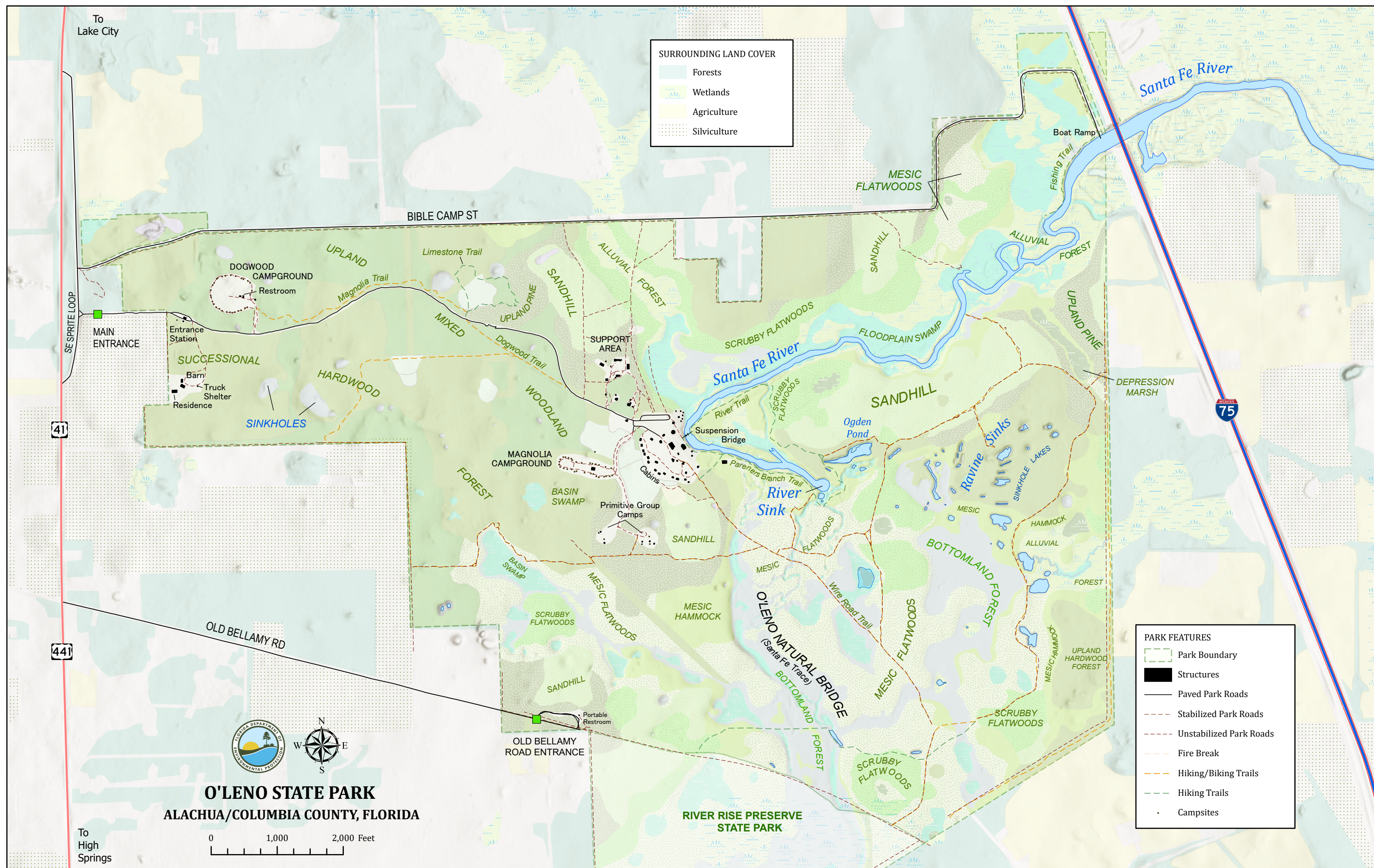


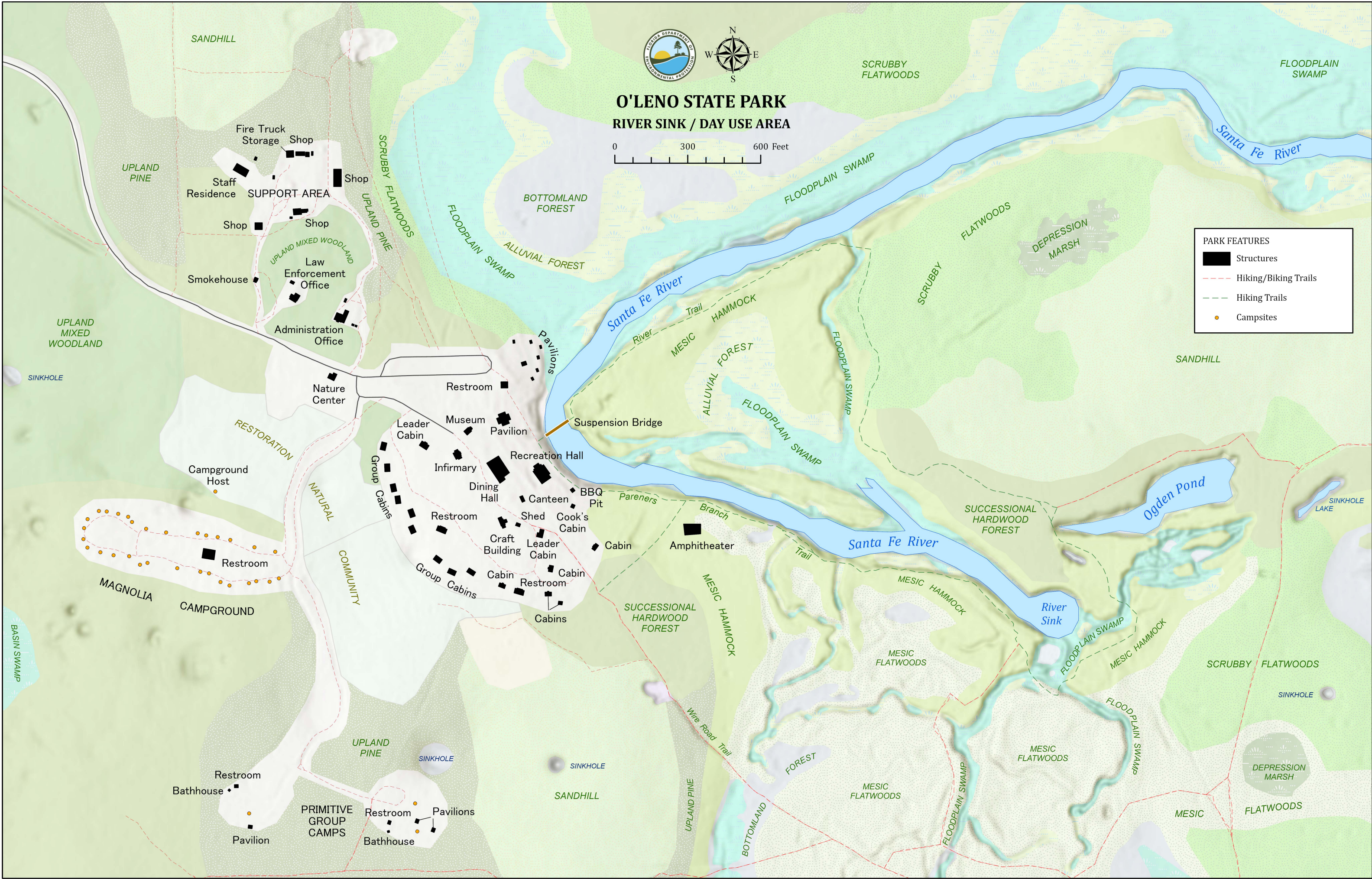


O'LENO STATE PARK RIVER RISE STATE PARK

Park Chapter

NORTH FLORIDA HIGHLANDS REGION





O'LENO STATE PARK RIVER SINK / DAY USE AREA

0 300 600 Feet

PARK FEATURES

- Structures
- Hiking/Biking Trails
- Hiking Trails
- Campsites

INTRODUCTION

LOCATION AND ACQUISITION HISTORY

O'Leno State Park and River Rise Preserve State Park span portions of Columbia and Alachua counties. The Vicinity Map shows both parks in context of other regionally significant land and water resources. As adjacent units, the two parks are managed holistically regarding resource management and recreational planning. O'Leno State Park is the visitor orientation and interpretive gateway for recreational opportunities afforded at both parks and is accessed from U.S. Highway 41.

O'Leno State Park was acquired on Sept. 4, 1934, with funds from the Land Acquisition Trust Fund (LATF) under the original Lease No. 2324. Currently, the park comprises 2,372.41 acres. River Rise Preserve State Park was acquired on Sept. 4, 1974, under O'Leno State Park's existing lease (No. 2324). Currently, the park comprises 3,844.43 acres.

On March 28, 1984, the Board of Trustees of the Internal Improvement Trust Fund (Trustees) amended the term of Lease No. 2324 for O'Leno State Park and River Rise Preserve State Park to 50 years. On Aug. 24, 1988, the Trustees assigned O'Leno State Park/River Rise Preserve State Park a new lease (No. 3638) without changing the conditions of the prior lease (No. 2324). The current lease (No. 3638), which includes both units, will expire on March 27, 2034.

The units are designated single-use to provide public outdoor recreation and conservation. There are no legislative or executive directives that constrain the use of this property (see Addendum 1). A legal description of the park property can be made available upon request to the Florida Department of Environmental Protection (DEP).

SECONDARY AND INCOMPATIBLE USES

In accordance with 253.034(5) F.S., the potential of the park to accommodate secondary management purposes was analyzed. These secondary purposes were considered within the context of the Division of Recreation and Parks' (DRP) statutory responsibilities and resource values. This analysis considered the park's natural and cultural resources, management needs, aesthetic values, visitation and visitor experiences. It was determined that timber management for restoration could be accommodated in a manner that would be compatible and not interfere with the primary purpose of resource-based outdoor recreation and conservation.

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

