does not have a water table within a depth of 80 inches at any time. The available water capacity is low. Permeability is rapid in the subsurface layer and moderately rapid in the surface layer and subsoil. Natural fertility is low. The organic matter content is moderately low in the surface layer and low in the all layers below that.

(6C) Arents, 0 to 5 percent slopes – These are nearly level to gently sloping soils that have been reworked in earthmoving operations and are used dominantly as trench-type sanitary landfills. The individual areas of these soils range from 1 to 160 acres.

The upper 2 to 3 feet of these soils is a mixture of sandy materials interbedded with fragments or pieces of loamy subsoil material or weakly cemented sandy subsoil material, or both. This material is underlain by 2 to 20 feet of garbage and refuse. In some areas, the mixture of sandy materials is used as a daily cover for stratified layers of garbage.

Some areas of this map unit are former pits. In other areas, material has been dumped on the surface of undisturbed soils. Included in mapping are areas that do not have fragments of pieces of subsoil material and ponds or depressions that have been filled with various materials other than garbage and refuse.

Arents soils have a variable water table t hat is dependent upon the water table of the surrounding soils. Permeability is variable but generally ranges from very rapid to moderately rapid. Natural fertility is low. The content of organic matter and the available water capacity are variable.

(7A) Kanapaha sand, 0 to 5 percent slopes - This nearly level to gently sloping, poorly drained soil is in small to relatively large areas on uplands. Slopes are nearly smooth to slightly convex. The areas are irregular in shape and range from about 10 to 200 acres.

Typically, the surface layer is dark gray sand about 8 inches thick. The subsurface layer is sand about 36 inches thick. The upper 5 inches is light

brownish gray, and the lower 31 inches is light gray. The subsoil is sand clay loam to a depth of 80 inches or more. The upper 6 inches is light brownish gray, and the lower 30 inches is gray.

Included with this soil in mapping are small areas of Blichton, Bivans, Lochloosa, and Wacahoota soils. Also included are small areas of soils which are similar to the Kanapaha soils except that the weighted average is more than 35 percent clay in the upper 20 inches of the subsoil. Small areas of Kanapaha soils which have 5 to 8 percent slopes are included. Also included are about 20 acres along the Santa Fe River that are occasionally flooded. Total included areas are about 20 percent or less.

The Kanapaha soil has a water table that is less than 10 inches below the surface for 1 to 3 moths during most years. Surface runoff is slow. The available water capacity is very low to low in the sandy surface and subsurface layers, and it is low to medium in the subsoil. Permeability is moderately rapid in the surface and subsurface layers and is slow to moderately slow in the subsoil. Natural fertility is low to medium. Organic matter content of the surface layer ranges from moderately low to moderate.

(7C) Bigbee fine sand - This is a nearly level excessively drained soil on low terraces along rivers. The areas of this soil range from 10 to 80 acres and are circular to irregularly elongated.

Typically, the surface layer is dark grayish brown fine sand about 7 inches thick. The substratum is fine sand and extends to a depth of 80 inches or more. In the upper 7 inches, it is yellowish brown; in the next 16 inches, it is light yellowish brown with common uncoated sand grains; and in the next 18 inches, it is yellow with faint brownish yellow mottles and uncoated sand grains. In the lower 32 inches, the substratum is white with light yellowish brown and brownish yellow mottles.

Included with this soil in mapping are small areas of the occasionally flooded Electra Variant, Leon, Alpin and Blanton soils. Also included are soils that are similar to the Bigbee soil but have weakly cemented, organic coated layers that have tongues of white sand. These soils make up about 20 percent of the map unit.

The Bigbee soil has a water table at a depth of 20 to 40 inches for brief periods and at a depth of 40 to 70 inches for 1 to 2 months. A permanent water table is at a depth of more than 80 inches during the rest of the year. This soil is flooded occasionally for long periods during seasons of high rainfall. The available water capacity is low. Permeability is rapid. Natural fertility and the organic matter content are low.

(8A) Millhopper sand, 0 to 5 percent slopes - This nearly level to gently sloping, moderately well-drained soil is in small and large irregularly shaped areas on the uplands and on slightly rolling knolls in the broad flatwoods.

Slopes are mostly nearly smooth or convex. The areas are variable in size. They range from about 10 to 250 acres.

Typically, the surface layer is dark grayish brown sand about 9 inches thick. The subsurface layer is sand or fine sand about 49 inches thick. The upper 17 inches is yellowish brown, the next 22 inches is light yellowish brown, and the lower 10 inches is very pale brown. The subsoil extends to a depth of 89 inches. The upper 6 inches is yellowish brown loamy sand that has grayish and brownish mottles; the next 22 inches is light gray, mottled sandy clay loam; and the lower 3 inches is light gray, mottled sandy clay loam.

Included with this soil in mapping are small areas of Arredondo, Bonneau, Fort Meade, Gainesville, Kanapaha, Lochloosa, and Sparr soils. Siliceous limestone boulders and small sinks are within some delineations. Small areas of Millhopper soils that have 5 to 8 percent slopes are also included. About 25 acres mapped as the Millhopper soil along the Santa Fe River is occasionally flooded. Total included areas are about 20 percent or less.

This Millhopper soil has a water table that is at a depth of 40 to 60 inches for 1 to 4 months and at a depth of 40 to 60 inches for 1 to 2 months during most years. The available water capacity is low in the surface and subsurface layers and is low to medium in the subsoil. Permeability is rapid in the surface and subsurface layers, moderately rapid in the upper 6 inches of the subsoil, and slow to moderately slow below this depth. Natural fertility is low. Organic matter content is low to moderately low.

(8C) Blanton fine sand, 0 to 5 percent slopes - This is a moderately well-drained, nearly level to gently sloping soil on broad ridges and undulating side slopes. The areas of this soil range from about 20 to 1,000 acres and are irregular in shape.

Typically, the surface layer is gray fine sand about 7 inches thick. The subsurface layer is very pale brown fine sand in the upper 30 inches and light gray fine sand in the lower 15 inches. The subsoil extends to a depth of 8 inches. In the upper 10 inches, it is light yellowish brown fine sandy loam with brownish yellow mottles; in the next 5 inches, it is very pale brown with strong brown and pale brown mottles; and in the lower part, it is light brownish gray fine sandy loam with strong brown mottles.

Included with this soil in mapping are small areas of Albany, Alpin, Chipley, Lakeland, Ocilla, Troup and Bonneau soils. These soils make up less than 15 percent of the map unit.

This Blanton soil has a water table at a depth of 5 to 6 feet most of the year. In wet seasons, a perched water table is above the subsoil for less than a month. The available water capacity is medium in the surface layer and low in the subsurface layer and subsoil. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil. Natural fertility and the organic

matter content are low.

(9C) Blanton fine sand, 5 to 8 percent slopes - This is a moderately well-drained, sloping soil on undulating landscapes. The areas of this soil range from 20 to 200 acres and are irregular in shape.

Typically, the surface layer is gray fine sand 4 inches thick. The subsurface layer, which extends to a depth of about 49 inches, is very pale brown and light gray fine sand. The subsoil extends to a depth of 80 inches or more. In the upper 15 inches, it is pale brown sandy loam with yellow and strong brown mottles. The lower part of the subsoil is light gray fine sandy loam with strong brown mottles.

Included with this soil in mapping are small areas of Albany, Alpin, Chipley, Lakeland, and Ocilla soils. These soils make up less than 15 percent of the map unit.

This Blanton soil has a water table at a depth of 5 to 6 feet most of the year. A perched water table is above the subsoil for less than a month during wet seasons. The available water capacity is medium in the surface layer and low in the subsurface layer and subsoil. Permeability is rapid in the surface ands subsurface layers and moderate in the subsoil. Natural fertility and the organic matter content are low.

(11C) Blanton-Bonneau-Ichetucknee complex, 2 to 5 percent slopes - This complex consists of nearly level to gently sloping soils on upland knolls and on broad, elevated, undulating karst landscapes. The areas of this complex mostly range from 5 to 500 acres, but some are as small as one-quarter acre. These soils are in areas that are so small or so intermingled that it was not practical to map them separately.

The Blanton soil makes up about 35 percent of this complex. Typically, the surface layer is gray fine sand about 7 inches thick. The upper 30 inches of the subsurface layer is very pale brown fine sand, and the lower 15 inches is light gray fine sand. The subsoil begins at a depth of 52 inches. In the upper 10 inches, it is light yellowish brown fine sandy loam; in the next 5 inches, it is very pale brown fine sandy loam with strong brown and pale brown mottles; and in the lower part, it is light brownish gray fine sandy loam with strong brown mottles.

The Blanton soil has a water table at a depth of 5 to 6 feet most of the year. In wet seasons, a perched water table is between depths of 60 and 72 inches for 1 to 3 months during most years. The available water capacity is medium in the surface layer and low in the subsurface layer and subsoil. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil. Natural fertility and the organic matter content of this soil are both low.

The Bonneau soil makes up about 25 percent of this complex. Typically, the

surface layer is grayish brown fine sand 7 inches thick. The upper 8 inches of the subsurface layer is yellowish brown fine sandy loam; in the next 38 inches, it is mottled very pale brown, yellowish red, and grayish brown sandy clay loam; and in the lower part, it is mottled, gray and pink sandy clay loam.

The Bonneau soil has a water table at a depth of 48 to 72 inches for a few weeks during the normal rainy season of most years. In some areas, a perched water table is above the subsoil for a day or two after intense rainfall. The available water capacity is low. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil. Natural fertility is moderate. The organic matter content is moderately low in the surface layer, low in the subsurface layer and upper part of the subsoil, and very low in the lower part of the subsoil.

The Ichetucknee soil makes up about 15 percent of the complex. Typically, the surface layer is gray fine sand about 5 inches thick. The subsurface layer is about 8 inches thick. It is light gray fine sand with very pale brown splotches. The subsoil is clay and extends to a depth of 55 inches. In the upper 26 inches, it is pale brown with gray, red, and yellow mottles; and in the lower 16 inches, it is yellowish red. It is underlain by soft limestone.

The Ichetucknee soil has a water table at a depth of 1.5 to 3 feet after intense rainfall. The available water capacity is medium in the surface and subsurface layers and lower part of the subsoil and is low in the upper part of the subsoil. Permeability is rapid in the surface and subsurface layers and slow in the subsoil. Natural fertility is moderate. The organic matter content is moderate in the surface layer and moderately low in the subsurface layer and subsoil.

Included with this complex in mapping are a few small areas of Albany, Alpin, Chiefland, Pedro Variant, Chipley, Lakeland and Ocilla soils. Not all of these soils are in each mapped area. These soils make up about 25 percent of the complex.

(12C) Blanton-Bonneau-Ichetucknee complex, 5 to 8 percent slopes - This complex is on undulating landscapes. The areas of this complex mostly range from 3 to 40 acres, but some are as small as one-quarter acre. These soils are in areas that are so small or so intermingled that it was not practical to map them separately.

The Blanton soil makes up about 30 percent of the complex. Typically, the surface layer is gray fine sand 4 inches thick. The subsurface layer, which extends to a depth of about 49 inches, is very pale brown and white fine sand. The subsoil extends to a depth of 80 inches or more. In the upper 15 inches, it is pale brown sandy loam with yellow and strong brown mottles. In the lower part, it is light gray fine sandy loam with strong brown mottles.

The Blanton soil has a water table at a depth of 6 feet most of the year. A perched water table is above the subsoil for less than a month during wet

seasons. The available water capacity is medium in the surface layer and low in the subsurface layer and subsoil. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil. Natural fertility and the organic matter content are both low.

The Bonneau soil makes up about 25 percent of the complex. Typically, the surface layer is grayish brown fine sand 7 inches thick. The subsurface layer is pale brown fine sand to a depth of 24 inches and pale brown fine sand with very pale brown mottles to a dept of 30 inches. From the top, the subsoil is 3 inches of brownish yellow fine sandy loam; 15 inches of brownish yellow sandy clay loam; 12 inches of brownish yellow sandy clay loam with light yellowish brown and gray mottles; 12 inches of mottled brownish yellow, light gray, and red sandy clay loam with about 2 percent plinthite; and below that, light gray sandy clay with light yellowish brown and red mottles.

The Bonneau soil has a water table at a depth of 48 to 72 inches for a few weeks during most years. The available water capacity is low. Permeability is rapid in the surface and subsurface layers and slow in the subsoil. Natural fertility is moderate. The organic matter content is moderately low in the surface layer, low in the subsurface layer and upper part of the subsoil, and very low in the lower part of the subsoil.

The Ichetucknee soil makes up about 20 percent of the complex. Typically, the surface layer is grayish brown fine sand about 4 inches thick. The subsurface layer is dark grayish brown fine sand about 3 inches thick. The subsoil is clay and extends to a depth of 80 inches. It is yellowish brown in the upper 9 inches; mottled pale brown, yellowish brown, gray, and yellowish red to a depth of 38 inches; gray with strong brown and red mottles to a depth of 55 inches; and mottled gray, yellowish brown, and red clay in the lower part.

The Ichetucknee soil has a water table at a depth of 1.5 to 3 feet after intense rainfall. The available water capacity is medium in the surface and subsurface layers and lower part of the subsoil and is low in the upper part of the subsoil. Permeability is moderately rapid in the surface and subsurface layers and very slow in the subsoil. Natural fertility is moderate. The organic matter content is moderate in the surface layer and moderately low in the subsurface layer and subsoil.

Included with this complex in mapping are a few small areas of Albany, Alpin, Chiefland, Pedro Variant, Chipley, Lakeland and Ocilla soils. Not all of these soils are in each mapped area. These soils make up about 25 percent of the map unit.

(13C) Bonneau fine sand, 2 to 5 percent slopes - This is a moderately well-drained, gently sloping soil on uplands and on knolls in the uplands. The areas of this soil range from 3 to 200 acres and are circular.

Typically, the surface layer is grayish brown fine sand about 7 inches thick.

The subsurface layer is fine sand about 20 inches thick. In the upper 8 inches, it is yellowish brown, and below that, it is brownish yellow with very pale brown splotches. The subsoil extends to a depth of 80 inches. In the upper 9 inches, it is yellowish brown fine sandy loam; in the next 22 inches, it is very pale brown, yellowish red, and grayish brown sandy clay loam with pockets of fine sandy loam; and in the lower part it is gray and pink sandy clay loam.

Included with this soil in mapping are small areas of Lucy, Ocilla, Blanton, Goldsboro, and Ichetucknee soils. These soils make up less than 20 percent of the map unit.

This Bonneau soil has a water table at a depth of 48 to 72 inches for 1 to 2 months during rainy periods in most years. Otherwise, the water table is below a depth of 72 inches. The available water capacity is low in the surface and subsurface layers and upper part of the subsoil and medium in the lower part of the subsoil. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil. Natural fertility is moderate. The organic matter content is very low.

(17C) Chiefland-Pedro Variant complex, 0 to 5 percent slopes - This complex consists of nearly level to gently sloping, well-drained soils on an upland karst landscape in the southern part of the county. The areas of these soils are so small or so intermingled that it was not practical to map them separately. The areas of this complex range from 5 to 800 acres.

The Chiefland soil makes up about 45 percent of the complex. Typically, the surface layer is brown fine sand about 8 inches thick. The subsurface layer is pale brown fine sand to a depth of 33 inches. The subsoil is strong brown fine sandy loam that extends to a depth of 39 inches. It is underlain by limestone.

The Chiefland soil has no water table within a depth of 72 inches. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil. The available water capacity is very low in the surface and subsurface layers and medium in the subsoil. The natural fertility and organic matter content are very low.

The Pedro Variant soil makes up about 35 percent of the complex. Typically, the surface layer is gray fine sand about 3 inches thick. The subsurface layer is dark brown fine sand about 5 inches thick. The subsoil is dark brown sandy clay loam about 3 inches thick. It is underlain by about 3 inches of soft weathered limestone. Below that, hard limestone extends to a depth of 80 inches or more.

The Pedro Variant soil has no water table within a depth of 72 inches. Permeability is rapid in the surface and subsurface layers and moderately rapid in the subsoil. The available water capacity is very low in the surface and subsurface layers and medium in the subsoil. The natural fertility and organic matter content are very low.

Soils of minor extent make up about 20 percent of the complex. These include Alpin, Lakeland, Troup and Albany soils. Not all of these soils are in each mapped area. Small areas of rock outcrops and sinkholes are common.

(18C) Chiefland-Pedro Variant complex, 5 to 8 percent slopes - This complex consists of sloping, well-drained soils on an upland karst landscape in the southern part of the county. The individual areas of each soil are so small or so intermingled that it was not practical to map them separately at the scale selected for mapping. The areas of this complex range from 5 to 50 acres.

The Chiefland soil makes up about 45 percent of the complex. Typically, the surface layer is brown fine sand about 8 inches thick. The subsurface layer is pale brown fine sand to a depth of 30 inches. The subsoil is strong brown fine sandy loam that extends to a depth of 35 inches. It is underlain by limestone.

The Chiefland soil has no water table within a depth of 72 inches. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil. The available water capacity is very low in the surface and subsurface layers and medium in the subsoil. The natural fertility and organic matter content are very low.

The Pedro Variant soil makes up about 35 percent of the complex. Typically, the surface layer is gray fine sand about 3 inches thick. It is underlain by about 3 inches of soft weathered limestone. Below that, hard limestone extends to a depth of 80 inches or more.

The Pedro Variant soil has no water table within a depth of 72 inches. Permeability is rapid in the surface and subsurface layers and moderately rapid in the subsoil. The available water capacity is very low in the surface and subsurface layers and medium in the subsoil. The natural fertility and organic matter content are very low.

Soils of minor extent make up about 20 percent of the complex. These include small areas of the Alpin, Lakeland, Troup, and Albany soils. Not all of these soils are in each mapped area. Small areas of rock outcrop and sinkholes are common.