In accordance with 253.034(5) F.S., the potential for generating revenue to enhance management was also analyzed. Visitor fees and charges are the principal source of revenue generated by the park. It was determined that selective timbering in support of natural community restoration would be appropriate at this park as an additional source of revenue for land management since the intent of this activity is compatible with the park's primary purpose of resource-based outdoor recreation and conservation.

Generating revenue from consumptive uses or from activities that are not expressly related to resource management and conservation is not under consideration.

PURPOSE AND SIGNIFICANCE OF THE PARK

Park Purpose

The purpose of O'Leno State Park and River Rise Preserve State Park is to protect distinct karst characteristics of the Santa Fe River and supporting natural areas for the benefit of conservation and the provision of resource-based recreation.

Park Significance

- O'Leno State Park was originally developed in the 1930s by the Civilian Conservation Corps (CCC) and the Works Progress Administration as a Florida Forest Service training camp at the previous site of the mill town of Leno.
- Generations of people including indigenous, Spanish and settlers crossed the natural land bridge, created where the Santa Fe River flows underground for several miles from River Sink to River Rise. The name of this Native American route changed over time to The Spanish Mission Trail and subsequently to the Bellamy Road, Florida's first federally funded highway.
- The parks protect prominent hydrological and karst features of the Santa Fe River system, including the Old Bellamy Cave System, a vast underground system of aquatic caves. Numerous cultural sites provide evidence that these features drew generations of Florida's first peoples to inhabit this area.
- 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.

Central Park Themes

The scenic Santa Fe River winds through O'Leno State Park before abruptly plunging underground at River Sink, a mysterious geological feature that has inspired generations of Florida's conservationists.

After flowing beneath our feet for over three miles, the Santa Fe River re-emerges from its complex underground journey at River Rise Preserve State Park, breathing new life into a landscape shaped by Florida's ancient geological past.

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

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

OTHER DESIGNATIONS

The units 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 a component of the Florida Greenways and Trails System, administered by the DEP Office of Greenways and Trails.

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

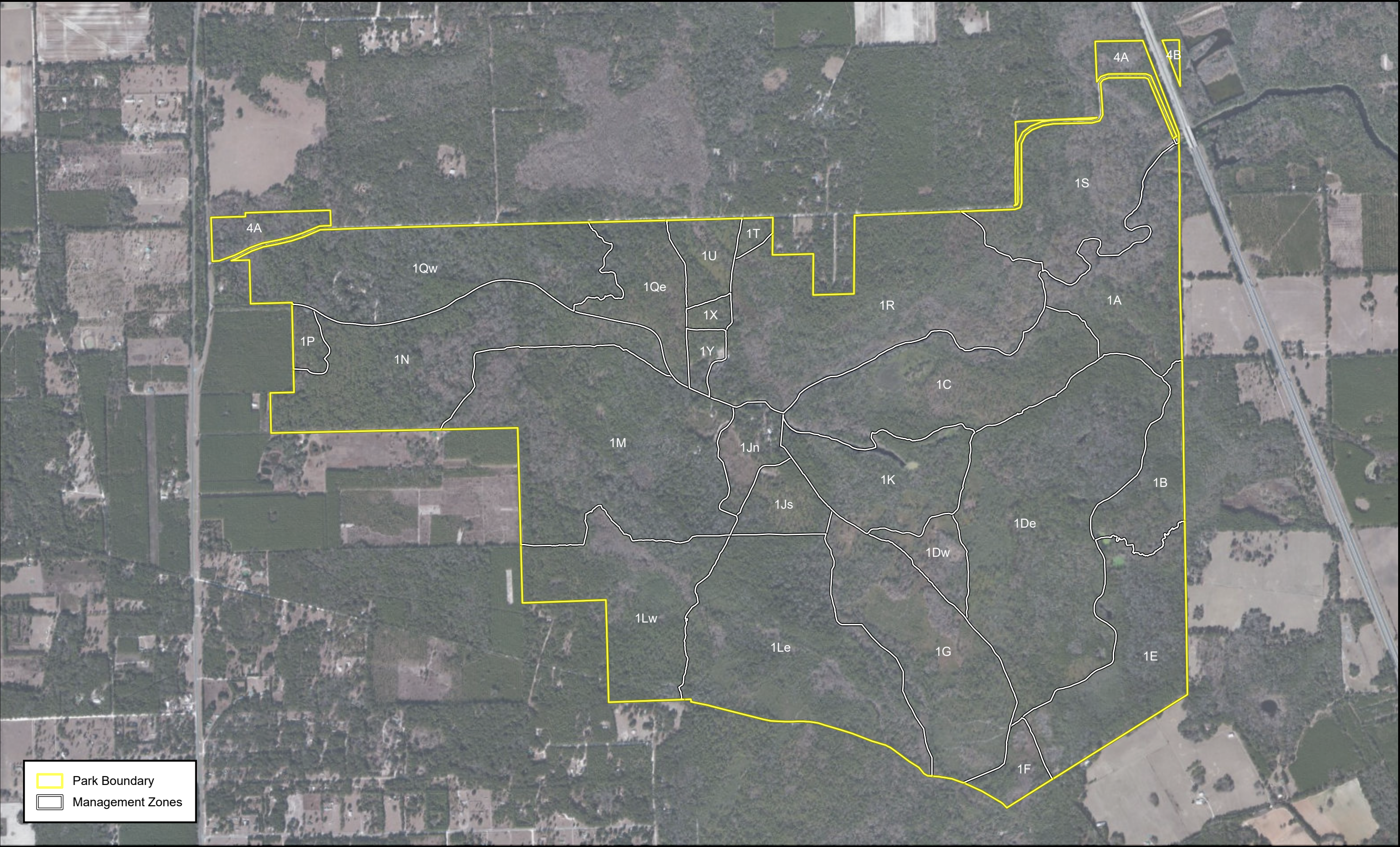
PARK ACCOMPLISHMENTS

- Annually applied up to 1,000 acres of prescribed fire between both units.
- At both units, staff improved natural communities by employing mechanical reduction of understory coupled with prescribed fire.
- New interpretive programs were developed at both units.
- Essential resource management equipment was procured for use at both units.

RESOURCE MANAGEMENT COMPONENT

O'Leno State Park and River Rise Preserve State Park Management Zones			
Management Zone	Acreage	Managed with Prescribed Fire	Contains Known Cultural Resources
OL-1De	262.07	Y	Y
OL-1Dw	25.13	Y	Y
RR-2Dn	74.44	Y	Y
RR-2Ds	36.29	Y	Y
RR-2Fe	158.65	Y	Y
RR-2Fs	137.26	N	Y
RR-2Fw	69.86	Y	Y
RR-2Gn	62.01	Y	Y
RR-2Gs	45.8	N	Y
RR-2Kn	28.31	N	Y
RR-2Ks	80.61	N	Y
OL-1A	91.27	Y	Y
OL-1B	49.34	Y	N
OL-1C	135.25	Y	Y
OL-1E	117.96	Y	Y
OL-1F	19.85	Y	Y
OL-1G	139.34	Y	Y
OL-1Jn	28.08	Y	Y
OL-1Js	30.22	Y	Y
OL-1K	82.72	Y	Y
OL-1Le	196.45	Y	Y
OL-1Lw	118.42	Y	Y
OL-1M	237.92	Y	Y
OL-1N	164.66	Y	Y
OL-1P	11.5	Y	N
OL-1Qe	56.06	Y	Y
OL-1Qw	160.21	Y	Y
OL-1R	229.48	Y	Y
OL-1S	129.96	Y	Y
OL-1T	5.86	Y	N
OL-1U	27.03	Y	Y
OL-1X	7.35	Y	Y
OL-1Y	10.92	Y	Y

Management Zone	Acreage	Managed with Prescribed Fire	Contains Known Cultural Resources
OL-4A	33.03	Y	N
OL-4B	2.31	N	N
RR-2Ae	146.59	Y	Y
RR-2Aw	71.34	Y	Y
RR-2B	38.99	Y	Y
RR-2Ce	118.42	Y	Y
RR-2Cw	73.38	Y	Y
RR-2E	193.07	Y	Y
RR-2H	190.9	N	Y
RR-2J	213.67	N	Y
RR-2L	446.29	Y	Y
RR-2M	33.73	Y	N
RR-2N	282.67	Y	Y
RR-3A	29.52	Y	N
RR-3Bn	25.86	Y	N
RR-3Bs	140.04	Y	Y
RR-3Cn	41.42	Y	N
RR-3Cs	84.23	Y	Y
RR-3D	158.57	Y	Y
RR-3E	242.57	Y	Y
RR-3F	272.85	Y	Y
RR-3Ge	164.76	Y	N
RR-3Gw	39.84	Y	N
RR-3H	125.26	N	N
RR-3J	17.24	N	Y
RR-3K	161.06	Y	N