(19C) Chiefland-Pedro Variant complex, occasionally flooded - This complex consists of nearly level to sloping soils that are within 3 miles of rivers and creeks interspersed with numerous sinkholes. These soils are flooded periodically from river overflow after unusually high rainfall. There have been three major floods since 1948. They occurred in the period of April to June. The areas of these soils are so small or so intermingled that it was not practical to map them separately. The areas of this complex range from 5 to 80 acres.

The Chiefland soil makes up about 41 percent of the complex. Typically, the surface layer is about 5 inches of dark grayish brown fine sand. The subsurface layer is light brownish gray fine sand to a depth of 23 inches. The upper 3 inches of the sandy clay loam subsoil is dark brown, and the lower part is strong brown. It is underlain by limestone.

The Chiefland soil has no water table within a depth of 72 inches. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil. The available water capacity is very low in the surface and subsurface layers and medium in the subsoil. The natural fertility and organic matter content are very low.

The Pedro Variant soil makes up about 39 percent of the complex. Typically, the surface layer is gray fine sand about 3 inches thick. The fine sand subsurface layer is dark brown about 5 inches thick. The subsoil is dark brown sandy clay loam about 3 inches thick. It is underlain by about 3 inches of soft weathered limestone. Below that, hard limestone extends to a depth of 80 inches or more.

The Pedro Variant soil has no water table within a depth of 72 inches. Permeability is rapid in the surface and subsurface layers and moderately rapid in the subsoil. The available water capacity is very low in the surface and subsurface layers and medium in the subsoil. The natural fertility and organic matter content are low.

Soils of minor extent make up about 20 percent of the complex. These include Alpin, Lakeland, Troup and Albany soils. Not all of these soils are in each mapped area. Small areas of rock outcrop and sinkholes are common.

(20A) Tavares sand, 0 to 5 percent slopes - This is a nearly level to gently sloping, moderately well-drained soil. This soil is deep and sandy. It is on slightly convex slopes in broad areas of the flatwoods and along gentle slopes of the rolling uplands. The areas are mainly irregular in shape and range from about 10 to 125 acres.

Typically, the surface layer is dark gray sand about 8 inches thick. The underlying layers are sand to a depth of 80 inches or more. The upper 11 inches is pale brown, the next 17 inches is very pale brown, and the lower 44 inches is very pale brown or white and has mottles.

Included with this soil in mapping are small areas of Tavares soils that have 5 to 8 percent slopes. Also included are small areas of Chipley, Candler, Apopka, Pompano, and Zolfo soils. About 120 acres of this soil mapped along the Santa Fe River is occasionally flooded. Total included areas are about 15 percent.

In this Tavares soil, the water table is at a depth of 40 to 72 inches for a cumulative period of 6 months or more during most years. It recedes to more than 72 inches below the surface during droughty periods. Surface runoff is

slow. The available water capacity is very low to low. Permeability is rapid to very rapid. Natural fertility is low, and organic matter content is low to moderate in the surface layer.

(20C) Chipley fine sand, 0 to 5 percent slopes - This is a moderately well-drained, nearly level to gently sloping soil in somewhat depressed areas and on flats in the uplands. The areas range from 3 to 800 acres and are circular to irregularly elongated.

Typically, the surface layer is gray fine sand about 7 inches thick. Fine sand extends to a depth of 80 inches. In sequence downward, 23 inches is very pale brown and has yellow mottles; the next 10 inches is light gray and has very pale brown mottles; the next 20 inches is very pale brown and has brownish yellow, white and yellowish red mottles; and the lowermost 20 inches is white with brownish yellow and yellow mottles.

Included with this soil in mapping are small areas of Blanton, Alpin, Lakeland, Albany and Hurricane soils. These soils make up less than 15 percent of the map unit.

This Chipley soil has a water table at a depth of 20 to 40 inches for 2 to 4 months in most years. The water table is usually at a depth of 40 to 60 inches during the rest of the year. It recedes, however, to a depth of more than 60 inches during very dry periods. The available water capacity is very low, and permeability is rapid throughout the soil. Natural fertility and the organic matter content are low.

(21A) Newnan sand – This nearly level, somewhat poorly drained soil is in small to relatively large areas in the flatwoods. Slopes are nearly level to slightly convex and range from about 0 to 2 percent. The areas generally range from 10 to 250 acres.

Typically, the surface layer is dark gray sand about 5 inches thick. The subsurface layer is light brownish gray sand to a depth of 12 inches. The upper part of the subsoil is 4 inches of dark brown sand, in which the sand grains are well coated with organic material, and 4 inches of dark brown sand that is mottled. Below this is a leached layer of light gray to white sand to a depth of 56 inches. The lower part of the subsoil is loamy, light gray, and mottled. The upper 3 inches is loamy sand, the next 16 inches is fine sandy loam, and the lower 7 inches is sandy clay loam.

Included with the soil in some areas are Mulat, Pomona, Sparr, and Wauchula soils. In some areas are soils that have characteristics similar to Newnan soils except that they have a brown, organically stained layer directly below the surface layer or have only 1 to 3 inches of leached, light gray or white material between the surface layer and the stained layer. About 65 acres mapped as Newnan soil is within the flood plain of the Santa Fe River and is occasionally flooded. Total included areas are about 20 percent or less.

(22C) Electra Variant fine sand, 0 to 5 percent slopes - This is a somewhat poorly drained, nearly level to gently sloping soil on low ridges adjacent to drainageways and around swamps or depressions. The areas range from 7 to 300 acres and are irregularly elongated in shape.

Typically, the surface layer is gray fine sand about 4 inches thick. The fine sand subsurface layer extends to a depth of 38 inches. The upper part is dark brown fine sand 13 inches thick; the next 2 inches is dark yellowish brown fine sand; the next 4 inches is yellowish brown fine sandy loam with pale brown mottles; and the lower 23 inches is light brownish gray fine sandy loam with red and brownish yellow mottles.

Included with this soil in mapping are small areas of Albany, Plummer, Mascotte, Sapelo, Leon, Hurricane and Pelham soils. Also included are some soils that are similar to the Electra Variant soil but have iron concretions in the subsurface layer and in the subsoil. These soils make up about 20 percent of the area.

This Electra Variant soil has a water table at a depth of 25 to 40 inches for about 4 months during most years. The water table recedes to a depth of more than 40 inches the rest of the year. The available water capacity is low in the surface layer, very low in the subsurface layer, and medium in the subsoil. Permeability is rapid in the surface layer, moderately rapid in the subsurface layer, moderate in the sandy part of he subsoil, and slow in the loamy part of the subsoil. The organic matter content is moderately low in the surface layer, very low in the subsurface layer, moderate in the upper part of the subsoil, and very low in the lower part. Natural fertility is low.

(23C) Electra Variant fine sand, occasionally flooded - This is a somewhat poorly drained, nearly level to gently sloping soil on floodplains along rivers, creeks and other drainageways. This soil is flooded occasionally during March and April from abnormally heavy and prolonged rainfall over most of the Suwannee River and Santa Fe River drainage area. The lowlands remain flooded for about 30 days; the depressions that drain by percolation and seepage remain flooded for longer periods. Major floods occurred in March and April of 1948, 1959 and 1973. The areas of this soil range from 10 to 50 acres and are irregularly elongated in shape. The slope ranges from 0 to 5 percent.

Typically, the surface layer is gray fine sand about 2 inches thick. The fine sand subsurface layer extends to a depth of 39 inches. The upper 6 inches is light gray, the next 28 inches is white, and the lowermost 3 inches is grayish brown. The upper part of the subsoil is fine sand and extends to a depth of 54 inches. In the upper 11 inches, it is dark brown; and in the next 4 inches, it is dark yellowish brown. A layer of brown sandy loam 4 inches thick is between the upper and lower parts of the subsoil. The lower part of the subsoil extends to a depth of 80 inches or more. In the upper 3 inches, it is gray sandy clay

loam; and in the next 13 inches, it is gray sandy clay loam; and in the lowermost 6 inches, it is gray sandy clay loam with yellowish brown mottles.

Included with this soil in mapping are small areas of Plummer Muck, depressional; Bigbee and Mascotte soils; and Leon and Albany soils in areas that are occasionally flooded. Also included are soils that are similar to the Electra Variant soil but have iron concretions in the subsurface layer and subsoil. These soils makeup about 20 percent of the area.

This Electra Variant soil has a water table at a depth of 25 to 40 inches for about 4 months in most years. The water table recedes to a depth of more than 40 inches the rest of the year. This soil is flooded by the river during abnormal rainy conditions. The available water capacity is very low in the surface and subsurface layers and medium in the subsoil. The available water capacity is low in the layer between the upper and lower parts of he subsoil. Permeability is rapid in the surface layer and moderately rapid in the subsurface layer. It is moderate in the upper part of he subsoil and slow in the lower part of the subsoil, but it is moderately rapid in the slayer between the upper and lower parts of the subsoil. Organic matter content is moderately low in the surface layer; very low in the subsurface layer, in the lower parts of the subsoil, and in the layer between the upper and lower parts of the subsoil; and moderate in the upper part of the subsoil. Natural fertility is low.

(26C) Hurricane fine sand - This is a somewhat poorly drained, nearly level soil on flats and in areas adjacent to depressions and poorly defined drainageways. The areas range from 10 to 200 acres and are circular to elongated. The slope ranges from 0 to 2 percent.

Typically, the surface layer is very dark gray fine sand about 8 inches thick. The fine sand subsurface layer extends to a depth of 56 inches. The top 10 inches is grayish brown, the next 14 inches is pale brown, and the lower 24 inches is light gray. The subsoil is dark brown fine sand, about 9 inches thick, over black fine sand that extends to a depth of 80 inches or more. The black color of the subsoil is due to the organic matter coating the sand grains.

Included with this soil in mapping are small areas of Albany, Chipley, Leon, Plummer and Sapelo soils. Also included are soils that are similar to the Hurricane soil but have a loamy subsurface layer. The included soils make up less than 15 percent of the map unit.

The Hurricane soil has a water table at a depth of 20 to 30 inches for 1 to 4 months during most years. Occasionally it rises above 20 inches for short periods. It recedes to a depth of 45 inches or more during dry periods. The available water capacity is low throughout. Permeability is rapid in the surface and subsurface layers and moderately rapid in the subsoil. Natural fertility is low. The organic matter content is medium in the surface layer, very low in the subsurface layer, and medium in the subsoil.

(27C) Ichetucknee fine sand, 2 to 5 percent slopes - This is a somewhat poorly drained, gently sloping soil on small knolls and undulating terrain on erosional uplands. The areas range from 5 to 70 acres and are irregularly shaped.

Typically, the surface layer is gray fine sand about 5 inches thick. The subsurface layer is light gray fine sand with very pale brown splotches about 8 inches thick. The clay subsoil extends to a depth of 55 inches. The upper 26 inches is pale brown with gray, red and brownish yellow mottles, and the lower 16 inches is yellowish red. Limestone bedrock is at a depth of 55 inches.

Included with this soil in mapping are small areas of Bonneau and Goldsboro soils. Also included are areas of soils that are similar to the Ichetucknee soil, but some have a clayey surface layer, some are saturated for 2 to 4 months because of hillside seepage, and some have bedrock within a depth of 40 inches. The included soils make up about 25 percent of the map unit.

The Ichetucknee soil has a perched water table at a depth of 1 ½ to 3 feet for 1 to 4 months. The soil is saturated after heavy rains. The available water capacity is medium in the surface and subsurface layers and in the lower part of the subsoil. It is low in the upper part of the subsoil. Permeability is rapid in the surface and subsurface layers and slow in the subsoil. Natural fertility is moderate. The organic matter content is moderate in the surface layer and moderately low in the subsurface layer and subsoil.

(29C) Lakeland fine sand, 0 to 5 percent slopes - This is an excessively drained, nearly level to gently sloping soil on broad, slightly elevated ridges. The areas range from 8 to 1,500 acres.

Typically, the surface layer is grayish brown fine sand about 6 inches thick. Below that, in sequence, there is, to a depth of 20 inches, light yellowish brown fine sand; to a depth of 55 inches, very pale brown fine sand with light yellowish brown splotches; and to a depth of 80 inches or more, very pale brown fine sand with yellow mottles.

Included with this soil in mapping are small areas of Alpin, Blanton, Troup and Chipley soils. Also included are soils that are similar to the Lakeland soil except that they have limestone deposits within a depth of 80 inches. The included soils make up less than 10 percent of the map unit.

This Lakeland soil does not have a water table within a depth of 80 inches at any time. The available water capacity is low. Permeability is rapid. Natural fertility and the content of organic matter are very low.

(30A) Kendrick sand, 2 to 5 percent slopes - This gently sloping, well-drained soil is in both small and large areas on the gently rolling uplands. These areas are mostly irregularly shaped or elongated and range from about

20 to 200 acres.

Typically, the surface layer is dark grayish brown sand about 9 inches thick. The subsurface layer is yellowish brown loamy sand to a depth of 26 inches. The subsoil extends to a depth of 90 inches or more. The upper 5 inches is yellowish brown fine sandy loam; the next 20 inches is dark yellowish brown, mottled sandy clay loam; the next 22 inches is dark yellowish brown sand clay loam; the next 10 inches is yellowish brown, mottled fine sandy loam; and the lower 7 inches is yellowish brown sandy clay loam.

Included with this soil in mapping are some small areas of soils that have similar characteristics to the Kendrick soils except that they have a loamy sand surface and subsurface layers less than 20 inches thick over a sandy clay loam subsoil. Small areas of soils that are similar to the Kendrick soils but have fine sand surface and subsurface layers or have a subsoil that is sandy clay throughout are included. Also included are small areas of Arredondo, Blichton, Bonneau, Lochloosa, and Norfolk soils. A few areas of Kendrick soils have 0 to 2 percent slopes or 5 to 8 percent slopes. Small moderately eroded spots are in a few areas. Sinkholes and limestone boulders are in some areas and are shown by appropriate symbols. Total included areas are about 15 percent.

In this Kendrick soil, the available water capacity is low in the surface and subsurface layers, medium in the upper 5 inches of the subsoil, and medium to high below this depth. Permeability is rapid in the surface and subsurface layers. Permeability is moderate to moderately rapid in the upper 5 inches of the subsoil, moderately slow to moderate in the next 42 inches and slow in the lower 17 inches. Natural fertility is low in the sandy surface layer and medium in the loamy subsoil. Organic matter content is low to moderately low in the surface layer. The water table is more than 72 inches below the surface. Surface runoff is moderately slow.

(30C) Lakeland fine sand, 5 to 12 percent slopes - This is an excessively drained, sloping to strongly sloping soil on broad, slightly elevated ridges and around depressions. The areas range from about 5 to 40 acres and are irregularly shaped.

Typically, the surface layer is brown fine sand about 3 inches thick. The subsurface layer is fine sand and extends to a depth of 80 inches or more. The upper 41 inches is brownish yellow; the next 29 inches is brownish yellow with common uncoated sand grains; and the lowermost 7 inches is light yellowish brown with many uncoated sand grains.

Included with this soil in mapping are small areas of the Alpin, Blanton and Chipley soils. Also included are soils that are similar to the Lakeland soil except that they have deep limestone with a depth of 80 inches. The included soils make up less than 10 percent of the map unit.

This Lakeland soil does not have a water table within a depth of 80 inches. The available water capacity is low. Permeability is rapid. Natural fertility and the content of organic matter are very low.

(33A) Norfolk loamy fine sand, 2 to 5 percent slopes – This gently sloping, well-drained soil is in relatively small areas on the rolling uplands. Slopes are slightly convex. The areas are irregular in shape and range from about 10 to 50 acres. Typically, the surface layer is dark grayish brown loamy fine sand about 9 inches thick. The subsoil extends to a depth of 62 inches. The upper 6 inches is yellowish brown fine sandy loam; the next 26 inches is dark yellowish brown sandy clay loam; the next 14 inches is dark yellowish brown sandy clay; and the lower 7 inches is dark yellowish brown clay that has gray mottles. Between depths of 62 and 80 inches, the underlying material is light gray, mottled clay.

Included with this soil in mapping are small areas of Bivans, Kendrick, Lochloosa, and Micanopy soils. Included in some areas are small areas of Norfolk soils that have slopes of 0 to 2 percent and 5 to 8 percent. Limestone boulders and sinkholes are in some areas and are shown by appropriate symbols. Total included areas are about 15 percent.

This Norfolk soil has a water table that is at a depth of about 48 to 72 inches for 1 to 3 months during most years. Surface runoff is medium. The available water capacity is low in the surface layer and medium to high in the subsoil. Permeability is rapid in the surface layer, moderately slow to moderate in the upper part of the subsoil, and very slow to slow in the lower part. Natural fertility is low in the sandy surface and subsurface layers and medium in the sandy clay loam and sandy clay subsoil. Organic matter content is low to moderately low.

(33C) Leon fine sand, occasionally flooded - This is a poorly drained, nearly level soil in broad areas in the flatwoods along river flood plains. The areas range from 10 to 100 acres and are irregularly elongated. The slope ranges from 0 to 2 percent.

Typically, the surface layer is grayish brown fine sand about 3 inches thick. The fine sand subsurface layer extends to a depth of 12 inches and is light brownish gray. The fine sand subsoil extends to a depth of 23 inches. The upper 4 inches is very dark gray; the next 4 inches is dark brown; and the lower 3 inches is very dark grayish brown. The fine sand substratum extends to a depth of 80 inches or more. The upper 3 inches is dark brown, the next 28 inches is yellowish brown, and the lower 26 inches is very pale brown.

Included with this soil in mapping are small areas of Bigbee, Pelham, Plummer, Electra Variant and Mascotte soils. These soils make up less than 25 percent of the map unit.

This Leon soil has a water table within 10 inches of the surface for 1 to 4

months in most years. The water table is at a depth of 10 to 40 inches during the rest of the year, except during very dry seasons when it recedes to a depth of more than 40 inches. The available water capacity is high in the surface layer, very low in the subsurface layer, medium in the layer between the upper and lower parts of the subsoil, and low in the upper and lower parts of the subsoil. Permeability is rapid in the surface layer and moderate to moderately rapid in the rest of the soil. The natural fertility is low. The organic matter content is high in the surface layer, moderately low in the subsurface layer, and moderate in the subsoil.