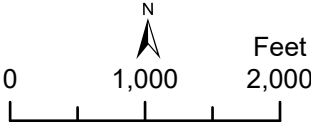


Park Boundary

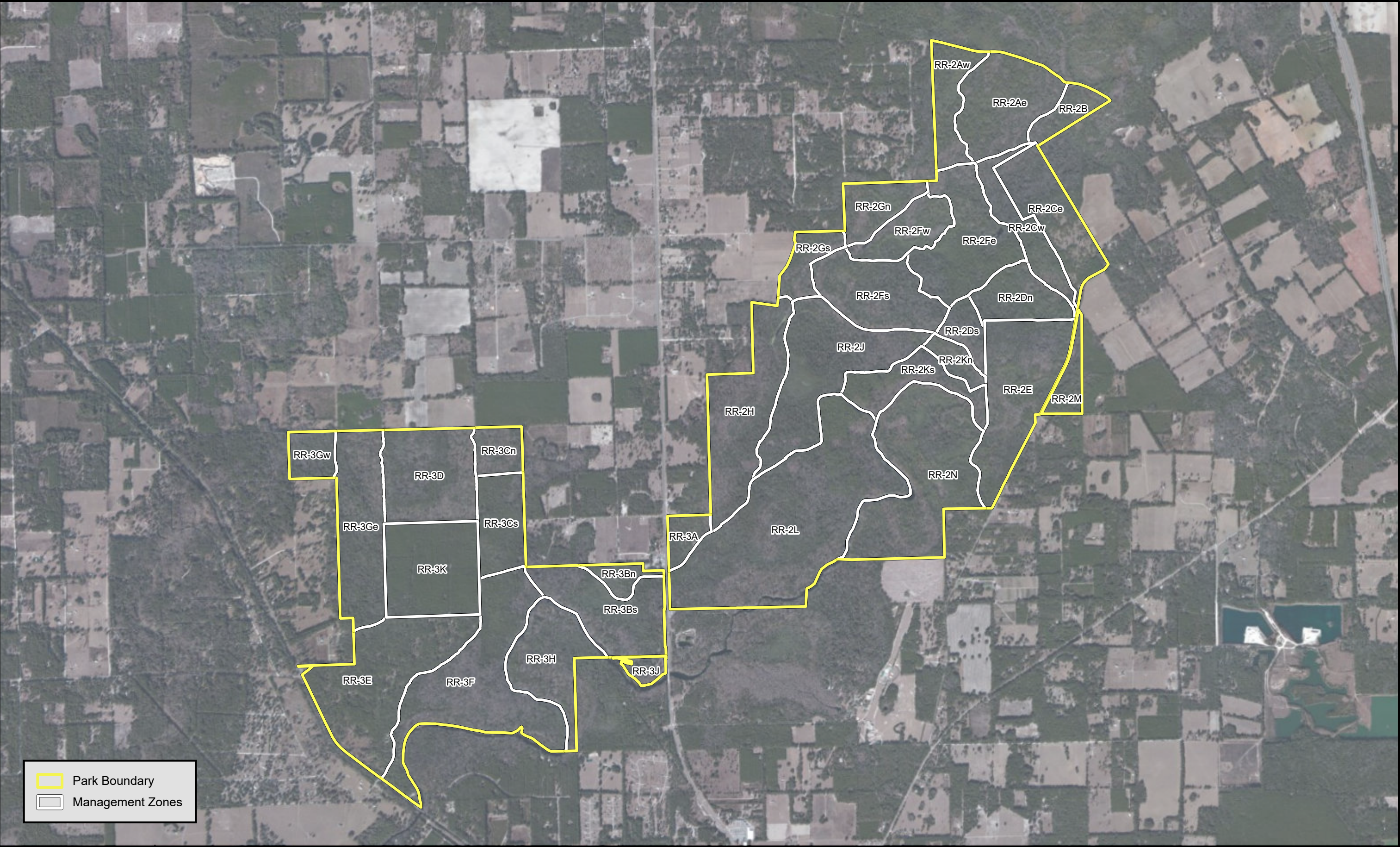
Management Zones



O'LENO STATE PARK
Management Zones



Sources: ESRI; Florida Department of Environmental Protection
This graphical representation is provided for informational purposes and should not be considered authoritative for navigational, engineering, legal, and other uses.



Park Boundary

Management Zones



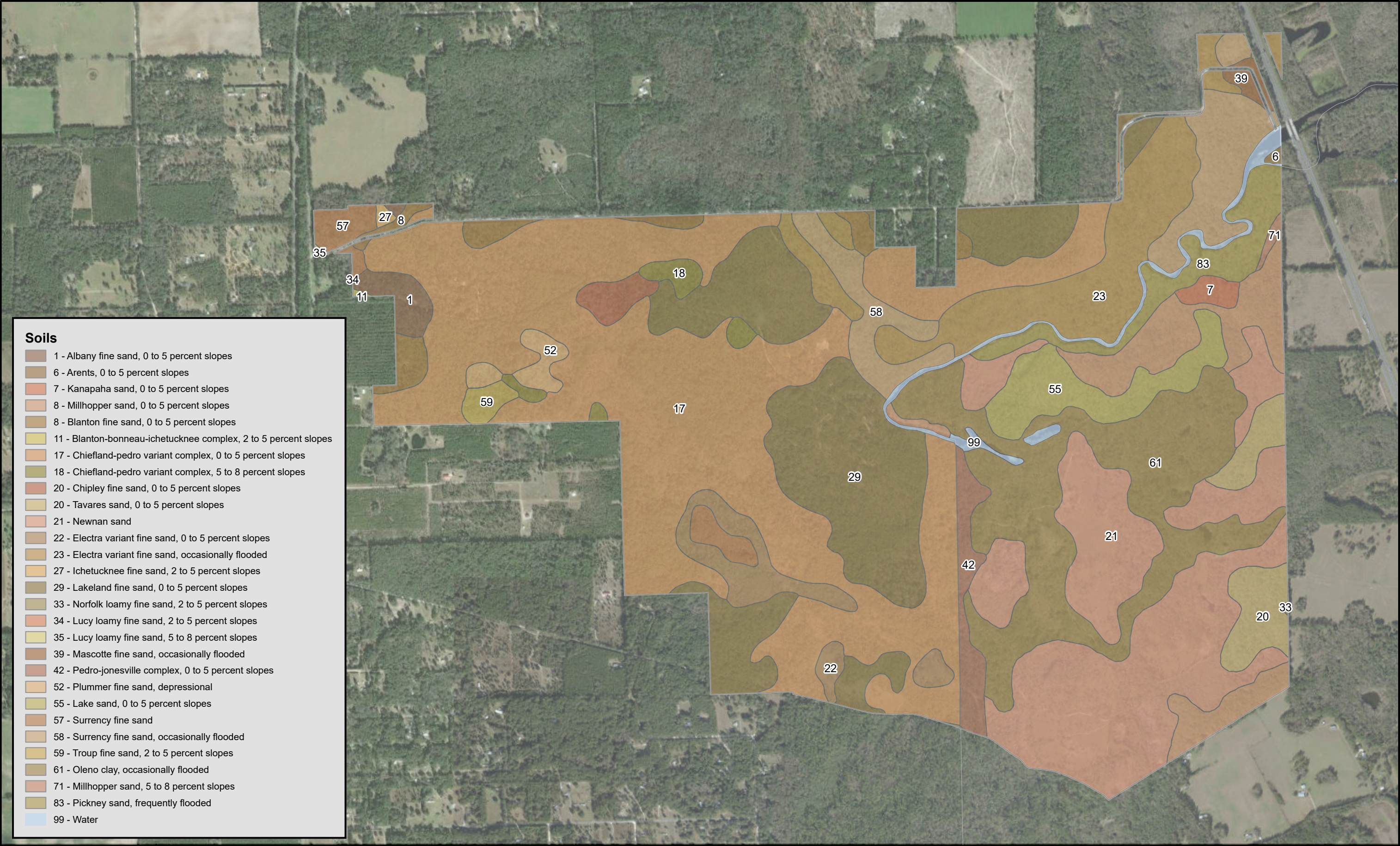
RIVER RISE PRESERVE STATE PARK
Management Zones

N

00.51

Mile

Sources: ESRI; Florida Department of Environmental Protection
This graphical representation is provided for informational purposes and should not be considered authoritative for navigational, engineering, legal, and other uses.

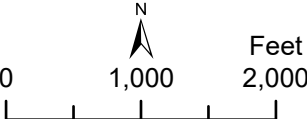


Soils

- 1 - Albany fine sand, 0 to 5 percent slopes
- 6 - Arents, 0 to 5 percent slopes
- 7 - Kanapaha sand, 0 to 5 percent slopes
- 8 - Millhopper sand, 0 to 5 percent slopes
- 8 - Blanton fine sand, 0 to 5 percent slopes
- 11 - Blanton-bonneau-ichetucknee complex, 2 to 5 percent slopes
- 17 - Chiefland-pedro variant complex, 0 to 5 percent slopes
- 18 - Chiefland-pedro variant complex, 5 to 8 percent slopes
- 20 - Chipley fine sand, 0 to 5 percent slopes
- 20 - Tavares sand, 0 to 5 percent slopes
- 21 - Newnan sand
- 22 - Electra variant fine sand, 0 to 5 percent slopes
- 23 - Electra variant fine sand, occasionally flooded
- 27 - Ichetucknee fine sand, 2 to 5 percent slopes
- 29 - Lakeland fine sand, 0 to 5 percent slopes
- 33 - Norfolk loamy fine sand, 2 to 5 percent slopes
- 34 - Lucy loamy fine sand, 2 to 5 percent slopes
- 35 - Lucy loamy fine sand, 5 to 8 percent slopes
- 39 - Mascotte fine sand, occasionally flooded
- 42 - Pedro-jonesville complex, 0 to 5 percent slopes
- 52 - Plummer fine sand, depressional
- 55 - Lake sand, 0 to 5 percent slopes
- 57 - Surrency fine sand
- 58 - Surrency fine sand, occasionally flooded
- 59 - Troup fine sand, 2 to 5 percent slopes
- 61 - Oleno clay, occasionally flooded
- 71 - Millhopper sand, 5 to 8 percent slopes
- 83 - Pickney sand, frequently flooded
- 99 - Water



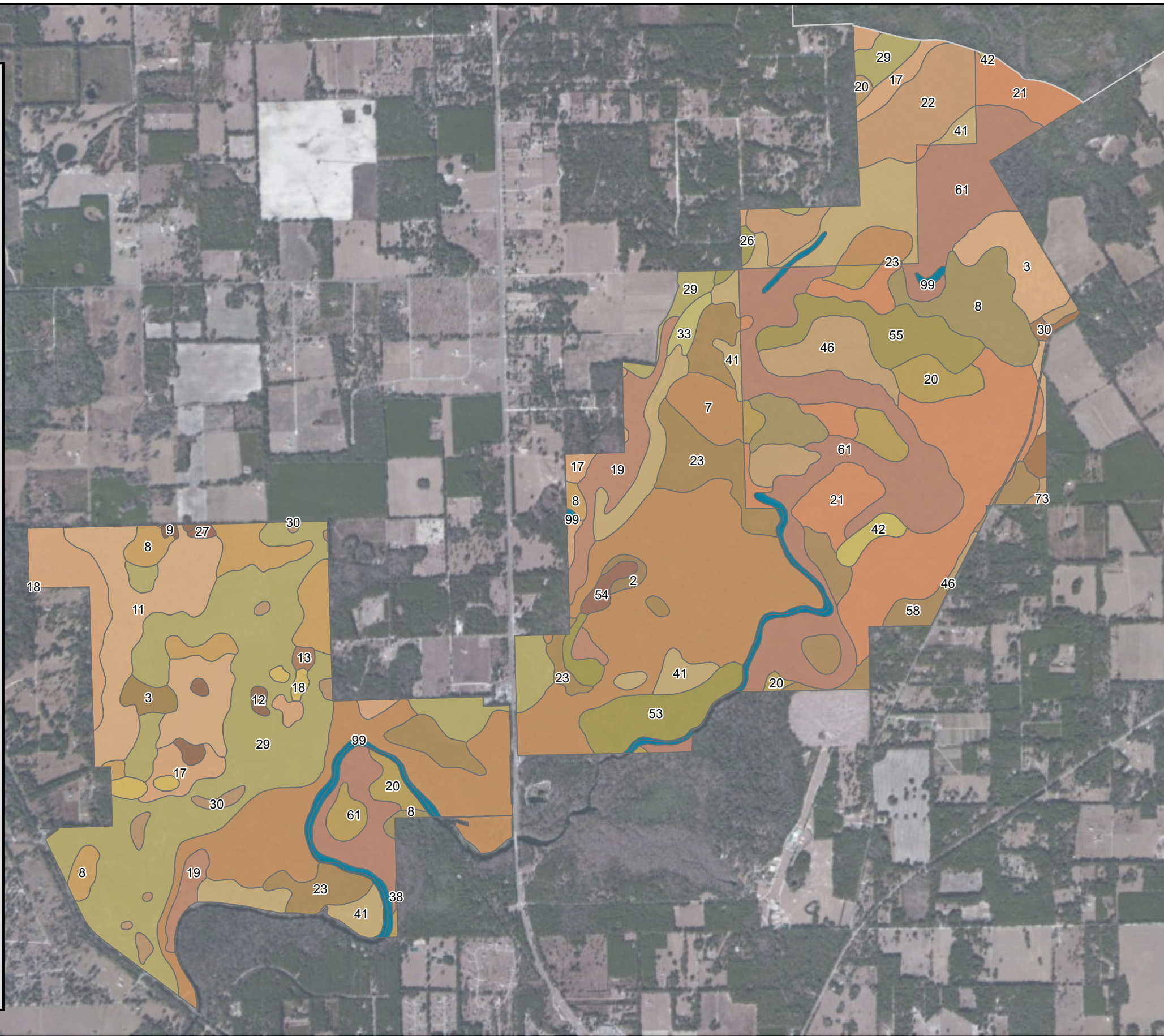
**O'LENO STATE PARK
Soils**



Sources: ESRI; Florida Department of Environmental Protection
This graphical representation is provided for informational purposes and should not be considered authoritative for navigational, engineering, legal, and other uses.