(34C) Lucy loamy fine sand, 2 to 5 percent slopes – This is a well-drained, gently sloping soil on broad upland ridges. The areas range from 5 to 40 acres and are irregular in shape.

Typically, the surface layer is dark brown loamy fine sand about 6 inches thick. The subsurface layer, in sequence downward, is yellowish brown loamy sand, strong brown loamy fine sand, and strong brown loamy sand. The fine sandy loam subsoil is yellowish red and extends to a depth of 80 inches or more.

Included with this soil in mapping are small areas of Blanton, Bonneau, Orangeburg, and Troup soils. Also included are small areas of soils that are similar to the Lucy soil but have rock within a depth of 60 inches. The included soils make up about 15 percent of the map unit.

The water table is below a depth of 72 inches at all times. The available water capacity is medium in the surface layer, low in the subsurface layer, and medium in the subsoil. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil. Natural fertility and the organic matter content are low.

(35C) Lucy loamy fine sand, 5 to 8 percent slopes - This is a well-drained, sloping soil on broad to narrow sides of upland ridges. The areas range from 5 to 40 acres and are irregular in shape.

Typically, the surface layer is dark brown loamy fine sand about 6 inches thick. The subsurface layer is yellowish brown loamy fine sand 10 inches thick. Below this is a strong brown loamy fine sand to a depth of 20 inches. The subsoil extends to a depth of 80 inches or more. The upper 7 inches is strong brown fine sandy loam. It is underlain by yellowish red sandy clay loam.

Included with this soil in mapping are small areas of Blanton, Bonneau, Orangeburg, and Troup soils. Also included are small areas of soils that are similar to the Lucy soil, but some have rock within a depth of 60 inches and some are sandy clay loam to a depth of 20 inches. The included soils make up about 20 percent of the map unit.

The water table is at a depth of more than 72 inches at all times. The available

water capacity is medium in the surface layer, low in the subsurface layer, and medium in the subsoil. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil. The natural fertility and the organic matter content are low.

(38A) Pits and dumps - This map unit consists of pits from which limestone has been or is being removed during surface mining operations and dumps where the excavated overburden material has been piled adjacent to the pits. Individual areas of pits and dumps are usually impractical to separate at the scale in which they are mapped.

The pits vary from about 5 to 75 acres in size and about 30 to 70 feet in depth. They are quite variable in age, ranging from pits that are currently being mined to old abandoned ones that are approximately 65 to 75 years old.

The dumps mostly consist of large areas of heterogeneous soil material that has been excavated from the surface of the limestone and piled adjacent to the pits. This mixed soil material commonly is about 1 to 15 percent, by volume, fragments and boulders of limestone, which are intermixed with the soil material. This material is in relatively narrow piles which are about 6 to 30 feet high and are around the perimeter of the pits.

Included with this map unit are some pits in which the soil has been excavated for use in road construction and for fill material on sites for buildings. These pits, locally known as borrow pits, are about 4 to 20 acres in size and about 5 to 10 feet in depth. Small piles of limestone that has been excavated and stored on the floor of some of the pits for future use are also included.

Most of these pits and dumps are in the western part of the county, where several are presently being mined. Many abandoned pits, however, are throughout most areas of the county. They are at varying stages of natural revegetation. The type of vegetation depends upon the site location and the kind of original overburden material.

(39C) Mascotte fine sand, occasionally flooded - This is a poorly drained, nearly level soil on the floodplains of rivers and streams. This soil is flooded occasionally as a result of heavy and prolonged rains. A sharp rise in the water level causes the rivers and streams to overflow. The lowlands remain flooded for approximately 30 days and the depressions, which drain by percolation and seepage, for longer periods. This soil has been flooded in March or April in about 1 year out of every 10.

Typically, the surface layer is dark gray fine sand about 3 inches thick. It has many uncoated sand grains. The upper part of the subsoil is fine sand and extends to a depth of 34 inches. The upper 3 inches is dark brown, and most sand grains are coated with organic matter; the next 6 inches is brown, and most sand grains are coated with organic matter; and the lower 6 inches is brown with grayish brown sand pockets and brownish organic matter coated

sand grains. A 4-inch-thick layer of fine sand separates the upper and lower parts of the subsoil. It is light brownish gray with brown mottles. The lower part of the subsoil extends to a depth of more than 80 inches. The upper 7 inches is light brownish gray fine sandy loam with light gray, very pale brown and reddish brown mottles; the next 14 inches is light gray sandy clay loam with reddish brown, gray, light yellowish brown and very pale brown mottles; and the next 21 inches is mottled gray, very pale brown, yellowish brown and strong brown sandy clay loam.

Included with this soil in mapping are small areas of Pelham, Plummer and Leon soils, and occasionally flooded Electra Variant soils. Also included are small areas of soils that are similar to the Mascotte soil but have a clayey subsoil with mica flakes and chunks of coral or that are in small depressions and are ponded for several months during rainy seasons. The included soils make up less than 25 percent of the map unit.

This Mascotte soil is ponded for up to 6 months in most years during the rainy season. At other times, the water table is within a depth of 15 inches for 6 to 8 months during most years. It recedes to a depth of more than 40 inches for very short periods during dry seasons. The available water capacity is very low to low in the surface and subsurface layers, moderately rapid in the upper part of the subsoil and slow in the lower part of the subsoil. The organic matter content is moderate, and natural fertility is low.

(41C) Oleno clay - This is a poorly drained, nearly level soil on the flood plains of rivers and creeks. The areas range from 20 to 600 acres and are elongated in shape. The concave slopes are less than 2 percent.

Typically, the surface layer and subsoil are alternating layers of dark gray and gray clay to a depth of 32 inches. Below that depth, in sequence, there is 10 inches of grayish brown fine sandy loam, 13 inches of gray fine sandy loam, 16 inches of dark gray fine sandy loam, and 6 inches of gray sandy clay loam. Below that, greenish gray clay extends to a depth of 80 inches or more.

Included with this soil in mapping are small areas of Surrency and Plummer soils. Also included are small areas of soils that are similar to the Oleno soil but have limestone within a depth of 20 inches. The included soils make up about 20 percent of the map unit.

This Oleno soil has a water table at a depth of 6 to 18 inches for 6 to 8 months and at a depth below 18 inches during the remainder of the year. This soil is flooded by the river or creek for periods of up to a month in about 1 year in 10. The available water capacity is very high. Permeability is slow in the upper layers and moderate in the lower layers. Natural fertility and the organic matter content are moderate.

(42A) Pedro-Jonesville Complex, 0 to 5 percent slopes - This complex consists of small areas of nearly level to gently sloping, well-drained Pedro and

Jonesville soils that are so intermixed that they cannot be separated at the scale of the mapping. Slopes are smooth to slightly convex. Mapped areas of this complex are irregular in shape and range from about 10 to 50 acres. These soils are intermixed across the landscape. Individual areas of each soil range from about 1/10 of an acre to 3 acres.

Pedro fine sand makes up about 40 to 55 percent of each mapped area. Typically, the soil has a dark gray fine sand surface layer about 5 inches thick. The subsurface layer is light yellowish brown sand about 7 inches thick. The subsoil is strong brown sandy clay loam about 5 inches thick. The underlying material to a depth of 72 inches or more is white, partially decomposed limestone soft enough to be dug with light power equipment, such as a backhoe.

In the Pedro soil, the available water capacity is low in the sandy surface and subsurface layers and medium in the thin, loamy subsoil. Permeability is rapid in the sandy surface and subsurface layers and moderately rapid in the loamy subsoil. Organic matter content is low, and natural fertility is low to medium. Surface runoff is slow. The water table is below a depth of 72 inches.

Jonesville sand makes up about 35 to 45 percent of each mapped area. Typically, the surface layer is dark gray sand bout 7 inches thick. The subsurface layer is pale brown sand to a depth of 29 inches. The subsoil extends to a depth of 33 inches. It is brownish yellow sandy clay loam. Below this is limestone to a depth of 80 inches or more. This limestone is partially weathered and soft enough to be dug with light power equipment.

In the Jonesville soil, the available water capacity is low in the surface layer and very low to low in the subsurface layer. It is low in the subsoil. Permeability is rapid in the surface and subsurface layers and moderately slow in the subsoil. Organic matter content is moderately low. Natural fertility is low to medium. Surface runoff is slow. The water table is more than 72 inches below the surface.

Included with these soils in mapping are soils that have pedon characteristics similar to the Cadillac soils. Also included in some areas are soil that have sandy surface and subsurface layers less than 20 inches thick, a yellowish brown or strong brown sandy clay subsoil, and soft limestone at a depth of 20 to 50 inches. Included in a few areas are included soils that are sandy to a depth of less than 20 inches and have a loamy or clayey, yellowish brown subsoil that has gray mottles at a depth of 25 to 40 inches. These included soils are strongly acid to slightly acid in the surface layer and strongly acid to mildly alkaline in the subsoil. Limestone boulders and sinkholes are common in areas of this complex. About 12 acres mapped as this complex is within the flood plain of the Santa Fe River and is occasionally flooded. Included areas make up 5 to 25 percent of each mapped area.

(46A) Jonesville-Cadillac-Bonneau complex, 0 to 5 percent slopes -

This complex consists of small areas of nearly level to gently sloping, well-drained Jonesville and Cadillac soils and moderately well-drained Bonneau soils. These soils are so intermixed that they cannot be separated at the scale of mapping. These soils are intermixed across the landscape. Individual areas of each soil range from about 1/10 of an acre to 5 acres. Mapped areas of this complex are irregular in shape and range from about 25 to 125 acres.

Jonesville sand makes up about 45 to 55 percent of each mapped area. Typically, the soil has a dark gray sand surface layer about 7 inches thick. The subsurface layer is pale brown fine sand to a depth of 29 inches. The subsoil extends to a depth of 33 inches and is brownish yellow and clay loam. Below this is white limestone to a depth of 80 inches or more. This limestone is soft enough to be dug with light power equipment, such as a backhoe.

In the Jonesville soil, the available water capacity is low in the sandy surface layer, low to very low in the sandy subsurface layer, and medium in the loamy subsoil. Permeability is rapid in the sandy in the sandy surface and subsurface layers and moderately slow to moderate in the loamy subsoil. Organic matter content is moderately low. Natural fertility is low to medium. Surface runoff is slow. The water table is at a depth of more than 72 inches.
Cadillac fine sand makes up about 25 to 35 percent of each mapped area. Typically, the surface layer is dark gray fine sand about 7 inches thick. The subsurface layer is fine sand to a depth of 52 inches. The upper 22 inches is light yellowish brown, and the lower 33 inches is very pale brown. The subsoil extends to a depth of 76 inches. The upper 7 inches is yellowish brown fine sandy loam, and the lower 17 inches is strong brown sandy clay loam. Between a depth of 76 and 118 inches, the underlying material is clay. The upper 22 inches is yellowish brown and has mottles, and the lower 20 inches is gray and has some limestone fragments.

In the Cadillac soil, the available water capacity is low in the sandy surface and subsurface layers and medium in the loamy subsoil. Permeability is rapid in the sandy layers and slow to moderate in the loamy subsoil. Organic matter content is low to moderately low. Natural fertility is low in the sandy surface and subsurface layers and medium in the loamy subsoil. The water table in this soil is at a depth of more than 72 inches. Surface runoff is slow.

Bonneau fine sand makes up about 5 to 10 percent of each mapped area. Typically, the surface layer is dark gray fine sand about 9 inches thick. The subsurface layer is brownish yellow fine sand to a depth of 29 inches. The subsoil is sandy clay loam that extends to a depth of 84 inches or more. The upper 9 inches is yellowish brown, and the lower 47 inches is gray and has yellowish and brownish mottles.

In this Bonneau soil, the water table is about 40 to 72 inches below the surface for 1 to 3 months during most years. During dry seasons, it is more than 72 inches below the surface. Permeability is moderately rapid to rapid in the sandy surface and subsurface layers. It is moderately slow to moderate in

the upper part of the subsoil and very slow to slow in the lower part. The available water capacity and the natural fertility are low in the sandy surface and subsurface layers and medium in the subsoil. Organic matter content is low to moderately low.

Included with these soils in mapping are many areas of soils that have pedon characteristics similar to the Pedro soils. Also included are some soils that have a grayish brown, sandy surface layer; a pale brown, sandy subsurface layer that extends a depth of 20 to 40 inches; and a yellowish brown or strong brown sandy clay loam subsoil that reaches a depth of more than 60 inches. Some soils have sandy surface and subsurface layers 40 to 50 inches thick, a subsoil 4 to 10 inches thick that is yellowish brown or strong brown sandy loam or sandy clay loam, and soft, white limestone at a depth of about 45 to 60 inches. Included in some areas are soils that have fine sand surface and subsurface layers less than 20 inches thick, a yellowish brown or strong brown sandy clay subsoil, and soft limestone at a depth of about 30 to 50 inches. Some areas have included soils that have pedon characteristics similar to the Arredondo and Candler soils. Limestone boulders and sinkholes are common. About 12 acres mapped as this complex along the Santa Fe River is occasionally flooded. Total included areas are 5 to 15 percent of each mapped area.

(52C) Plummer fine sand, depressional - This is a nearly level, poorly drained soil in depressions. The areas range from 5 to 80 acres and are circular or irregularly shaped. The slope is less than 2 percent.

Typically, the surface layer is gray fine sand about 5 inches thick. The subsurface layer is gray fine sand and extends to a depth of 75 inches. It is gray sandy clay loam with yellow, strong brown and very pale brown mottles. The substratum is white fine sand and extends to a depth of more than 80 inches.

Included with this soil in mapping are small areas of Surrency and Pelham soils. Also included are soils that are similar to the Plummer soil, but some have a clayey subsoil, some have phosphatic pebbles and iron concretions, and other have weakly cemented organic-stained layers in the subsurface layer. The included soils make up less than 15 percent of the map unit.

This Plummer soil has a water table at or above the surface layer for 4 to 6 months during most years. It is within a depth of 15 inches for 6 to 8 months during most years. It recedes to a depth of more than 40 inches during dry periods. The available water capacity is low in the surface and subsurface layers and medium in the subsoil. Permeability is rapid in the surface and subsurface layers and moderately slow in the subsoil. Natural fertility is low.

(53C) Plummer fine sand, occasionally flooded - This is a poorly drained, nearly level soil on the flood plains of rivers and streams. This soil is flooded occasionally after heavy and prolonged rains. A sharp rise in the water level

causes the rivers and streams to overflow. The lowlands remain flooded for approximately 30 days and the depressions, which drain by percolation and seepage, for longer periods. This soil has been flooded in March or April in about 1 year out of 10. The slope is less than 2 percent.

Typically, the surface layer is dark gray fine sand about 4 inches thick. The subsurface is light gray fine sand to a depth of 55 inches. The subsoil is gray sandy clay loam and has pockets of sandy clay. This layer extends to a depth of 80 inches or more.

Included with this soil in mapping are small areas of Mascotte, Pelham, and Electra Variant soils. Also included are small areas of soils that are similar to the Plummer soil, but some do not have a loamy subsoil, some have a clay subsoil, some have slopes ranging up to 12 percent, and some have ironstone fragments in the profile. The included soils make up about 25 percent of the map unit.

This Plummer soil has a water table within a depth of 15 inches for 6 to 8 months during most years. The water table recedes to a depth of more than 40 inches during very dry periods. The available water capacity is low in the surface and subsurface layers and medium in the subsoil. Permeability is rapid in the surface and subsurface layers and moderately slow in the subsoil. Natural fertility and organic matter content are low.

(54C) Plummer muck, depressional - This is a nearly level, poorly drained soil in concave depressions and poorly defined drainageways. The areas range from 5 to 300 acres and are irregular in shape. The slope is less than 2 percent. This soil is similar to the Plummer fine sand soils in all characteristics, except that the dark colored surface layer is thicker than typical. This difference does not affect use and behavior of this soil.

Typically, the surface layer is covered with about 8 inches of partially decayed sphagnum moss and muck. This layer has many roots, leaves and twigs. The muck is about 60 percent fiber. The mineral surface layer is black fine about 5 inches thick. The subsurface layer is fine sand and extends to a depth of 55 inches. The upper 7 inches is light brownish gray. The next 43 inches is dark grayish brown. The subsoil is light brownish gray fine sandy loam and extends to a depth of 80 inches or more.

Included with this soil in mapping are small areas of Surrency, Pamlico and Pelham soils. Also included are soils that are similar to the Plummer soil, but some have a sandy texture to a depth of 80 inches or more or have an organic-stained subsurface layer. The included soils make up about 25 percent of the map unit.

This soil has within a depth of 15 inches for 6 to 8 months during most years. The water table is ponded during spring and summer. The available water capacity is high in the surface layer, low in the subsurface layer, and medium

in the subsoil. Permeability is moderately rapid to rapid in the surface and subsurface layers and moderately slow in the subsoil. Natural fertility is moderate.

(55A) Lake sand, 0 to 5 percent slopes - This is a nearly level to gently sloping, excessively drained soil that has a sandy texture to a depth of more than 80 inches. Slopes are nearly smooth to convex. The soil is in irregularly shaped areas on the gently rolling uplands. The individual areas are both small and large in size and range from about 20 to 300 acres.

Typically, the surface layer is dark grayish brown sand about 8 inches thick. The underlying layer is sand to a depth of 82 inches or more. The upper 33 inches is yellowish brown, the next 28 inches is strong brown, and the lower 13 inches is yellowish brown and has thin streaks of light gray, clean sand grains.

Included with this soil in mapping are small areas of Arredondo, Candler, Gainesville, and Tavares soils. Also included are a few small areas of Lake soils that have 5 to 8 percent slopes. About 10 acres mapped as this soil along the Santa Fe River is occasionally flooded. Total included areas are about 15 percent or less.

Available water capacity in this Lake soil is very low to low. Permeability is rapid to very rapid. Organic matter content and natural fertility are low. Surface runoff is very slow. The water table is more than 72 inches below the surface.

(57C) Surrency fine sand - This is a very poorly drained, nearly level soil in depressions, near shallow ponds, and along drainageways. The areas range form 3 to 200 acres and are circular to elongated. Concave slopes are less than 1 percent.

Typically, the surface layer is fine sand about 16 inches thick. The upper 8 inches is black, and the lower 8 is very dark gray. The subsurface layer is gray fine sand about 22 inches thick. The subsoil is grayish brown sandy clay loam with yellowish brown mottles. It extends to a depth of 80 inches or more.

Included with this soil in mapping are small areas of Plummer, Pantego and Pelham soils. Also included are small areas of soils that are similar to the Surrency soil but have an organic surface layer less than 16 inches thick. The included soils make up about 10 percent of the map unit.

This soil has a water table at or above the surface for most of the year, and ponding is common. The available water capacity is high in the surface layer, medium in the subsurface layer, and low in the subsoil. Permeability is moderately rapid to rapid in the surface and subsurface layers and moderate in the subsoil. Natural fertility and the organic matter content are moderate.

(58C) Surrency fine sand, occasionally flooded - This is a very poorly drained, nearly level soil on the flood plains of rivers and streams. The soil is flooded occasionally as a result of heavy and prolonged rains that cause the rivers and streams to overflow. The soil remains flooded for 30 days or more. This soil has been flooded in March or April in about 1 year out of 10. The slope is less than 1 percent.

Typically, the fine sand surface layer is about 16 inches thick. The upper 8 inches is black, and the lower 8 inches is very dark gray. The subsurface layer is about 22 inches of gray fine sand. The subsoil is grayish brown sandy clay loam with yellowish brown mottles. It extends to a depth of 80 inches or more.

Included with this soil in mapping are small areas of Pelham and Plummer soils. Also included are small areas of soils that are similar to the Surrency soil but have clay, sand or chunks of coral in the substratum. The included soils make up less than 25 percent of the map unit.

This soil has a water table at or above the surface for most of the year. In addition to the apparent water table, this soil is covered by floodwater occasionally. The available water capacity is high in the surface layer, low in the subsurface layer, and medium in the subsoil. Permeability is moderately rapid to rapid in the surface and subsurface layers and moderate in the subsoil. Natural fertility and the organic matter content are moderate.

(58A) Lake fine sand, 0 to 5 percent slopes – This nearly level to gently sloping, excessively drained soil is in small to large areas on gently rolling, limestone plains of the western part of the county. Slopes are nearly smooth to convex. The areas are irregular in shape and range from about 12 to 200 acres.

Typically, the surface layer is dark gray fine sand about 7 inches thick. The underlying layer is fine sand to a depth of 82 or more. The upper 4 inches is pale brown, the net 49 inches is very pale brown, and the lower 22 inches is very pale brown and has thin bands of brownish yellow, loamy sand lamellae.

Included with this soil in mapping are small areas of Arredondo, Cadillac, and Jonesville soils. Also included are small areas of excessively drained soils that are sandy to a depth of 80 or more inches but do not have thin bands of lamellae. Small limestone fragments and boulders 5 to 60 centimeters in diameter are in some pedons. A few limestone boulders are on the surface in some areas. Total included areas are about 20 percent or less.

This Lake soil has low available water capacity. Permeability is rapid. Natural fertility is low. Organic matter content of the surface layer is low. Surface runoff is slow. The water table is at a depth of more than 72 inches.

(59C) Troup fine sand, 2 to 5 percent slopes - This is a well-drained,

gently sloping soil on broad ridges and undulating terrain. The areas range from 20 to 400 acres and are irregular in shape.

Typically, the surface layer is dark brown fine sand about 8 inches thick. The upper 30 inches of the subsurface layer is reddish yellow loamy sand, and the lower 14 inches is strong brown loamy sand. The subsoil extends to a depth of 80 inches. The upper 6 inches is strong brown fine sandy loam; the next 9 inches is yellowish red sandy clay loam; and the lower 13 inches is yellowish red sandy clay loam with brown mottles.

Included with this soil in mapping are small areas of Blanton, Chiefland, Fort Meade Variant, Ocilla, Lucy and Orangeburg soils. These soils make up less than 15 percent of the map unit.

This Troup soil does not have a water table within a depth of 72 inches. The available water capacity is low in the surface and subsurface layers and medium in the subsoil. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil. Natural fertility and the organic matter content are low.

(61A) Oleno clay, occasionally flooded - This nearly level, poorly drained soil is in small to relatively large areas on the flood plain of the Santa Fe River. This floodplain is along the northern boundary of the county. Slopes are nearly smooth or slightly concave and are less than 2 percent. The areas are generally meandering, elongated, or irregular in shape and range from about 25 to 250 acres.

Typically, the surface layer is dark gray clay about 6 inches thick. The subsoil is about 26 inches thick. It is dark gray or gray clay. The underlying material extends to a depth of 82 inches or more. The upper 10 inches is grayish brown fine sandy loam, the next 13 inches is gray fine sandy loam, the next 16 inches is dark gray fine sandy loam, the next 6 inches is gray sandy clay loam, and the lower 5 inches is greenish gray clay.

Included with this soil in mapping are small areas of Jonesville, Newnan, and Millhopper soils. Also included are small areas of soils that area similar to Oleno soils but have a clayey, fluvial surface layer about 10 to 24 inches thick. Included in a few areas are soils that have 24 to 47 inches of clayey material overlying sandy material; the sandy material extends to a depth of 80 inches or more. Some small areas have limestone within 20 inches of the surface. Total included areas are about 20 percent or less.

This Oleno soil is occasionally flooded for periods of about 1 month or less. The water table is at a depth of 6 to 18 inches for 6 to 8 months during most years. Surface runoff is slow. The available water capacity is very high in the clayey surface layer and subsoil, and it is very low to very high in the underlying material. Permeability is slow in the clayey surface layer and subsoil. It ranges from moderately rapid to slow in the underlying material.

Natural fertility is medium, and organic matter content of the clay surface layer is moderate.

(71A) Millhopper sand, 5 to 8 percent slopes - This sloping, moderately well-drained soil is in small areas on narrow breaks and on long slopes of rolling uplands. These areas are mostly irregular or elongated and range from about 10 to 40 acres.

Typically, the surface layer is dark grayish brown sand about 7 inches thick. The subsurface layer is sand about 47 inches thick. The upper 37 inches is yellowish brown, and the lower 10 inches is pale brown. Mottles of brown and yellow range from none to common. The subsoil extends to a depth of 80 inches or more. The upper 6 inches is yellowish brown sandy loam that has light gray and strong brown mottles, and the lower 22 inches is light gray sandy clay loam that has gray, strong brown, and very pale brown mottles.

Included with this soil in mapping are small areas of a soil which is similar to this Millhopper soil but which has loamy sand surface and subsurface layers. Small areas of Apopka, Arredondo, Gainesville, Kanapaha, and Lochloosa soils are included. Small areas of Millhopper soils that have 0 to 5 percent slopes are also included. Total included areas are about 20 percent or less.

This Millhopper soil has a water table that is at a depth of 40 to 60 inches for 1 to 2 months and at a depth of 60 to 72 inches for 2 to 3 months during most years. The available water capacity is low in the surface and subsurface layers, and it is low to medium in the subsoil. Permeability is rapid in the surface and subsurface layers. It is moderate in the upper part of the subsoil and slow to moderately slow in the lower part. The natural soil fertility and the organic matter content are low.

(73A) Kendrick sand, 5 to 8 percent slopes - This sloping, well-drained soil is usually in elongated areas on the long slopes of uplands. The areas are small to relatively large and range from about 10 to 125 acres.

Typically, the surface layer is grayish brown sand about 6 inches thick. The subsurface layer is yellowish brown sand to a depth of 24 inches. The subsoil extends to a depth of 76 inches or mores. The upper 5 inches of the subsoil is yellowish brown, mottled sandy clay loam; and the lower 20 inches is yellowish brown, mottled sandy clay loam.

Included with this soil are small areas of soils that are similar to Kendrick soils but have a brownish yellow or yellowish brown loamy subsoil less than 20 inches below the surface or have fine sand surface and subsurface layers. Also included are a few areas of soils that are sandy clay at a depth of 20 to 40 inches. Small areas of Arredondo, Blichton, Gainesville, and Lochloosa soils are in some areas. A few areas of Kendrick soils have 2 to 5 percent slopes or 8 to 12 percent slopes. Small moderately eroded spots are included in some areas. Limestone boulders and sinkholes are in some areas and are shown by

appropriate symbols. Total included areas are about 20 percent.

In this Kendrick soil, the available water capacity is low in the sandy surface and subsurface layers and medium to high in the subsoil. Permeability is rapid in the sandy surface and subsurface layers, moderate in the upper part of the subsoil, and slow to moderately slow in the lower part. Natural fertility is low in the sandy layers and medium in the loamy subsoil. Organic matter content is medium in the loamy subsoil. Organic matter content is low. The water table is more than 72 inches below the surface. Surface runoff is medium.

(83A) Pickney sand, frequently flooded - This nearly level, very poorly drained soil is on flood plains on marine terraces. The parent material is sandy marine deposits and/or fluviomarine deposits. A typical profile consists of dark sand on the surface, down to a depth of 34 inches. Underlying layers (34 to 80 inches) are fine sand. Pickney and similar soils comprise 75 percent of the map unit, while the minor component, Pompano soil, comprises 25 percent.

In frequently flooded Pickney sand, the water table is right at the surface. Surface runoff is slow. The available water capacity is low. Permeability is very rapid. The natural fertility is low.

Addendum 5—Plant and Animal List

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

LICHENS

Brick-spored firedot lichen	*Briganteiaea leucoxantha*
Black-bottomed Carolina	*Canoparmelia amazonica*
Powdery headed shield lichen	*Canoparmelia cryptochlorophaea*
Sulphur dust lichen	*Chrysothrix chlorina*
Evans' reindeer lichen	*Cladina evansii*
Pale-fruited funnel cladonia	*Cladonia beaumontii*
Mealy pixie-cup	*Cladonia chlorophaea*
Southern soldiers	*Cladonia didyma* var. *didyma*
Jester cladonia	*Cladonia leporina*
Turban cladonia	*Cladonia pezizformis*
Ravenel's cup cladonia	*Cladonia ravenelii*
Powdery peg lichen	*Cladonia subradiata*
Dixie reindeer lichen	*Cladonia subtenuis*
Salted shell lichen	*Coccocarpia palmicola*
Cotton lobed lichen	*Crocynia pyxinoides*
Christmas lichen	*Herpothallon rubrocinctum*
White fringe lichen	*Heterodermia albicans*
Soft fringe lichen	*Heterodermia japonica*
Elegant fringe lichen	*Heterodermia leucomela*
Powdered fringe lichen	*Heterodermia speciosa*
Wrinkled loop lichen	*Hypotrachyna livida*
Ruffled jellyskin	*Leptogium chloromelum*
Salted blue jellyskin	*Leptogium isidiosellum*
Margin-fruiting jellyskin	*Leptogium marginellum*
Frilly jellyskin	*Leptogium phyllocarpum*
Spiral-spored lichen	*Letrouitia parabola*
Hairy-spined shield lichen	*Parmelinopsis horrescens*
Hairless-spined shield lichen	*Parmelinopsis minarum*
P+ orange powdered	*Parmotrema hypoleucinum*
UV-perforated ruffle	*Parmotrema perforatum*
Long-whiskered lichen	*Parmotrema rampoddense*
Palm ruffle lichen	*Parmotrema tinctorum*
Spotted gray ruffle lichen	*Parmotrema ultralucens*
Pelt lichen	*Peltigera hymenina*
Green specklebelly	*Pseudocyphellaria aurata*
Rough speckled shield lichen	*Punctelia rudecta*
Marg. soredia buttoned rosette	*Pyxine cocoes*
Thin rosette lichen	*Pyxine eschweileri*
Thorny ramalina	*Ramalina willeyi*
Fringed moon lichen	*Sticta beauvoisii*
Powder-tipped beard lichen	*Usnea dimorpha*
Bushy beard lichen	*Usnea strigosa*

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
PTERIDOPHYTES		
Bicolored spleenwort	*Asplenium heterochroum*	
Ebony spleenwort	*Asplenium platyneuron*	
Modest spleenwort	*Asplenium verecundum*	LO
Southern lady fern	*Athyrium filix-femina*	SH, UHF
American waterfern	*Azolla filiculoides*	
Southern grape-fern	*Botrychium biternatum*	
Rattlesnake fern	*Botrychium virginianum*	
Japanese climbing fern	*Lygodium japonicum* *	
Cinnamon fern	*Osmunda cinnamomea*	
Royal fern	*Osmunda regalis L.* var. *spectabilis*	
Plume polypody	*Pecluma plumula*	LO
Golden polypody	*Phlebodium aureum*	
Resurrection fern	*Pleopeltis polypodioides* var. *michauxiana*	
Christmas fern	*Polystichum acrostichoides*	
Tailed bracken	*Pteridium aquilinum* var. *pseudocaudatum*	
Cretan brake	*Pteris cretica* *	
Water spangles	*Salvinia minima* *	
Hairy maiden fern	*Thelypteris hispidula* var. *versicolor*	
Widespread maiden fern	*Thelypteris kunthii*	
Ovate marsh fern	*Thelypteris ovata*	
Marsh fern	*Thelypteris palustris Schott* var. *pubescens*	
Netted chain fern	*Woodwardia areolata*	
Virginia chain fern	*Woodwardia virginica*	
GYMNOSPERMS		
Red cedar	*Juniperus virginiana*	
Sand pine	*Pinus clausa*	
Slash pine	*Pinus elliottii*	
Spruce pine	*Pinus glabra*	
Longleaf pine	*Pinus palustris*	
Loblolly pine	*Pinus taeda*	
Pond-cypress	*Taxodium ascendens*	
Bald-cypress	*Taxodium distichum*	
ANGIOSPERMS		
MONOCOTS		
Ticklegrass	*Agrostis hyemalis*	
Wild colicroot	*Aletris farinosa*	
Southern colicroot	*Aletris obovata*	
Meadow garlic	*Allium canadense*	
Shortspike bluestem	*Andropogon brachystachyus*	

* Non-native species

 ++ Extirpated, historically present

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Bushy bluestem	*Andropogon glomeratus*	
Purple bluestem	*Andropogon glomeratus* var. *glaucopsis*	
Bushy bluestem	*Andropogon glomeratus* var. *pumilus*	
Elliott's bluestem	*Andropogon gyrans*	
Splitbeard bluestem	*Andropogon ternarius*	
Broomsedge bluestem	*Andropogon virginicus*	
Chalky bluestem	*Andropogon virginicus* var. *glaucus*	
Green silkyscale	*Anthaenantia villosa*	
Nodding nixie	*Apteria aphylla*	
Greendragon	*Arisaema dracontium*	
Jack-in-the-pulpit	*Arisaema triphyllum*	
Corkscrew threeawn	*Aristida gyrans*	
Woollysheath threeawn	*Aristida lanosa*	
Arrowfeather threeawn	*Aristida purpurascens*	
Bottlebrush threeawn	*Aristida spiciformis*	
Wiregrass	*Aristida stricta* var. *beyrichiana*	
Virginia snakeroot	*Aristolochia serpentaria*	
Switchcane	*Arundinaria gigantea*	
Tropical carpetgrass	*Axonopus compressus*	
Common carpetgrass	*Axonopus fissifolius*	
Big carpetgrass	*Axonopus furcatus*	
Pinguin	*Bromelia pinguin*	
Rescuegrass	*Bromus catharticus* *	
Watergrass	*Bulbostylis barbata* *	
Capillary hairsedge	*Bulbostylis ciliatifolia*	
Sandyfield hairsedge	*Bulbostylis stenophylla*	
Ware's hairsedge	*Bulbostylis warei*	
Bluethread	*Burmannia biflora*	
Piedmont roseling	*Callisia rosea*	
Bandanna-of-the-Everglades	*Canna flaccida*	
Greenwhite sedge	*Carex albolutescens*	
Willdenow's sedge	*Carex basiantha*	
Longhair sedge	*Carex comosa*	
Sandywoods sedge	*Carex dasycarpa*	
Hammock sedge	*Carex fissa* var. *aristata*	
Frank's sedge	*Carex frankii*	
Clustered sedge	*Carex glaucescens*	
Long's sedge	*Carex longii*	
Hop sedge	*Carex lupulina*	
Bent sedge	*Carex styloflexa*	
Southern sandbur	*Cenchrus echinatus*	
Slender sandspur	*Cenchrus gracillimus*	
Coastal sandbur	*Cenchrus spinifex*	
Indian woodoats	*Chasmanthium latifolium*	
Slender woodoats	*Chasmanthium laxum*	
Longleaf woodoats	*Chasmanthium laxum* var. *sessiliflorum*	