Soils

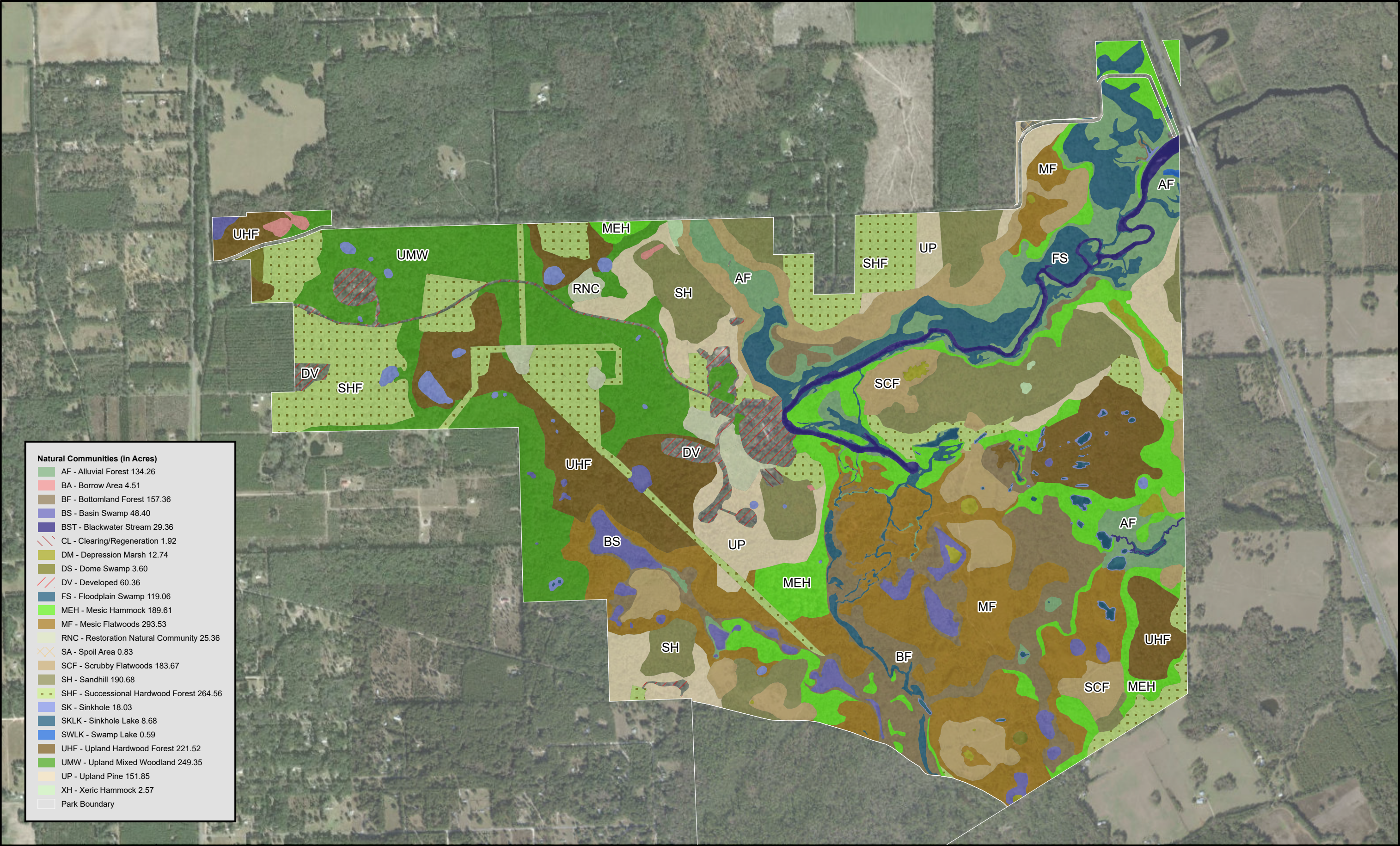
- 2 - Albany fine sand, occasionally flooded
- 3 - Alpin fine sand, 0 to 5 percent slopes
- 3 - Arredondo fine sand, 0 to 5 percent slopes
- 7 - Bigbee fine sand
- 8 - Blanton fine sand, 0 to 5 percent slopes
- 8 - Millhopper sand, 0 to 5 percent slopes
- 9 - Blanton fine sand, 5 to 8 percent slopes
- 11 - Blanton-bonneau-ichetucknee complex, 2 to 5 percent slopes
- 12 - Blanton-bonneau-ichetucknee complex, 5 to 8 percent slopes
- 13 - Bonneau fine sand, 2 to 5 percent slopes
- 17 - Chiefland-pedro variant complex, 0 to 5 percent slopes
- 18 - Chiefland-pedro variant complex, 5 to 8 percent slopes
- 19 - Chiefland-pedro variant complex, occasionally flooded
- 20 - Chipley fine sand, 0 to 5 percent slopes
- 20 - Tavares sand, 0 to 5 percent slopes
- 21 - Newnan sand
- 22 - Electra variant fine sand, 0 to 5 percent slopes
- 23 - Electra variant fine sand, occasionally flooded
- 26 - Hurricane fine sand
- 27 - Ichetucknee fine sand, 2 to 5 percent slopes
- 29 - Lakeland fine sand, 0 to 5 percent slopes
- 30 - Kendrick sand, 2 to 5 percent slopes
- 30 - Lakeland fine sand, 5 to 12 percent slopes
- 33 - Leon fine sand, occasionally flooded
- 38 - Pits and dumps
- 41 - Oleno clay
- 42 - Pedro-jonesville complex, 0 to 5 percent slopes
- 46 - Jonesville-cadillac-bonneau complex, 0 to 5 percent slopes
- 53 - Plummer fine sand, occasionally flooded
- 54 - Plummer muck, depressional
- 55 - Lake sand, 0 to 5 percent slopes
- 58 - Lake fine sand, 0 to 5 percent slopes
- 61 - Oleno clay, occasionally flooded
- 73 - Kendrick sand, 5 to 8 percent slopes
- 99 - Water



RIVER RISE STATE PARK
Soils



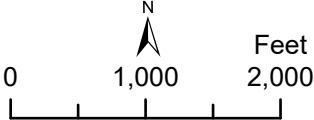
Sources: ESRI; Florida Department of Environmental Protection
This graphical representation is provided for informational purposes and should not be considered authoritative for navigational, engineering, legal, and other uses.



Natural Communities (in Acres)	
AF - Alluvial Forest	134.26
BA - Borrow Area	4.51
BF - Bottomland Forest	157.36
BS - Basin Swamp	48.40
BST - Blackwater Stream	29.36
CL - Clearing/Regeneration	1.92
DM - Depression Marsh	12.74
DS - Dome Swamp	3.60
DV - Developed	60.36
FS - Floodplain Swamp	119.06
MEH - Mesic Hammock	189.61
MF - Mesic Flatwoods	293.53
RNC - Restoration Natural Community	25.36
SA - Spoil Area	0.83
SCF - Scrubby Flatwoods	183.67
SH - Sandhill	190.68
SHF - Successional Hardwood Forest	264.56
SK - Sinkhole	18.03
SKLK - Sinkhole Lake	8.68
SWLK - Swamp Lake	0.59
UHF - Upland Hardwood Forest	221.52
UMW - Upland Mixed Woodland	249.35
UP - Upland Pine	151.85
XH - Xeric Hammock	2.57
Park Boundary	






