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Jamaica swamp sawgrass	*Cladium jamaicense*	
Wild taro	*Colocasia esculenta* *	
Whitemouth dayflower	*Commelina erecta*	
Autumn coralroot	*Corallorhiza odontorhiza*	UHF
Spring coralroot	*Corallorhiza wisteriana*	
Seven-sisters	*Crinum americanum*	
Toothachegrass sp.	*Ctenium sp.*	
Bermudagrass	*Cynodon dactylon* *	
Baldwin's flatsedge	*Cyperus croceus*	
Swamp flatsedge	*Cyperus distinctus*	
Yellow nutgrass	*Cyperus esculentus* *	
Haspan flatsedge	*Cyperus haspan*	
Leconte's flatsedge	*Cyperus lecontei*	
Pinebarren flatsedge	*Cyperus ovatus*	
Plukenet's flatsedge	*Cyperus plukenetii*	
Manyspike flatsedge	*Cyperus polystachyos*	
Nutgrass	*Cyperus rotundus* *	
Bearded flatsedge	*Cyperus squarrosus*	
Strawcolored flatsedge	*Cyperus strigosus*	
Tropical flatsedge	*Cyperus surinamensis*	
Fourangle flatsedge	*Cyperus tetragonus*	
Green flatsedge	*Cyperus virens*	
Needleleaf witchgrass	*Dichanthelium aciculare*	
Bosc's witchgrass	*Dichanthelium boscii*	
Deertongue witchgrass	*Dichanthelium clandestinum*	
Variable witchgrass	*Dichanthelium commutatum*	
Cypress witchgrass	*Dichanthelium dichotomum*	
Cypress witchgrass	*Dichanthelium ensifolium* var. *unciphyllum*	
Openflower witchgrass	*Dichanthelium laxiflorum*	
Eggleaf witchgrass	*Dichanthelium ovale*	
Roughhair witchgrass	*Dichanthelium strigosum* var. *leucoblepharis*	
Southern crabgrass	*Digitaria ciliaris*	
Slender crabgrass	*Digitaria filiformis*	
Florida yam	*Dioscorea floridana*	
Jungle rice	*Echinochloa colona* *	
Common water-hyacinth	*Eichhornia crassipes* *	
Baldwin's spikerush	*Eleocharis baldwinii*	
Viviparous spikerush	*Eleocharis vivipara*	
Indian goosegrass	*Eleusine indica* *	
Green-fly orchid	*Epidendrum conopseum*	
Elliott's lovegrass	*Eragrostis elliottii*	
Bigtop lovegrass	*Eragrostis hirsuta*	
Purple lovegrass	*Eragrostis spectabilis*	
Coastal lovegrass	*Eragrostis virginica*	
Centipedegrass	*Eremochloa ophiuroides* *	
Fourspike fingergrass	*Eustachys neglecta*	

* Non-native species

++ Extirpated, historically present

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Pinewoods fingergrass	*Eustachys petraea*	
Hairy fimbry	*Fimbristylis puberula*	
Bearded skeletongrass	*Gymnopogon ambiguus*	
Longhorn false rein orchid	*Habenaria quinqueseta*	
Spiked crested coralroot	*Hexalectris spicata*	UMW, UP
Spring-run spiderlily	*Hymenocallis rotata*	
Fringed yellow stargrass	*Hypoxis juncea*	
Tapertip rush	*Juncus acuminatus*	
Forked rush	*Juncus dichotomus*	
Soft rush	*Juncus effusus*	
Bog rush	*Juncus elliottii*	
Whitehead bogbutton	*Lachnocaulon anceps*	
Dotted duckweed	*Landoltia punctata*	
Lesser duckweed	*Lemna aequinoctialis*	
Little duckweed	*Lemna obscura*	
Valdivia duckweed	*Lemna valdiviana*	
Catesby's lily	*Lilium catesbaei*	MF
False aloe	*Manfreda virginica*	
Southern waternymph	*Najas guadalupensis*	
Woodsgrass; Basketgrass	*Oplismenus hirtellus*	
Beaked panicum	*Panicum anceps*	
Maidencane	*Panicum hemitomon*	
Redtop panicum	*Panicum rigidulum*	
Pitchfork crowngrass	*Paspalum bifidum*	
Florida paspalum	*Paspalum floridanum*	
Bahiagrass	*Paspalum notatum* *	
Brownseed paspalum	*Paspalum plicatulum*	
Thin paspalum	*Paspalum setaceum*	
Blackseed needlegrass	*Piptochaetium avenaceum*	
Annual bluegrass	*Poa annua* *	
Rosebud orchid	*Pogonia divaricata*	MF
Rabbitsfootgrass	*Polypogon monspeliensis* *	
Hairy shadow witch	*Ponthieva racemosa*	
Giant orchid	*Pteroglossaspis ecristata*	SH
Needle palm	*Rhapidophyllum hystrix*	
Starrush whitetop	*Rhynchospora colorata*	
Fascicled beaksedge	*Rhynchospora fascicularis*	
Southern beaksedge	*Rhynchospora microcarpa*	
Fragrant beaksedge	*Rhynchospora odorata*	
Plumed beaksedge	*Rhynchospora plumosa*	
Scrub palmetto	*Sabal etonia*	
Dwarf palmetto	*Sabal minor*	
Cabbage palm	*Sabal palmetto*	
Narrow plumegrass	*Saccharum baldwinii*	
Sugarcane plumegrass	*Saccharum giganteum*	
Little bluestem	*Schizachyrium scoparium*	

* Non-native species

++ Extirpated, historically present

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Florida feathershank	*Schoenocaulon dubium*	
Woolgrass	*Scirpus cyperinus*	
Littlehead nutrush	*Scleria oligantha*	
Tall nutgrass	*Scleria triglomerata*	
Saw palmetto	*Serenoa repens*	
Coastal bristlegrass	*Setaria corrugata*	
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*	
Laurel greenbrier	*Smilax laurifolia*	
Sarsaparilla vine	*Smilax pumila*	
Jackson vine	*Smilax smallii*	
Bristly greenbrier	*Smilax tamnoides*	
Coral greenbrier	*Smilax walteri*	
Yellow indiangrass	*Sorghastrum nutans*	
Lopsided indiangrass	*Sorghastrum secundum*	
Prairie wedgescale	*Sphenopholis obtusata*	
Longlip ladiestresses	*Spiranthes longilabris*	MF
October ladiestresses	*Spiranthes ovalis* var. *erostellata*	UHF
Little ladiestresses	*Spiranthes tuberosa*	SH
Spring ladiestresses	*Spiranthes vernalis*	
Smutgrass	*Sporobolus indicus* *	
Pineywoods dropseed	*Sporobolus junceus*	
St. Augustinegrass	*Stenotaphrum secundatum*	
Spanish moss	*Tillandsia usneoides*	
Bluejacket	*Tradescantia ohiensis*	
Purpletop tridens	*Tridens flavus*	
Threebirds orchid	*Triphora trianthophoros*	UHF
Broadleaf cattail	*Typha latifolia*	
Hairy signalgrass	*Urochloa piligera* *	
American eelgrass	*Vallisneria americana*	
Squirreltail fescue	*Vulpia elliotea*	
Brazilian watermeal	*Wolffia brasiliensis*	
Florida mudmidget	*Wolffiella gladiata*	
Carolina yelloweyed grass	*Xyris caroliniana*	
Adam's needle	*Yucca filamentosa*	

DICOTS

Slender threeseed mercury	*Acalypha gracilens*	
Hispid starburr	*Acanthospermum hispidum* *	
Boxelder	*Acer negundo*	

* Non-native species

 ++ Extirpated, historically present

O'Leno State Park and River Rise Preserve State Park Plants

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Red maple	*Acer rubrum*	
Florida maple	*Acer saccharum* ssp. *floridanum*	
Sticky jointvetch	*Aeschynomene viscidula*	
Red buckeye	*Aesculus pavia*	
Beach false foxglove	*Agalinis fasciculata*	
Seminole false foxglove	*Agalinis filifolia*	
Hammock snakeroot	*Ageratina jucunda*	
Incised agrimony	*Agrimonia incisa*	SH, UP
Smallfruit agrimony	*Agrimonia microcarpa*	
Tree-of-heaven	*Ailanthus altissima* *	
Silktree; Mimosa	*Albizia julibrissin* *	
Alligatorweed	*Alternanthera philoxeroides* *	
White moneywort	*Alysicarpus vaginalis* *	
Spiny amaranth	*Amaranthus spinosus* *	
Slender amaranth	*Amaranthus viridis* *	
Alligatorweed	*Alternanthera philoxeroides* *	
Common ragweed	*Ambrosia artemisiifolia*	
Bastard false indigo	*Amorpha fruticosa*	
Peppervine	*Ampelopsis arborea*	
Eastern bluestar	*Amsonia tabernaemontana*	
Indianhemp	*Apocynum cannabinum*	
Peanut	*Arachis hypogaea* *	
Devil's walkingstick	*Aralia spinosa*	
Spreading sandwort	*Arenaria lanuginosa*	
Thymeleaf sandwort	*Arenaria serpyllifolia* *	
Florida indian plantain	*Arnoglossum floridanum*	
Clasping milkweed	*Asclepias amplexicaulis*	
Carolina milkweed	*Asclepias cinerea*	
Pinewoods milkweed	*Asclepias humistrata*	
Swamp milkweed	*Asclepias perennis*	
Butterflyweed	*Asclepias tuberosa*	
Whorled milkweed	*Asclepias verticillata*	
Slimleaf pawpaw	*Asimina angustifolia*	
Woolly pawpaw	*Asimina incana*	
Smallflower pawpaw	*Asimina parviflora*	
Dwarf pawpaw	*Asimina pygmea*	
Bearded milkvetch	*Astragalus villosus*	
Fernleaf yellow foxglove	*Aureolaria pectinata*	
Groundsel tree; Sea-myrtle	*Baccharis halimifolia*	
Coastalplain honeycombhead	*Balduina angustifolia*	
White wild indigo	*Baptisia alba*	
Pineland wild indigo	*Baptisia lecontei*	
Alabama supplejack	*Berchemia scandens*	
Soft greeneyes	*Berlandiera pumila*	
Florida greeneyes	*Berlandiera subacaulis*	
River birch	*Betula nigra*	

* Non-native species

++ Extirpated, historically present

O'Leno State Park and River Rise Preserve State Park Plants

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Beggarticks	*Bidens alba*	
Spanish needles	*Bidens bipinnata*	
Devil's beggarticks	*Bidens frondosa*	
Crossvine	*Bignonia capreolata*	
False nettle; Bog hemp	*Boehmeria cylindrica*	
Red spiderling	*Boerhavia diffusa*	
False boneset	*Brickellia eupatorioides*	
American beautyberry	*Callicarpa americana*	
Woodland poppymallow	*Callirhoe papaver*	UP
Trumpet creeper	*Campsis radicans*	
Hairy bittercress	*Cardamine hirsuta* *	
Coastalplain chaffhead	*Carphephorus corymbosus*	
American hornbeam	*Carpinus caroliniana*	
Water hickory	*Carya aquatica*	
Pignut hickory	*Carya glabra*	
Mockernut hickory	*Carya tomentosa*	
Chinquapin	*Castanea pumila*	
New Jersey tea; Redroot	*Ceanothus americanus*	
Sugarberry; Hackberry	*Celtis laevigata*	
Spadeleaf	*Centella asiatica*	
Pineland butterfly pea	*Centrosema arenicola*	SH, UP
Spurred butterfly pea	*Centrosema virginianum*	
Common buttonbush	*Cephalanthus occidentalis*	
Mouse-ear chickweed	*Cerastium glomeratum* *	
Coontail	*Ceratophyllum demersum*	
Eastern redbud	*Cercis canadensis*	
Hairyfruit chervil	*Chaerophyllum tainturieri*	
Partridge pea	*Chamaecrista fasciculata*	
Sensitive pea	*Chamaecrista nictitans*	
Limestone sandmat	*Chamaesyce blodgettii*	
Heartleaf sandmat	*Chamaesyce cordifolia*	
Hyssopleaf sandmat	*Chamaesyce hyssopifolia*	
Spotted sandmat	*Chamaesyce maculata*	
Mexican tea	*Chenopodium ambrosioides* *	
White fringetree	*Chionanthus virginicus*	
Maryland goldenaster	*Chrysopsis mariana*	
Scrubland goldenaster	*Chrysopsis subulata*	
Spotted water hemlock	*Cicuta maculata*	
Camphortree	*Cinnamomum camphora* *	
Purple thistle	*Cirsium horridulum*	
Nuttall's thistle	*Cirsium nuttallii*	
Satincurls	*Clematis catesbyana*	
Swamp leather-flower	*Clematis crispa*	
Netleaf leather-flower	*Clematis reticulata*	
Atlantic pigeonwings	*Clitoria mariana*	
Tread-softly	*Cnidoscolus stimulosus*	

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Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Carolina coralbead	*Cocculus carolinus*	
Blue mistflower	*Conoclinium coelestinum*	
American squawroot	*Conopholis americana*	
Canadian horseweed	*Conyza canadensis*	
Roughleaf dogwood	*Cornus asperifolia*	
Flowering dogwood	*Cornus florida*	
Swamp dogwood	*Cornus foemina*	
Smallflower fumewort	*Corydalis micrantha* ssp. *australis*	
May haw	*Crataegus aestivalis*	
Cockspur hawthorn	*Crataegus crus-galli*	
Yellowleaf hawthorn	*Crataegus flava*	
Parsley hawthorn	*Crataegus marshallii*	
Michaux's hawthorn	*Crataegus michauxii*	
Dwarf hawthorn	*Crataegus uniflora*	
Green hawthorn	*Crataegus viridis*	
Slender scratchdaisy	*Croptilon divaricatum*	
Slenderleaf rattlebox	*Crotalaria ochroleuca* *	
Rabbitbells	*Crotalaria rotundifolia*	
Showy rattlebox	*Crotalaria spectabilis* *	
Silver croton	*Croton argyranthemus*	
Vente conmigo	*Croton glandulosus*	
Rushfoil	*Croton michauxii*	
Marsh parsley	*Cyclospermum leptophyllum*	
Leafless swallowwort	*Cynanchum scoparium*	
Titi	*Cyrilla racemiflora*	
Whitetassels	*Dalea carnea*	
Summer farewell	*Dalea pinnata*	
American wild carrot	*Daucus pusillus*	
Western tansymustard	*Descurainia pinnata*	
Florida ticktrefoil	*Desmodium floridanum*	
Zarabacoa comun	*Desmodium incanum*	
Smooth ticktrefoil	*Desmodium laevigatum*	
Panicled beggarweed	*Desmodium paniculatum*	
Threeflower ticktrefoil	*Desmodium triflorum* *	
Balm	*Dicerandra* sp.	
Florida balm	*Dicerandra densiflora*	
Carolina ponysfoot	*Dichondra carolinensis*	
Poor Joe	*Diodia teres*	
Virginia buttonweed	*Diodia virginiana*	
Common persimmon	*Diospyros virginiana*	
Gulf sebastian-bush	*Ditrysinia fruticosa*	
Dwarf sundew	*Drosera brevifolia*	
Swamp twinflower	*Dyschoriste humistrata*	
Oblongleaf twinflower	*Dyschoriste oblongifolia*	
False daisy	*Eclipta prostrata*	
Tall elephantsfoot	*Elephantopus elatus*	

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Smooth elephantsfoot	*Elephantopus nudatus*	
Devil's grandmother	*Elephantopus tomentosus*	
Carolina scalystem	*Elytraria caroliniensis*	
American burnweed	*Erechtites hieraciifolius*	
Philaelphia fleabane	*Erigeron philadelphicus*	
Oakleaf fleabane	*Erigeron quercifolius*	
Prairie fleabane	*Erigeron strigosus*	
Early whitetop fleabane	*Erigeron vernus*	
Dogtongue wild buckwheat	*Eriogonum tomentosum*	
Fragrant eryngo	*Eryngium aromaticum*	
Baldwin's eryngo	*Eryngium baldwinii*	
Button rattlesnakemaster	*Eryngium yuccifolium*	
Coralbean; Cherokee bean	*Erythrina herbacea*	
Swamp doghobble	*Eubotrys racemosa*	
American strawberrybush	*Euonymus americanus*	
White thoroughwort	*Eupatorium album*	
Dogfennel	*Eupatorium capillifolium*	
Yankeeweed	*Eupatorium compositifolium*	
Hyssopleaf thoroughwort	*Eupatorium hyssopifolium*	
Mohr's thoroughwort	*Eupatorium mohrii*	
Lateflowering thoroughwort	*Eupatorium serotinum*	
Coastal spurge	*Euphorbia exserta*	
Slender flattop goldenrod	*Euthamia caroliniana*	
White ash	*Fraxinus americana*	
Carolina ash; pop ash	*Fraxinus caroliniana*	
Cottonweed	*Froelichia floridana*	
Lanceleaf blanketflower	*Gaillardia aestivalis*	
Firewheel	*Gaillardia pulchella*	
Elliott's milkpea	*Galactia elliottii*	
Downy milkpea	*Galactia regularis*	
Eastern milkpea	*Galactia volubilis*	
Coastal bedstraw	*Galium hispidulum*	
Hairy bedstraw	*Galium pilosum*	
Stiff marsh bedstraw	*Galium tinctorium*	
Oneflower bedstraw	*Galium uniflorum*	
Pennsylvania everlasting	*Gamochaeta pensylvanica*	
Southern beeblossom	*Gaura angustifolia*	
Dwarf huckleberry	*Gaylussacia dumosa*	
Blue huckleberry	*Gaylussacia frondosa*	
Yellow jessamine	*Gelsemium sempervirens*	
Carolina cranesbill	*Geranium carolinianum*	
South American mock vervain	*Glandularia pulchella* *	
Water locust	*Gleditsia aquatica*	
Caribbean purple everlasting	*Gnaphalium antillana*	
Rabbit tobacco	*Gnaphalium obtusifolium*	
Prostrate globe amaranth	*Gomphrena serrata* *	

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O'Leno State Park and River Rise Preserve State Park Plants

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Angularfruit milkvine	*Gonolobus suberosus*	UP
Rough hedgehyssop	*Gratiola hispida*	
Roundfruit hedgehyssop	*Gratiola virginiana*	
Carolina silverbell	*Halesia carolina*	
American witchhazel	*Hamamelis virginiana*	
Shortleaf sneezeweed	*Helenium brevifolium*	
Purplehead sneezeweed	*Helenium flexuosum*	
Carolina frostweed	*Helianthemum carolinianum*	
Pinebarren frostweed	*Helianthemum corymbosum*	
Narrowleaf sunflower	*Helianthus angustifolius*	
Florida sunflower	*Helianthus floridanus*	
Clasping heliotrope	*Heliotropium amplexicaule* *	
Camphorweed	*Heterotheca subaxillaris*	
Comfortroot	*Hibiscus aculeatus*	
Innocence	*Houstonia procumbens*	
Queen-devil	*Hieracium gronovii*	
Floating marshpennywort	*Hydrocotyle ranunculoides*	
Manyflower marshpennywort	*Hydrocotyle umbellata*	
Whorled marshpennywort	*Hydrocotyle verticillata*	
Nakedflower ticktrefoil	*Hylodesmum nudiflorum*	
Carolina woollywhite	*Hymenopappus scabiosaeus*	
Coastalplain St. John's-wort	*Hypericum brachyphyllum*	
St. Peter's-wort	*Hypericum crux-andreae*	
Bedstraw St. John's-wort	*Hypericum galioides*	
Pineweeds	*Hypericum gentianoides*	
St. Andrew's-cross	*Hypericum hypericoides*	
Dwarf St. John's-wort	*Hypericum mutilum*	
Fourpetal St. John's-wort	*Hypericum tetrapetalum*	
Clustered bushmint	*Hyptis alata*	
Tropical bushmint	*Hyptis mutabilis* *	
Carolina holly; Sand holly	*Ilex ambigua*	
Possumhaw	*Ilex decidua*	
Inkberry; Gallberry	*Ilex glabra*	
American holly	*Ilex opaca*	
Yaupon	*Ilex vomitoria*	
Carolina indigo	*Indigofera caroliniana*	
Hairy indigo	*Indigofera hirsuta* *	
Trailing indigo	*Indigofera spicata* *	
Tievine	*Ipomoea cordatotriloba*	
Man-of-the-earth	*Ipomoea pandurata*	
Cypressvine	*Ipomoea quamoclit* *	
Virginia willow	*Itea virginica*	
Looseflower waterwillow	*Justicia ovata*	
Wicky	*Kalmia hirsuta*	
Virginia dwarfdandelion	*Krigia virginica*	
Japanese clover	*Kummerowia striata* *	

* Non-native species

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Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Canada lettuce	*Lactuca canadensis*	
Lantana; Shrubverbena	*Lantana camara* *	
Thymeleaf pinweed	*Lechea minor*	
Hairy pinweed	*Lechea mucronata*	
Piedmont pinweed	*Lechea torreyi*	
Virginia pepperweed	*Lepidium virginicum*	
Narrowleaf lespedeza	*Lespedeza angustifolia*	
Hairy lespedeza	*Lespedeza hirta*	
Tall lespedeza	*Lespedeza stuevei*	
Pinscale fayfeather	*Liatris elegans*	
Slender gayfeather	*Liatris gracilis*	
Fewflower fayfeather	*Liatris pauciflora*	
Shortleaf gayfeather	*Liatris tenuifolia*	
Gopher apple	*Licania michauxii*	
Canadian toadflax	*Linaria canadensis*	
Apalachicola toadflax	*Linaria floridana*	
Yellowseed false pimpernel	*Lindernia dubia* var. *anagallidea*	
Sweetgum	*Liquidambar styraciflua*	
Glade lobelia	*Lobelia glandulosa*	
Japanese honeysuckle	*Lonicera japonica* *	
Coral honeysuckle	*Lonicera sempervirens*	
Anglestem primrosewillow	*Ludwigia leptocarpa*	
Seaside primrosewillow	*Ludwigia maritima*	
Smallfruit primrosewillow	*Ludwigia microcarpa*	
Creeping primrosewillow	*Ludwigia repens*	
Shrubby primrosewillow	*Ludwigia suffruticosa*	
Lady lupine	*Lupinus villosus*	
Rose-rush	*Lygodesmia aphylla*	
Rusty staggerbush	*Lyonia ferruginea*	
Coastalplain staggerbush	*Lyonia fruticosa*	
Fetterbush	*Lyonia lucida*	
Southern magnolia	*Magnolia grandiflora*	
Sweetbay	*Magnolia virginiana*	
Florida milkvine	*Matelea floridana*	UP
Trailing milkvine	*Matelea pubiflora*	
Axilflower	*Mecardonia acuminata*	
Black medick	*Medicago lupulina* *	
Snow squarestem	*Melanthera nivea*	
Chinaberrytree	*Melia azedarach* *	
White sweetclover	*Melilotus albus* *	
Creeping cucumber	*Melothria pendula*	
Shade mudflower	*Micranthemum umbrosum*	
Climbing hempvine	*Mikania scandens*	
Sensitive brier	*Mimosa quadrivalvis*	
Partridgeberry	*Mitchella repens*	
Lax hornpod	*Mitreola petiolata*	

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Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Indian chickweed	*Mollugo verticillata* *	
Spotted beebalm	*Monarda punctata*	
Indianpipe	*Monotropa uniflora*	
Red mulberry	*Morus rubra*	
Southern bayberry; Wax myrtle	*Myrica cerifera*	
Spatterdock	*Nuphar advena*	
Water tupelo	*Nyssa aquatica*	
Swamp tupelo	*Nyssa sylvatica* var. *biflora*	
Common eveningprimrose	*Oenothera biennis*	
Cutleaf eveningprimrose	*Oenothera laciniata*	
Flattop mille graines	*Oldenlandia corymbosa* *	
False gromwell	*Onosmodium virginianum*	
Pricklypear	*Opuntia humifusa*	
Piedmont leatherroot	*Orbexilum lupinellus*	
Wild olive	*Osmanthus americanus*	
Eastern hophornbeam	*Ostrya virginiana*	
Common yellow woodsorrel	*Oxalis corniculata*	
Coastalplain palafox	*Palafoxia integrifolia*	
American nailwort	*Paronychia americana*	
Baldwin's nailwort	*Paronychia baldwinii*	
Coastalplain nailwort	*Paronychia herniarioides*	
Virginia creeper	*Parthenocissus quinquefolia*	
Purple passionflower	*Passiflora incarnata*	
Yellow passionflower	*Passiflora lutea*	
Corkystem passionflower	*Passiflora suberosa*	
Buckroot	*Pediomelum canescens*	
Eustis lake beardtongue	*Penstemon australis*	
Manyflower beardtongue	*Penstemon multiflorus*	
Red bay	*Persea borbonia*	
Swamp bay	*Persea palustris*	
Annual phlox	*Phlox drummondii* *	
Trailing phlox	*Phlox nivalis*	
Downy phlox	*Phlox pilosa*	
Red chokeberry	*Photinia pyrifolia*	
Oak mistletoe	*Phoradendron leucarpum*	
Turkey tangle fogfruit	*Phyla nodiflora*	
Carolina leafflower	*Phyllanthus caroliniensis*	
Chamber bitter	*Phyllanthus urinaria* *	
Cutleaf groundcherry	*Physalis angulata*	
Longleaf groundcherry	*Physalis longifolia*	
Husk tomato	*Physalis pubescens*	
Walter's groundcherry	*Physalis walteri*	
American pokeweed	*Phytolacca americana*	
Small butterwort	*Pinguicula pumila*	
Pitted stripeseed	*Piriqueta cistoides* ssp. *caroliniana*	
Narrowleaf silkgrass	*Pityopsis graminifolia*	

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++ Extirpated, historically present

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Waterelm	*Planera aquatica*	
Virginia plantain	*Plantago virginica*	
Camphorweed	*Pluchea camphorata*	
Stinking camphorweed	*Pluchea foetida*	
Longleaf camphorweed	*Pluchea longifolia*	
Sweetscent	*Pluchea odorata*	
Rosy camphorweed	*Pluchea rosea*	
Procession flower	*Polygala incarnata*	
Orange milkwort	*Polygala lutea*	
Candyroot	*Polygala nana*	
Showy milkwort	*Polygala violacea*	
Tall jointweed	*Polygonella gracilis*	
Mild waterpepper	*Polygonum hydropiperoides*	
Pennsylvania smartweed	*Polygonum pensylvanicum*	
Dotted smartweed	*Polygonum punctatum*	
Jumpseed	*Polygonum virginianum*	
Rustweed	*Polypremum procumbens*	
Marsh mermaidweed	*Proserpinaca palustris*	
American plum	*Prunus americana*	
Chickasaw plum	*Prunus angustifolia*	
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*	UP
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*	
Basket oak; Swamp chestnut oak	*Quercus michauxii*	
Dwarf live oak	*Quercus minima*	
Myrtle oak	*Quercus myrtifolia*	
Water oak	*Quercus nigra*	
Running oak	*Quercus pumila*	
Post oak	*Quercus stellata*	
Live oak	*Quercus virginiana*	
Wild radish	*Raphanus raphanistrum* *	
Pale meadowbeauty	*Rhexia mariana*	

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Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Maid Marian	*Rhexia nashii*	
Nuttall's meadowbeauty	*Rhexia nuttallii*	
Sweet pinxter azalea	*Rhododendron canescens*	
Winged sumac	*Rhus copallinum*	
Dollarleaf	*Rhynchosia reniformis*	
Twining snoutbean	*Rhynchosia tomentosa* var. *mollissima*	
Tropical Mexican clover	*Richardia brasiliensis* *	
Rough Mexican clover	*Richardia scabra* *	
Southern marsh yellowcress	*Rorippa teres*	
Rose	*Rosa* sp.	
Sand blackberry	*Rubus cuneifolius*	
Sawtooth blackberry	*Rubus pensilvanicus*	
Southern dewberry	*Rubus trivialis*	
Blackeyed Susan	*Rudbeckia hirta*	
Carolina wild petunia	*Ruellia caroliniensis*	
Heartwing dock	*Rumex hastatulus*	
Shortleaf rosegentian	*Sabatia brevifolia*	
Coastal rosegentian	*Sabatia calycina*	
Smallflower mock buckthorn	*Sageretia minutiflora*	
Carolina willow	*Salix caroliniana*	
Azure blue sage	*Salvia azurea*	
Lyreleaf sage	*Salvia lyrata*	
Elderberry	*Sambucus canadensis*	
Pineland pimpernel	*Samolus valerandi* ssp. *parviflorus*	
Canadian blacksnakeroot	*Sanicula canadensis*	
Soapberry	*Sapindus saponaria*	
Chinese tallowtree	*Sapium sebiferum* *	
Sassafras	*Sassafras albidum*	
Sweetbroom	*Scoparia dulcis*	
Helmet skullcap	*Scutellaria integrifolia*	
Small's skullcap	*Scutellaria multiglandulosa*	
Coffeeweed; Sicklepod	*Senna obtusifolia*	
Whitetop aster	*Seriocarpus tortifolius*	
Piedmont blacksenna	*Seymeria pectinata*	
Cuban jute	*Sida rhombifolia*	
Common wireweed	*Sida ulmifolia*	
Tough bully	*Sideroxylon tenax*	
Gum bully	*Sideroxylon lanuginosum*	
Florida bully	*Sideroxylon reclinatum*	
Sleepy catchfly	*Silene antirrhina*	
Kidneyleaf rosinweed	*Silphium compositum*	
Hairy leafcup	*Smallanthus uvedalia*	
American black nightshade	*Solanum americanum*	
Black nightshade	*Solanum chenopodioides*	
Carolina goldenrod	*Solidago arguta* var. *caroliniana*	
Canada goldenrod	*Solidago canadensis* var. *scabra*	

* Non-native species

++ Extirpated, historically present

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Pinebarren goldenrod	*Solidago fistulosa*	
Chapman's goldenrod	*Solidago odora* var. *chapmanii*	
Downy ragged goldenrod	*Solidago petiolaris*	
Twistedleaf goldenrod	*Solidago tortifolia*	
Spiny sowthistle	*Sonchus asper* *	
Common sowthistle	*Sonchus oleraceus* *	
Florida false buttonweed	*Spermacoce keyensis*	
Roughfruit scaleseed	*Spermolepis divaricata*	
Florida hedgenettle	*Stachys floridana*	
Queensdelight	*Stillingia sylvatica*	
Pineland scalypink	*Stipulicida setacea*	
Slickseed fuzzybean	*Strophostyles leiosperma*	
Pink fuzzybean	*Strophostyles umbellata*	
Coastalplain dawnflower	*Stylisma patens*	
Sidebeak pencilflower	*Stylosanthes biflora*	
American snowbell	*Styrax americanus*	
Climbing aster	*Symphyotrichum carolinianum*	
Eastern silver aster	*Symphyotrichum concolor*	
Rice button aster	*Symphyotrichum dumosum*	
Annual saltmarsh aster	*Symphyotrichum subulatum*	
Wavyleaf aster	*Symphyotrichum undulatum*	
White arrowleaf aster	*Symphyotrichum urophyllum* *	
Walter's aster	*Symphyotrichum walteri*	
Common sweetleaf	*Symplocos tinctoria*	
Scurf hoarypea	*Tephrosia chrysophylla*	
Florida hoarypea	*Tephrosia florida*	
Sprawling hoarypea	*Tephrosia hispidula*	
Spiked hoarypea	*Tephrosia spicata*	
Pineland nerveray	*Tetragonotheca helianthoides*	
Wood sage	*Teucrium canadense*	
Climbing dogbane	*Thyrsanthella difforme*	
Carolina basswood	*Tilia americana* var. *caroliniana*	
Atlantic poison oak	*Toxicodendron pubescens*	
Eastern poison ivy	*Toxicodendron radicans*	
Wavyleaf noseburn	*Tragia urens*	
Virginia marsh St. John's-wort	*Triadenum virginicum*	
Forked bluecurls	*Trichostema dichotomum*	
White clover	*Trifolium repens* *	
Persian clover	*Trifolium resupinatum* *	
Small Venus' looking-glass	*Triodanis biflora*	
Clasping Venus' looking-glass	*Triodanis perfoliata*	
Winged elm	*Ulmus alata*	
American elm	*Ulmus americana*	
Eastern purple bladderwort	*Utricularia purpurea*	
Sparkleberry	*Vaccinium arboreum*	
Highbush blueberry	*Vaccinium corymbosum*	

* Non-native species

++ Extirpated, historically present

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Shiny blueberry	*Vaccinium myrsinites*	
Deerberry	*Vaccinium stamineum*	
Purpletop vervain	*Verbena incompta* *	
Texas vervain	*Verbena officinalis* ssp. *halei*	
Sandpaper vervain	*Verbena scabra*	
Coastalplain crownbeard	*Verbesina aristata*	
White crownbeard	*Verbesina virginica*	
Tall ironweed	*Vernonia angustifolia*	
Giant ironweed	*Vernonia gigantea*	
Corn speedwell	*Veronica arvensis* *	
Possumhaw	*Viburnum nudum*	
Walter's viburnum	*Viburnum obovatum*	
Rusty blackhaw	*Viburnum rufidulum*	
Fourleaf vetch	*Vicia acutifolia*	
Common vetch	*Vicia sativa* *	
Bog white violet	*Viola lanceolata*	
Early blue violet	*Viola palmata*	
Common blue violet	*Viola sororia*	
Prostrate blue violet	*Viola walteri*	
Summer grape	*Vitis aestivalis*	
Florida grape	*Vitis cinerea* var. *floridana*	
Muscadine	*Vitis rotundifolia*	
Southern rockbell	*Wahlenbergia marginata* *	
American wisteria	*Wisteria frutescens*	
Chinese wisteria	*Wisteria sinensis* *	
Oriental false hawksbeard	*Youngia japonica* *	
Hercules-club	*Zanthoxylum clava-herculis*	

* Non-native species

++ Extirpated, historically present

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

INVERTEBRATES

Biting Midges

	Culicoides arboricola	MTC
	Culicoides debilipalpis	MTC
	Culicoides haematopotus	MTC
	Culicoides insignis	MTC
	Culicoides ousairani	MTC
	Culicoides stellifer	MTC

Beetles

Emerald Ash Borer	*Dictyoptera aurora*	MTC
Long-horned Beetles	*Acanthocinus obsoletus*	MTC
	Archodontes dasystomus	MTC
	Curius dentatus	MTC
	Dorcaschema alternatum	MTC
	Eburia distincta	MTC
	Eburia quadrigeminata	MTC
	Elaphidion mucronatum	MTC
	Enaphalodes atomarius	MTC
	Enaphalodes rufulus	MTC
	Hippopsis lemniscata	MTC
	Leptostylopsis planidorsus	MTC
	Lepturges angulatus	MTC
	Mallodon dasystomus	MTC
	Methia necydalea	MTC
	Parelaphidion aspersum	MTC
	Prionus imbricornis	MTC
	Prionus pocularis	MTC
	Scaphinus muticus	MTC
	Smodicum cucujiforme	MTC
	Urographis fasciatus	MTC
	Xylotrechus s. sagittatus	MTC
	Xylotrechus colonus	MTC

Spiders

Abbot Purseweb Spider	*Sphodros abboti*	UHF

Dragonflies

Common Green Darner	*Anax junius*	MTC
Green Grey Clubtail	*Arigomphus pallidus*	BST
Black-shouldered Spineyleg	*Dromogomphus spinosus*	BST
Swamp Darner	*Epiaeschna heros*	MTC
Prince Baskettail	*Epitheca princeps*	BST
Eastern Pondhawk	*Erythemis simplicicollis*	MTC
Slaty Skimmer	*Libellula incesta*	BST
Great Blue Skimmer	*Libellula vibrans*	MTC