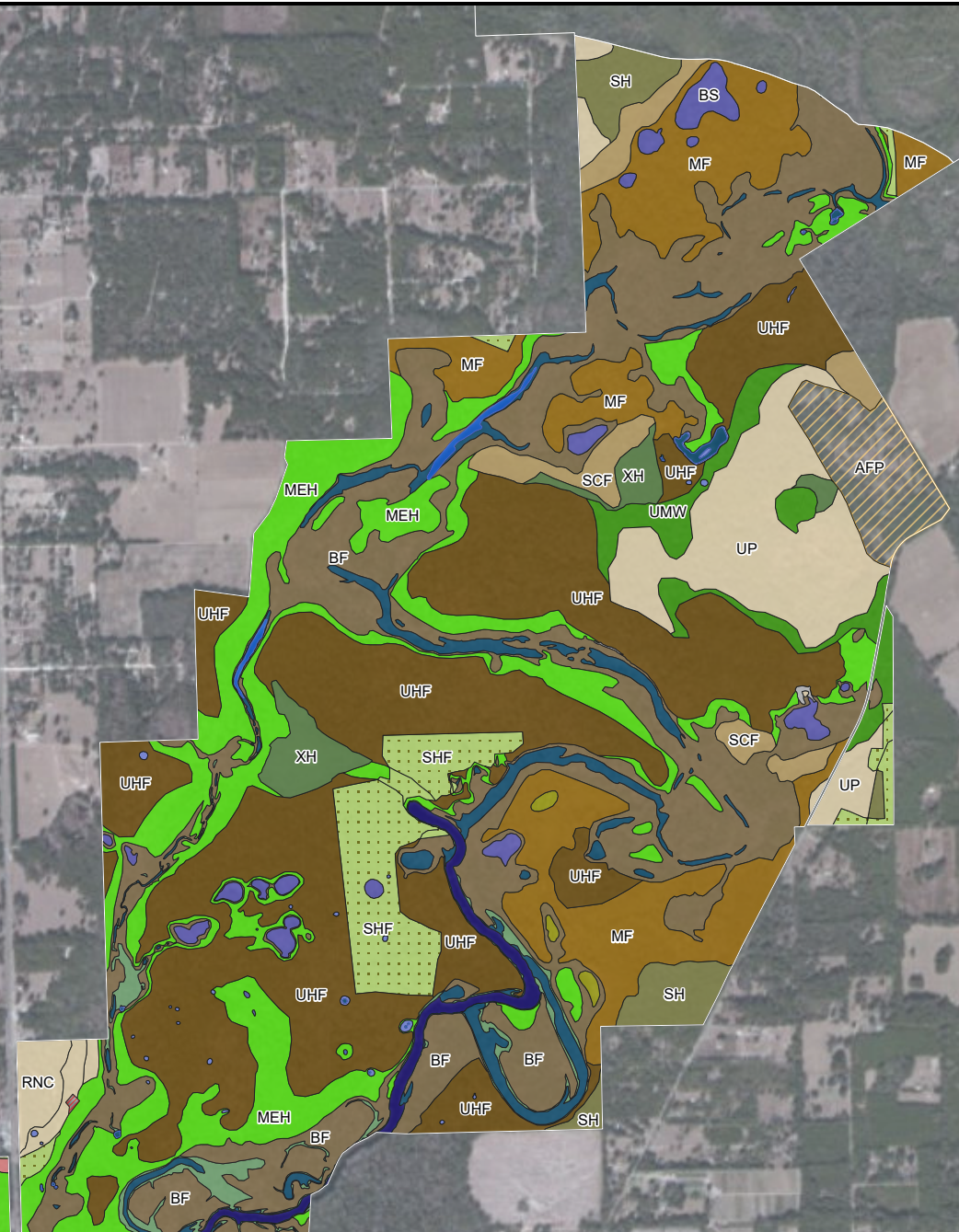
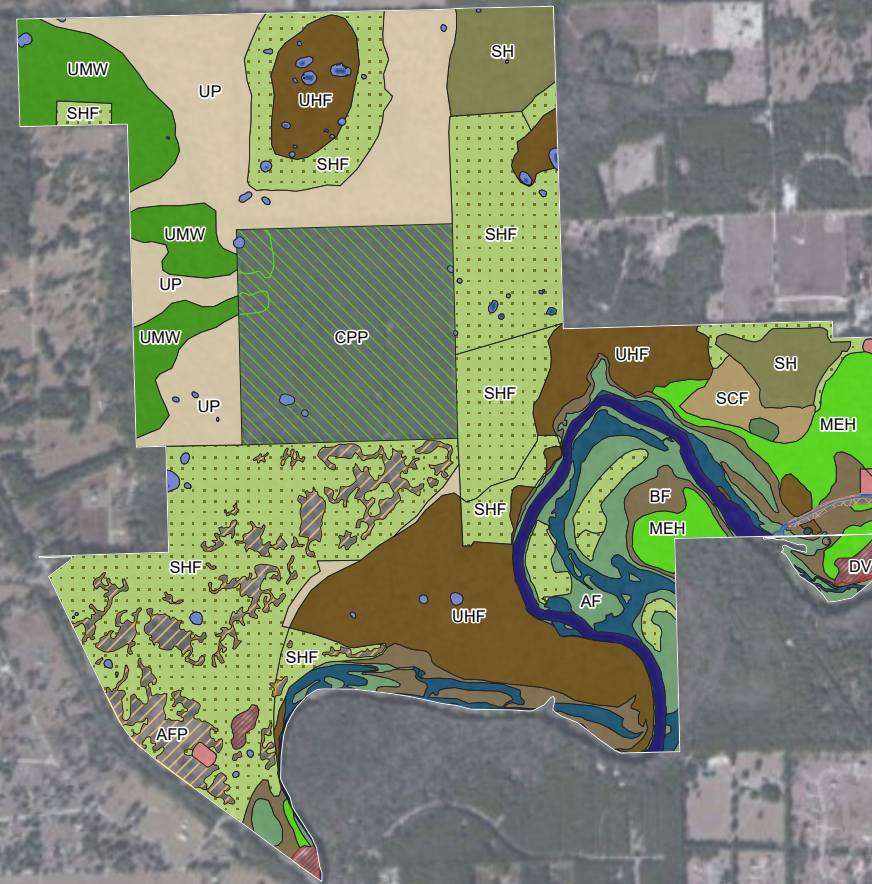
O'LENO STATE PARK
Natural Communities - Existing Conditions



Sources: ESRI; Florida Department of Environmental Protection
This graphical representation is provided for informational purposes and should not be considered authoritative for navigational, engineering, legal, and other uses.