* Non-native species

 ++ Extirpated, historically present

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Georgia River Cruiser	*Macromia illinoiensis georgina*	BST
Blue Dasher	*Pachydiplax longipennis*	MTC
Eastern Amberwing	*Perithemis tenera*	MTC
Carolina Saddlebags	*Tramea carolina*	MTC
Phantom Darner	*Triacanthagyna trifida*	MTC
Butterflies		
Gulf Fritillary	*Agraulis vanillae*	MTC
Delaware Skipper	*Anatrytone logan*	UP, MF, SH
Sachem Skipper	*Atalopedes campestris*	MTC
Great Purple Hairstreak	*Atlides halesus*	MTC
Viceroy	*Basilarchia archippus*	MTC
Red-spotted Purple	*Basilarchia arthemis astyanax*	AF, BF, FS, UHF
Pipevine Swallowtail	*Battus philenor*	MTC
Polydamas Swallowtail	*Battus polydamas*	MTC
Brazilian Skipper	*Calpodes ethlius*	UP, MF, SH
Red-banded Hairstreak	*Calycopis cecrops*	MTC
Spring Azure	*Celastrina ladon*	AF, BF, FS
Gemmed Satyr	*Cyllopsis gemma*	MTC
Wild Indigo Duskywing	*Erynnis baptisiae*	UP, SH
Horace's Duskywing	*Erynnis horatius*	MTC
Juvenal's Duskywing	*Erynnis juvenalis*	MTC
Zarucco Duskywing	*Erynnis zarucco*	MTC
Dun Skipper	*Euphyes vestris*	UP, MF, SH
Barred Yellow	*Eurema daira*	MTC
Little Yellow	*Eurema lisa*	MTC
Sleepy Orange	*Eurema nicippe*	UP, MF, SH
Zebra Swallowtail	*Eurytides marcellus*	MTC
Southern Hairstreak	*Fixsenia favonius*	MTC
Zebra Heliconian	*Heliconius charitonius*	MTC
Ceraunus Blue	*Hemiargus ceraunus*	MTC
Giant Swallowtail	*Heraclides cresphontes*	MTC
Carolina Satyr	*Hermeuptychia sosybius*	MTC
Fiery Skipper	*Hylephila phyleus*	MTC
Common Buckeye	*Junonia coenia*	MTC
Cassius Blue	*Leptotes cassius*	MTC
Clouded Skipper	*Lerema accius*	MTC
Eufala Skipper	*Lerodea eufala*	MTC
American Snout	*Libytheana carinenta*	MTC
Little Wood Satyr	*Megisto cymela*	MTC
Viola's Satyr	*Megisto viola*	MTC
Sweadner's Juniper Hairstreak	*Mitoura sweadneri*	MTC
Swarthy Skipper	*Nastra lherminier*	UP, MF, SH
Neamathla Skipper	*Nastra neamathla*	MTC
Dainty Sulphur	*Nathalis iole*	MTC
Twin-spot Skipper	*Oligoria maculata*	UP, MF, SH
Ocola Skipper	*Panquina ocola*	MTC

* Non-native species

++ Extirpated, historically present

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
White M Hairstreak	*Parrhasius m-album*	MTC
Cloudless Sulphur	*Phoebis sennae*	MTC
Phaon Crescent	*Phyciodes phaon*	MTC
Seminole Texan Crescent	*Phyciodes texana seminole*	AF, BF, FS, UHF
Pearl Crescent	*Phyciodes tharos*	MTC
Zabulon Skipper	*Poanes zabulon*	AF, BF, FS
Whirlabout	*Polites vibex*	MTC
Question Mark	*Polygonia interrogationis*	AF, BF, FS
Checkered White	*Pontia protodice*	MTC
Byssus Skipper	*Problema byssus*	AF, BF, FS
Eastern Tiger Swallowtail	*Pterourus glaucus*	MTC
Palamedes Swallowtail	*Pterourus palamedes*	MTC
Spicebush Swallowtail	*Pterourus troilus*	MTC
White Checkered Skipper	*Pyrgus albescens*	MTC
Tropical Checkered Skipper	*Pyrgus oileus*	MTC
Banded Hairstreak	*Satyrium calanus*	MF, SH
Striped Hairstreak	*Satyrium liparops*	MF, SH
King's Hairstreak	*Satyrium kingi*	MF, SH
Gray Hairstreak	*Strymon melinus*	MTC
Southern Cloudywing	*Thorybes bathyllus*	MTC
Confused Cloudywing	*Thorybes confusis*	MTC
Northern Cloudywing	*Thorybes pylades*	MTC
Long-tailed Skipper	*Urbanus proteus*	MTC
Red Admiral	*Vanessa atalanta*	MTC
American Lady	*Vanessa virginiensis*	MTC
Northern Broken Dash	*Wallengrenia egeremet*	MTC
Southern Broken Dash	*Wallengrenia otho*	MTC
Moths		
Alabama Underwing	*Catocala alabamae*	MTC
Gloomy Underwing	*Catocala andromedae*	MTC
Ilia Underwing	*Catocala ilia*	MTC
Lincoln Underwing	*Catocala lincolnana*	MTC
Little Underwing	*Catocala micronympha*	MTC
Orba Underwing	*Catocala orba*	MTC
Precious Underwing	*Catocala pretiosa*	MTC
Ultronia Underwing	*Catocala ultronia*	MTC
Umber Underwing	*Catocala umbrosa*	MTC
Sorghum Webworm Moth	*Nola cereella*	MTC
Zale Moth	*Zale* sp	MTC
Crustaceans		
Cave amphipods	*Hyalella* sp	ACV
Riverine Grass Shrimp	*Palaemonetes paludosus*	BST
Slough Crayfish	*Procambarus fallax*	BST
Seminole Crayfish	*Procambarus seminolae*	BST
Mollusks		

* Non-native species

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Pointed Campeloma	*Campeloma decisum*	BST
Asian Clam	*Corbicula fluminea* *	BST
Rasp Elimia	*Elimia floridensis*	BST
Variable Spike	*Elliptio icterina*	BST
Suwannee Moccasinshell	*Medionidus walkeri*	BST
Physa	*Physella* sp.	BST
Florida Applesnail	*Pomacea paludosa*	BST
Iridescent Lilliput	*Toxolasma paulus*	BST
Southern Rainbow	*Villosa vibex*	BST
Banded Mysterysnail	*Vivaparous georgianus*	BST

FISH

White Catfish	*Ameiurus catus*	BST
Yellow Bullhead	*Ameiurus natalis*	BST
Spotted Bullhead	*Ameiurus serracanthus*	BST
Bowfin	*Amia calva*	BST
American Eel	*Anquilla rostrata*	BST
Pirate Perch	*Aphredoderus sayanus*	BST
Lake Chubsucker	*Erimyzon sucetta*	BST
Redfin Pickerel	*Esox americanus americanus*	BST
Chain Pickerel	*Esox niger*	BST
Channel Catfish	*Ictalurus punctatus*	BST
Florida Brook Silverside	*Labidesthes sicculus vanhyningi*	BST
Longnose Gar	*Lepisosteus ossens*	BST
Florida Gar	*Lepisosteus platyrhincus*	BST
Redbreast Sunfish	*Lepomis auritus*	BST
Warmouth	*Lepomis gulosus*	BST
Bluegill	*Lepomis macrochirus*	BST
Readear Sunfish	*Lepomis microlophus*	BST
Spotted Sunfish	*Lepomis punctatus*	BST
Suwannee Bass	*Micropterus notius*	BST
Florida Largemouth Bass	*Micropterus salmoides floridanus*	BST
Spotted Sucker	*Minytrema melanops*	BST
Striped Mullet	*Mugil cephalus*	BST
Golden Shiner	*Notemigonus crysoleucas*	BST
Black Crappie	*Pomoxis nigromaculatus*	BST
Atlantic Needlefish	*Strongylura marina*	BST

AMPHIBIANS

Frogs and Toads

Florida Cricket Frog	*Acris gryllus dorsalis*	DM, SKLK
Oak Toad	*Anaxyrus quercicus*	SH, DM
Southern Toad	*Anaxyrus terrestris*	UHF, UP
Green Treefrog	*Hyla cinerea*	MF, FS, BS
Gopher Frog	*Lithobates capito*	SH, BS, DM

* Non-native species

++ Extirpated, historically present

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
American Bullfrog	*Lithobates catesbeiana*	BS, SKLK, BST
Southern Leopard Frog	*Lithobates sphenocephala*	BS, SKLK, BST
Southern Chorus Frog	*Pseudacris nigrita*	MF, BS
Little Grass Frog	*Pseudacris ocularis*	MF, BS, AF
Eastern Spadefoot Toad	*Scaphiopus holbrookii*	UP, DM
Salamanders and Amphiumas		
Eastern Tiger Salamander	*Ambystoma tigrinum tigrinum*	UP, DM
Two-toed Amphiuma	*Amphiuma means*	BS, DM, BST
Southern Dusky Salamander	*Desmognathus auriculatus*	SK
Mediterranean Gecko	*Hemidactylus turcicus* *	DV
Peninsula Newt	*Notopthalmus viridescens piaropicola*	DM, SKLK
REPTILES		
Crocodilians		
American Alligator	*Alligator mississippiensis*	SKLK, BST
Turtles		
Florida Softshell Turtle	*Apalone ferox*	SKLK, BST
Florida Snapping Turtle	*Chelydra serpentina osceola*	SKLK, BST
Gopher Tortoise	*Gopherus polyphemus*	MF, SH, UP
Striped Mud Turtle	*Kinosternon baurii*	SKLK, BST
Alligator Snapping Turtle	*Macrochelys temminckii*	BST
Florida Red-bellied Cooter	*Pseudemys nelsoni*	SKLK, BST
Peninsula Cooter	*Pseudemys peninsularis*	BST
Suwannee Cooter	*Pseudemys suwanniensis*	SKLK, BST
Loggerhead Musk Turtle	*Sternotherus minor*	BST
Eastern Musk Turtle; Stinkpot	*Sternotherus odoratus*	SKLK, BST
Florida Box Turtle	*Terrapene carolina bauri*	UHF, MEH
Red-eared Slider	*Trachemys scripta elegans* *	BST
Yellow-bellied Slider	*Trachemys scripta scripta*	BST
Lizards		
Green Anole	*Anolis carolinensis*	MTC
Six-lined Racerunner	*Aspidoscelis sexlineata*	SH, SCF
Eastern Glass Lizard	*Ophisaurus ventralis*	MTC
Mole Skink	*Plestiodon egregius*	SH, SCF
Southeastern Five-lined Skink	*Plestiodon inexpectatus*	MTC
Broad-headed Skink	*Plestiodon laticeps*	UHF, MEH, UP
Florida Worm Lizard	*Rhineura floridana*	SH, UP
Eastern Fence Lizard	*Sceloporus undulatus*	SH, UP
Snakes		
Florida Cottonmouth	*Agkistrodon piscivorus conanti*	BS, SWLK
Southern Black Racer	*Coluber constrictor priapus*	MF, SH, UP
Eastern Coachwhip	*Coluber flagellum flagellum*	SH, UP

* Non-native species

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
East.Diamond-backed Rattlesnake	*Crotalus adamanteus*	MF, SH, UP
Timber Rattlesnake	*Crotalus horridus*	MEH, UHF
Eastern Indigo Snake	*Drymarchon couperi*	SH, UP
Eastern Hognose Snake	*Heterodon platyrhinos*	SH, UP
Southern Hognose Snake	*Heterodon simus*	SH, UP
Scarlet Kingsnake	*Lampropeltis elapsoides*	MF, MEH, UP
Eastern Kingsnake	*Lampropeltis getula getula*	MEH, UP, AF
Eastern Coral Snake	*Micrurus fulvius*	UHF, MEH, UP
Redbelly Water Snake	*Nerodia erythrogaster erythrogaster*	SKLK, BST
Southern Water Snake	*Nerodia fasciata*	SKLK, SWLK
Brown Water Snake	*Nerodia taxispilota*	BST
Rough Green Snake	*Opheodrys aestivus*	MF, MEH, UP
Eastern Ratsnake	*Pantherophis alleghaniensis*	SH, UP, UMW
Eastern Corn Snake	*Pantherophis guttatus*	MF, SH, UP
Florida Pine Snake	*Pituophis melanoleucus mugitus*	SH, UP
Striped Crayfish Snake	*Regina alleni*	SKLK, SWLK, BST
Dusky Pigmy Rattlesnake	*Sistrurus miliarius barbouri*	MF, UP
Eastern Garter Snake	*Thamnophis sirtalis sirtalis*	MF, MF, AF

BIRDS

Waterfowl

Wood Duck	*Aix sponsa*	BS, SKLK, SWLK, BST
Hooded Merganser	*Lophodytes cucullatus*	SKLK, SWLK

Partridges, Grouse, and Turkeys

Wild Turkey	*Meleagris gallopavo*	SH, UMW, UP, MF

New World Quails

Northern Bobwhite	*Colinus virginianus*	SH, UP, MF

Loons

Common Loon	*Gavia immer*	OF

Grebes

Pied-billed Grebe	*Podilymbus podiceps*	SKLK, SWLK

Cormorants

Double-crested Cormorant	*Phalocrocorax auritus*	SKLK, SWLK

Anhingas

Anhinga	*Anhinga anhinga*	SKLK, SWLK, BST

Herons and Egrets

Great Blue Heron	*Ardea herodias*	SKLK, SWLK, BST
Great Egret	*Ardea alba*	SKLK, SWLK, BST
Snowy Egret	*Egretta thula*	SWLK
Little Blue Heron	*Egretta caerulea*	SKLK, SWLK, BST

* Non-native species

++ Extirpated, historically present

O'Leno State Park and River Rise Preserve State Park Animals

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Tricolored Heron	*Egretta tricolor*	SKLK, SWLK
Cattle Egret	*Bubulcus ibis*	OF
Green Heron	*Butorides virescens*	SKLK, SWLK
Yellow-crowned Night-Heron	*Nyctanassa violacea*	BST
Ibises and Spoonbills		
White Ibis	*Eudocimus albus*	SWLK
Roseate Spoonbill	*Platalea ajaja*	BST
Storks		
Wood Stork	*Mycteria americana*	BS, DM, FS
New World Vultures		
Black Vulture	*Coragyps atratus*	MF, SCF, OF
Turkey Vulture	*Cathartes aura*	MF, SCF, OF
Hawks, Eagles, and Kites		
Osprey	*Pandion haliaetus*	SKLK, SWLK, BST
Swallow-tailed Kite	*Elanoides forficatus*	MF, OF
Mississippi Kite	*Ictinia mississippiensis*	UHF, MF, AF
Bald Eagle	*Haliaeetus leucocephalus*	SKLK, OF
Northern Harrier	*Circus cyaneus*	OF
Sharp-shinned Hawk	*Accipiter striatus*	MTC, OF
Cooper's Hawk	*Accipiter cooperii*	UHF, UP, OF
Red-shouldered Hawk	*Buteo lineatus*	BS, MF, FS, OF
Broad-winged Hawk	*Buteo platypterus*	SHF, UHF, AF, OF
Red-tailed Hawk	*Buteo jamaicensis*	SH, UP, OF
Coots		
Common Gallinule	*Gallinula chloropus*	SWLK
American Coot	*Fulica americana*	SKLK, SWLK
Limpkins		
Limpkin	*Aramus guarauna*	BST
Cranes		
Sandhill Crane	*Grus canadensis*	OF,DM
Sandpipers		
Spotted Sandpiper	*Actitis macularius*	BST
Solitary Sandpiper	*Tringa solitaria*	SWLK
American Woodcock	*Scolopax minor*	MF, AF, FS
Gulls and Terns		
Ring-billed Gull	*Larus delawarensis*	OF
Pigeons and Doves		
Rock Pigeon	*Columba livia* *	MF

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O'Leno State Park and River Rise Preserve State Park Animals

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Eurasian Collared-Dove	*Streptopelia decaocto*	DV
Mourning Dove	*Zenaida macroura*	MTC
Common Ground-Dove	*Columbina passerina*	MF, SH
Cuckoos		
Black-billed Cuckoo	*Coccyzus erythropthalmus*	AF
Yellow-billed Cuckoo	*Coccyzus americanus*	UHF, MEH, UP, AF
Barn-Owls		
Barn Owl	*Tyto alba*	MEH, ABP
Owls		
Eastern Screech-Owl	*Otus asio*	SH, MEH, UP
Great Horned Owl	*Bubo virginianus*	UHF, MEH, UP
Barred Owl	*Strix varia*	BS, DS, FS
Nightjars		
Common Nighthawk	*Chordeiles minor*	SH, UP, OF
Chuck-will's-widow	*Antrostomus carolinensis*	UHF, MEH, UP
Eastern Whip-poor-will	*Antrostomus vociferus*	UHF, MEH, UP
Swifts		
Chimney Swift	*Chaetura pelagica*	OF
Hummingbirds		
Ruby-throated Hummingbird	*Archilochus colubris*	MF, UP
Kingfishers		
Belted Kingfisher	*Ceryle alcyon*	SKLK, SWLK, BST
Woodpeckers		
Red-headed Woodpecker	*Melanerpes erythrocephalus*	MF, SH, UP
Red-bellied Woodpecker	*Melanerpes carolinus*	MTC
Yellow-bellied Sapsucker	*Sphyrapicus varius*	UHF, MEH, MF
Downy Woodpecker	*Picoides pubescens*	MTC
Hairy Woodpecker	*Picoides villosus*	UP, MF
Red-cockaded Woodpecker	*Picoides borealis* ++	SH
Northern Flicker	*Colaptes auratus*	SH, UP, MF
Pileated Woodpecker	*Dryocopus pileatus*	MTC
Falcons		
American Kestrel	*Falco sparverius*	SH, UP, OF
Merlin	*Falco columbarius*	OF
Tyrant Flycatchers		
Eastern Wood-Pewee	*Contopus virens*	SH, UP

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++ Extirpated, historically present

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Acadian Flycatcher	*Empidonax virescens*	UHF, MF, AF, FS
Eastern Phoebe	*Sayornis phoebe*	SH, UP
Great Crested Flycatcher	*Myiarchus crinitus*	SH, MEH, UP
Eastern Kingbird	*Tyrannus tyrannus*	SH
Shrikes		
Loggerhead Shrike	*Lanius ludovicianus*	SH, MF
Vireos		
White-eyed Vireo	*Vireo griseus*	UHF, MEH, MF, AF
Yellow-throated Vireo	*Vireo flavifrons*	SH, MF, UP
Blue-headed Vireo	*Vireo solitarius*	UHF, MEH
Warbling Vireo	*Vireo gilvus*	UHF
Philadelphia Vireo	*Vireo philadelphicus*	UHF
Red-eyed Vireo	*Vireo olivaceus*	UHF, UP, MF
Crows and Jays		
Blue Jay	*Cyanocitta cristata*	MTC
American Crow	*Corvus brachyrhynchos*	MF, SH, UP, OF
Fish Crow	*Corvus ossifragus*	OF
Swallows		
Purple Martin	*Progne subis*	OF
Tree Swallow	*Tachycineta bicolor*	OF
Barn Swallow	*Hirundo rustica*	BST, OF
Tits and Allies		
Carolina Chickadee	*Poecile carolinensis*	SH, MEH, UP
Tufted Titmouse	*Baeolophus bicolor*	MTC
Nuthatches		
Red-breasted Nuthatch	*Sitta canadensis*	UHF, UP
Brown-headed Nuthatch	*Sitta pusilla* ++	MF
Creepers		
Brown Creeper	*Certhia americana*	UHF, MEH
Wrens		
Carolina Wren	*Thryothorus ludovicianus*	MTC
House Wren	*Troglodytes aedon*	MF, SH
Winter Wren	*Troglodytes hiemalis*	BS, DS, FS
Kinglets		
Golden-crowned Kinglet	*Regulus satrapa*	SH, UP
Ruby-crowned Kinglet	*Regulus calendula*	MTC
Old World Warblers and Gnatcatchers		

* Non-native species

 ++ Extirpated, historically present

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Blue-gray Gnatcatcher	*Polioptila caerulea*	MTC
Thrushes		
Eastern Bluebird	*Sialia sialis*	SH
Veery	*Catharus fuscescens*	UHF, MEH
Gray-cheeked Thrush	*Catharus minimus*	UHF, MEH
Swainson's Thrush	*Catharus ustulatus*	UHF, MEH
Hermit Thrush	*Catharus guttatus*	UHF, MEH
Wood Thrush	*Hylocichla mustelina*	UHF, MEH
American Robin	*Turdus migratorius*	MTC
Mockingbirds and Thrashers		
Gray Catbird	*Dumetella carolinensis*	MF, SCF
Northern Mockingbird	*Mimus polyglottos*	SH, MF, MF
Brown Thrasher	*Toxostoma rufum*	UHF, MEH, MF
Starlings		
European Starling	*Sturnus vulgaris* *	MF, DV
Waxwings		
Cedar Waxwing	*Bombycilla cedrorum*	MF, SH
New World Warblers		
Ovenbird	*Seiurus aurocapilla*	UHF, MEH, MF
Worm-eating Warbler	*Helmitheros vermivorum*	UHF, MEH, MF, BF
Louisiana Waterthrush	*Parkesia motacilla*	FS, BST
Northern Waterthrush	*Parkesia noveboracensis*	FS, BST
Golden-winged Warbler	*Vermivora chrysoptera*	UHF, UP, MF, AF
Blue-winged Warbler	*Vermivora cyanoptera*	UHF, UP, MF
Black-and-white Warbler	*Mniotilta varia*	UHF, UP, MF, BF
Prothonotary Warbler	*Protonotaria citrea*	BS, DS, FS
Swainson's Warbler	*Limnothlypis swainsonii*	UHF
Tennessee Warbler	*Oreothlypis peregrina*	UHF, MF, AF
Orange-crowned Warbler	*Oreothlypis celata*	SH, UHF, UP
Connecticut Warbler	*Oporornis agilis*	UP
Kentucky Warbler	*Geothlypis formosa*	MF, UHF
Common Yellowthroat	*Geothlypis trichas*	BS, DS, DM
Hooded Warbler	*Setophaga citrina*	UHF, MEH, MF, AF
American Redstart	*Setophaga ruticilla*	MEH, UP, MF, AF
Cape May Warbler	*Setophaga tigrina*	SH, MEH, UP
Cerulean Warbler	*Setophaga cerulea*	UHF
Northern Parula	*Setophaga americana*	UHF, BS, MF, AF, FS
Magnolia Warbler	*Setophaga magnolia*	UHF, UP, MF, AF
Bay-breasted Warbler	*Setophaga castanea*	UHF, MF, AF, FS
Blackburnian Warbler	*Setophaga fusca*	UHF, UP
Yellow Warbler	*Setophaga petechia*	DM

* Non-native species

++ Extirpated, historically present

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Chestnut-sided Warbler	*Setophaga pensylvanica*	SH, UHF, MF
Blackpoll Warbler	*Setophaga striata*	SH, UP
Black-throated Blue Warbler	*Setophaga caerulescens*	UHF, MF, AF, FS
Palm Warbler	*Setophaga palmarum*	MF, SH, UP
Pine Warbler	*Setophaga pinus*	SH, UP
Yellow-rumped Warbler	*Setophaga coronata*	MTC
Yellow-throated Warbler	*Setophaga dominica*	SH, UP
Prairie Warbler	*Setophaga discolor*	MF, SH, UP
Black-throated Green Warbler	*Setophaga virens*	SH, UHF, UP
Canada Warbler	*Cardellina canadensis*	UHF, MF, AF
Wilson's Warbler	*Cardellina pusilla*	BS, MF, FS
Yellow-breasted Chat	*Icteria virens*	MF, SCF
Tanagers		
Summer Tanager	*Piranga rubra*	MF, SH, MEH
Scarlet Tanager	*Piranga olivacea*	MEH, UP
Sparrows and Allies		
Eastern Towhee	*Pipilo erythrophthalmus*	MF, SCF
Bachman's Sparrow	*Peucaea aestivalis*	MF, SH
Chipping Sparrow	*Spizella passerina*	SH, DV
Field Sparrow	*Spizella pusilla*	SH, UP
Vesper Sparrow	*Pooecetes gramineus*	SH, ABP
Savannah Sparrow	*Passerculus sandwichensis*	SH, ABP
Grasshopper Sparrow	*Ammodramus savannarum*	DM
Henslow's Sparrow	*Ammodramus henslowii*	DM
Fox Sparrow	*Passerella iliaca*	UHF, BS
Song Sparrow	*Melospiza melodia*	MF, MEH, UP
White-throated Sparrow	*Zonotrichia albicollis*	MF, SH, ABP
Cardinals, Grosbeaks and Buntings		
Northern Cardinal	*Cardinalis cardinalis*	MTC
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	UHF, MEH
Blue Grosbeak	*Guiraca caerulea*	MF, SH, UP
Indigo Bunting	*Passerina cyanea*	MF, SCF
Blackbirds and Allies		
Bobolink	*Dolichonyx oryzivorus*	DM
Red-winged Blackbird	*Agelaius phoeniceus*	BS, DM, FS
Eastern Meadowlark	*Sturnella magna*	SH, ABP
Rusty Blackbird	*Euphagus carolinus*	BS, DS, FS
Common Grackle	*Quiscalus quiscula*	SH, DV, MF
Brown-headed Cowbird	*Molothrus ater* *	MTC
Orchard Oriole	*Icterus spurius*	MEH, UP
Baltimore Oriole	*Icterus galbula*	UHF, MEH, UP
Finches and Allies		

* Non-native species

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Purple Finch	*Haemorhous purpureus*	MEH, UP
American Goldfinch	*Carduelis tristis*	UHF, OF
Old World Sparrows		
House Sparrow	*Passer domesticus* *	DV
MAMMALS		
Didelphids		
Virginia Opossum	*Didelphis virginiana*	MTC
Insectivores		
Southern Short-tailed Shrew	*Blarina carolinensis*	UHF, UP
Least Shrew	*Cryptotis parva*	SH, UP
Eastern Mole	*Scalopus aquaticus*	SH, UP
Bats		
-----	*Lasiurus* sp.	UHF, MEH
Southeastern Bat	*Myotis austroriparus*	MF, OF
Eastern Pipestrelle	*Pipistrellus subflavus*	MF, OF
Edentates		
Nine-banded Armadillo	*Dasypus novemcinctus* *	MTC
Lagomorphs		
Eastern Cottontail	*Sylvilagus floridanus*	MTC
Marsh Rabbit	*Sylvilagus palustris*	MF, DM
Rodents		
Beaver	*Castor canadensis*	BST
Southeastern Pocket Gopher	*Geomys pinetis*	SH, UP
Southern Flying Squirrel	*Glaucomys volans*	UHF, MEH, UP
Capybara	*Hydrochoerus hydrochaeris* *	FS, AF
Eastern Woodrat	*Neotoma floridana*	UHF, MEH, UP
Golden Mouse	*Ochrotomys nuttalli*	MF, MEH
Cotton Mouse	*Peromyscus gossypinus*	MF, UHF, UMW, UP
Eastern Gray Squirrel	*Sciurus carolinensis*	MTC
Sherman's Fox Squirrel	*Sciurus niger shermani*	SH, UP
Hispid Cotton Rat	*Sigmodon hispidus*	SH, UP
Carnivores		
Coyote	*Canis latrans* *	MTC
River Otter	*Lutra canadensis*	SKLK, SWLK, BST
Bobcat	*Lynx rufus*	MTC
Striped Skunk	*Mephitis mephitis*	MTC
Long-tailed Weasel	*Mustela frenata*	MF, MEH, UP
Raccoon	*Procyon lotor*	MTC

* Non-native species

O'Leno State Park and River Rise Preserve State Park Animals

Common Name	*Scientific Name*	Primary Habitat Codes (for imperiled species)
Gray Fox	*Urocyon cinereoargenteus*	MF, MEH, UP
Black Bear	*Ursus americanus*	MTC
Artiodactyls		
White-tailed Deer	*Odocoileus virginianus*	MTC
Feral Hog	*Sus scrofa* *	MTC

* Non-native species

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 ..... ABF
Abandoned pasture ..... ABP
Agriculture ..... AG

Canal/ditch.....CD
Clearcut pine plantation ..... CPP
Clearing CL
Developed.....DV
Impoundment/artificial pond.....IAP
Invasive exotic monoculture ..... IEM
Pasture - improved.....PI
Pasture - semi-improved.....PSI
Pine plantation..... PP
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

O'Leno State Park/River Rise Preserve 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 six zones of the O'Leno State Park/River Rise Preserve. A field visit was made on August 14, 2013.

Zone 3Cs

Several zones with similar characteristics were viewed during our visit to this property, stand 3Cs being one of them. These stands were comprised primarily of an upland hardwood component with the occasional longleaf pine. Restoration of these stands will require removal of the undesirable hardwoods, a chemical application (mechanical or hand application) to control hardwood sprouting, and planting of longleaf pine. The restoration of these stands is certainly possible. This will be an expensive, long term process requiring patience, flexibility, and commitment of all involved in order for it to be successful.

Removal of the undesirable hardwood component can be accomplished in one of two ways:

1) The hardwood trees can be treated with an approved herbicide, left in place to die, gradually breaking down and decomposing over time. This would involve the individual stem treatment of the smaller, undesirable hardwoods. Over time, this would allow more sunlight to reach the ground, promoting the growth of groundcover species now being shaded out by overstory hardwoods and leaf litter. In addition, it would create small openings where longleaf could be planted. As these stands continued to be prescribe burned, these smaller hardwoods would gradually be consumed by the periodic fires. Over time, some of the larger undesirable hardwoods may succumb to the periodic prescribe burns. Remaining larger hardwood trees could gradually be removed through individual stem treatment with an approved herbicide.

2) The hardwood can be sold. In addition to the traditional hardwood markets of the past such as hardwood pulpwood and hardwood logs, there is an additional fuelwood market that utilizes much of the logging debris left from the conventional logging operation in addition to the smaller, non-merchantable material that was not utilized. Much of this undesirable non-merchantable material of the past can now be utilized as fuel chips. The chipping operation leaves the site relatively free of the unsightly logging slash typically found on conventional logging sites. This type of logging operation is highly mechanized, requiring adequate access for logging equipment and trucks. This operation may involve smaller harvest areas spaced out over a longer time period instead of one sizeable clearcut. Present roads would need to be widened for truck access. Following the logging operation, a chemical application would be required to control hardwood sprouting.

Zone 2CE

Former bahiagrass pasture now supporting a natural, fully stocked, merchantable stand of loblolly pine.

Clearcut loblolly pine. Approximately one year following the completion of harvest, establish firelines and prescribe burn this stand. For removal of bahiagrass, spray the area with recommended herbicide at the appropriate time using recommended rates. In winter, following the herbicide application, plant longleaf seedlings.

Zone 1N, 1QW

Mature natural Loblolly pine with open understory of mixed hardwoods. Much of this zone is burned on a regular basis, maintaining a relatively open, park-like appearance for visitors.

This zone runs along the main entrance drive into the park. Harvesting of large, mature timber such as this is difficult to accomplish in a “delicate” manner and will most certainly take away from the aesthetic appeal of this entrance drive. Following the harvest, there will be a flush of hardwood sprouting as demonstrated in past salvaging of bug spots in this area, resulting in the loss of the open park like look.

As a resource manager, I have to give precedence to the present aesthetic qualities of this area over restoration efforts. I would not recommend any harvesting activities along the entrance drive.

Zone 1J North

This area of upland hardwood would require similar treatment options presented for stand 3Cs. Should the decision be made to harvest this area, it is too small to work as a stand alone project for the typical logging operation unless combined with another project with similar characteristics and objectives such as Zone 1M.

Zone 1M

Mature mixed pine (longleaf, slash, and loblolly pine) with understory of mixed upland hardwoods. There is unimproved access to this area. Harvest loblolly pine and a portion of slash pine, leaving longleaf pine. Harvest undesirable hardwood through conventional harvesting methods or possibly in combination with a chipping operation. This may be the better alternative as the site would be left relatively free of logging slash. Approximately one year from the completion of the harvesting operation, assess the site for prescribe burning and individual stem/foliage treatment of hardwood sprouting. Once undesirable hardwoods are adequately controlled, begin planting longleaf pine in larger openings.

Addendum 9 —Land Management Review

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION
MARJORY STONEMAN DOUGLAS BUILDING
3900 COMMONWEALTH BOULEVARD
TALLAHASSEE, FLORIDA 32399-3000

RICK SCOTT
GOVERNOR

HERSCHEL T. VINYARD JR.
SECRETARY

MEMORANDUM

TO: Marianne Gengenbach, Program Administrator
Division of State Lands

FROM: Parks Small, Chief, Bureau of Natural and Cultural Resources
Division of Recreation and Parks

Lew Scruggs, Assistant Chief, Office of Park Planning
Division of Recreation and Parks

SUBJECT: Response to Draft Land Management Review (LMR) River Rise Preserve State Park / O'leno State Park

DATE: July 15, 2013

The Land Management Review draft report provided to DRP determined that management of River Rise Preserve State Park and O'leno State Park by the Division of Recreation and Parks met the two tests prescribed by law. Namely, the review team concluded that the land is being managed for the purposes for which it was acquired and in accordance with the land management plan.

Below are Additional Recommendations and Checklist Findings (items the LMR determined should be further addressed in the management plan update) of the draft LMR report, with our manager's response to each. The responses were prepared via a coordinated effort of the park, district office, and our offices.

The team recommends that DRP and park staff seek assistance from a professional forester to update the analysis of pine stands and harvest options, and provide guidance to improve success of reforestation efforts. (VOTE: 6+, 0-)
Managing Agency Response: Agree; The next Unit Management Plan will include an updated timber analysis.

The team recommends that DRP identify and prioritize the plant and animal species that require monitoring, in consultation with FWC, FNAI and other appropriate agencies. (VOTE: 6+, 0-)
Managing Agency Response: Agree; DRP will consult with FWC, FNAI and other agencies to identify and prioritize plant and animal species monitoring. Primary inventory and monitoring focus must be on species that require special management attention. All-species inventory generally must be a lower priority than actually conducting actions to manage habitats. As

needed, costs for inventory will be included in the Unit Management Plan, but can only be allocated as funds become available on a statewide priority needs basis.

The team recommends that DRP staff investigate interim management actions to prevent further soil erosion at the Bible Camp Road restoration until final project can be implemented. (VOTE: 6+, 0-)
Managing Agency Response: Disagree; Funding for this project has been awarded and DRP staff will focus on working with Columbia County to implement and complete the restoration as soon as possible rather than diverting energies to interim actions.

PLAN REVIEW

The review team average score indicates a need for acknowledgement of natural communities, specifically upland mixed woodland and mesic hammock. Please provide documentation in the management plan.
Managing Agency Response: Agree; The updated Unit Management Plan will address the upland mixed woodland and mesic hammock natural communities as well as other natural communities and altered land cover types as described by the Florida Natural Areas Inventory.

The review team average score indicates a need for acknowledgement of listed species: protection & preservation, specifically plant inventory. Please provide documentation in the management plan.
Managing Agency Response: Agree; The O'Leno River Rise Unit Management Plan update will specifically discuss actions needed for the management of listed species including plants.

The review team average score indicates a need for acknowledgement of natural resources survey/management resources, specifically listed species or habitat monitoring, other non-game species or habitat monitoring and other habitat management effects monitoring. Please provide documentation in the management plan.
Managing Agency Response: Agree; Intensity of listed species management and monitoring actions will be documented in the next plan. Other habitat or species monitoring will also be documented in the plan.

The review team average score indicates a need for acknowledgement of restoration of ruderal areas, specifically Bible Camp Rd./Blackwater Stream and southern pine beetle mesic flatwoods site. Please provide documentation in the management plan.
Managing Agency Response: Agree; DRP is collaborating with Columbia County to complete the restoration of the Bible Camp Rd. project. The county has received funding through an FWC boater improvement grant. This will be documented in the management plan. We also agree on the restoration of the mesic flatwoods that were impacted by southern pine beetles and this will be documented in the management plan update.

The review team average score indicates a need for acknowledgement of non-native, invasive & problem species, specifically prevention of pest/pathogens. Please provide documentation in the management plan.
Managing Agency Response: Agree; Documentation will be included in the next management plan.

The review team average score indicates a need for acknowledgement of adjacent property concerns, specifically discussion of potential surplus land determination and surplus lands identified. Please provide documentation in the management plan.
Managing Agency Response: Agree; DRP will address the determination of surplus lands in the update of the management plan.

FIELD REVIEW
The review team average score indicates a need for acknowledgement of infrastructure, specifically funding. Please provide documentation in the management plan.
Managing Agency Response: DRP will consider these recommendations during the next unit management plan revision.

Thank you for your attention.

/gk

CC: Clif Maxwell, Chief, Bureau of Parks District 2
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