Natural Communities (In Acres)

	AF - Alluvial Forest 105.66
	AFP - Abandoned Field/Abandoned Pasture 120.09
	BA - Borrow Area 4.12
	BF - Bottomland Forest 615.91
	BS - Basin Swamp 33.08
	BST - Blackwater Stream 53.11
	CD - Canal/ditch 1.37
	CPP - Clearcut Pine Plantation 160.08
	DM - Depression Marsh 3.99
	DV - Developed 10.36
	FS - Floodplain Swamp 127.98
	LO - Limestone Outcrop 0.98
	MEH - Mesic Hammock 381.84
	MF - Mesic Flatwoods 250.93
	RNC - Restoration Natural Community 26.82
	SA - Spoil Area 1.85
	SCF - Scrubby Flatwoods 72.66
	SH - Sandhill 109.38
	SHF - Successional Hardwood Forest 509.23
	SK - Sinkhole 12.46
	SKLK - Sinkhole Lake 3.94
	SWLK - Swamp Lake 4.94
	TCV - Terrestrial Cave 0.11
	UHF - Upland Hardwood Forest 857.22
	UMW - Upland Mixed Woodland 141.77
	UP - Upland Pine 354.05
	XH - Xeric Hammock 40.52



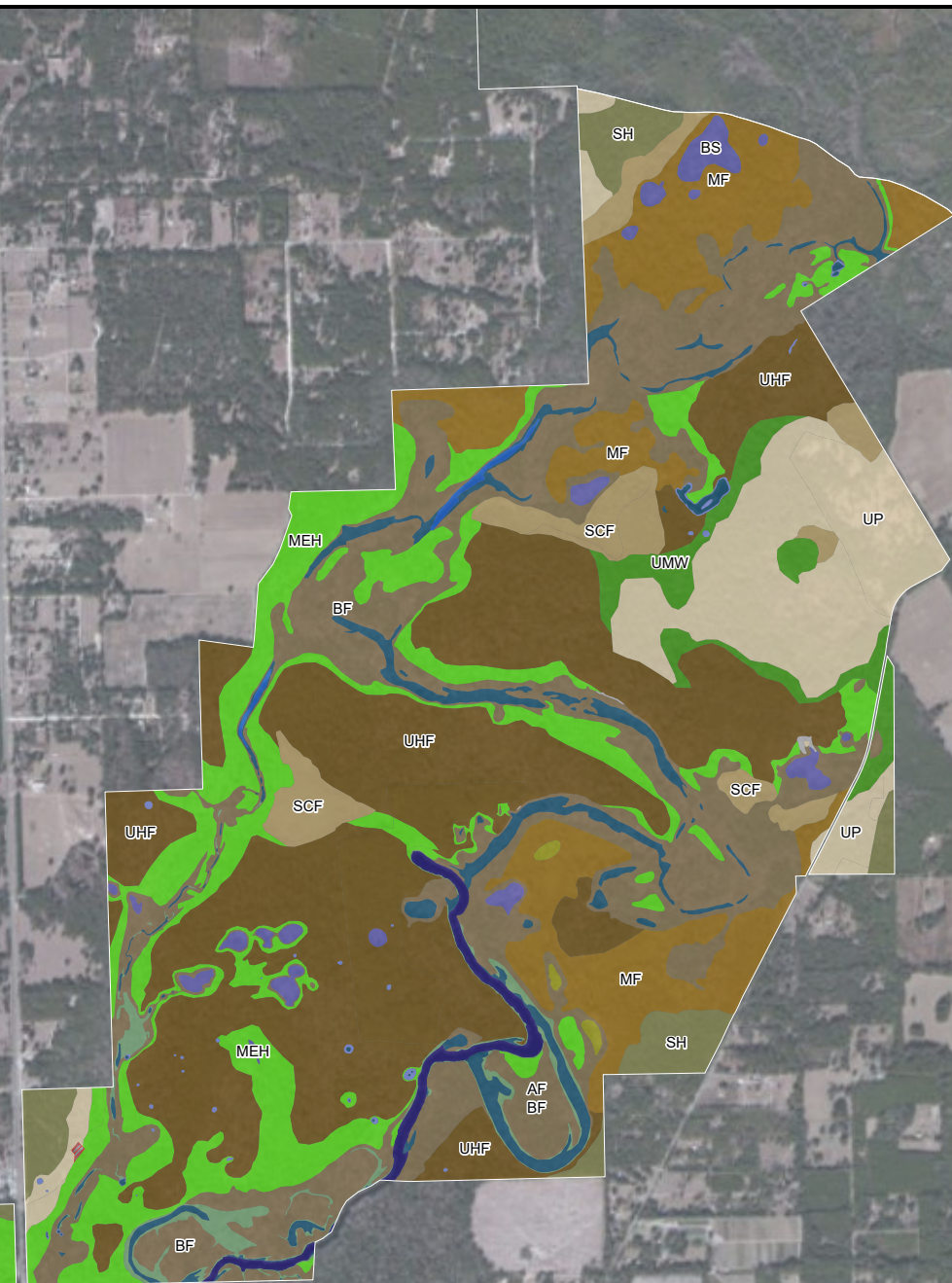
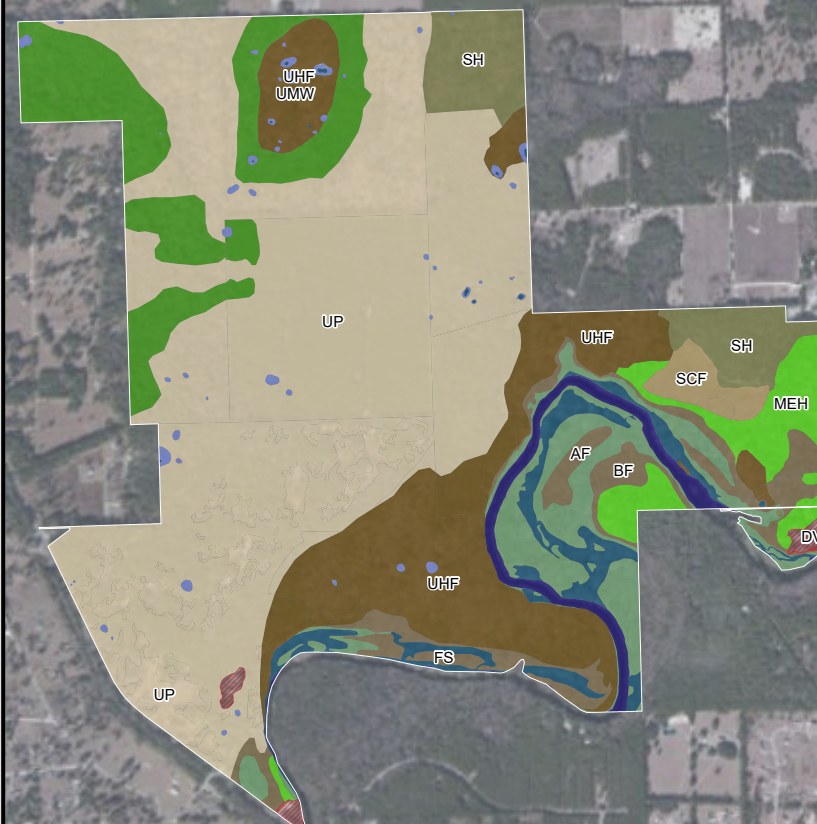
RIVER RISE PRESERVE STATE PARK Natural Communities - Existing Conditions

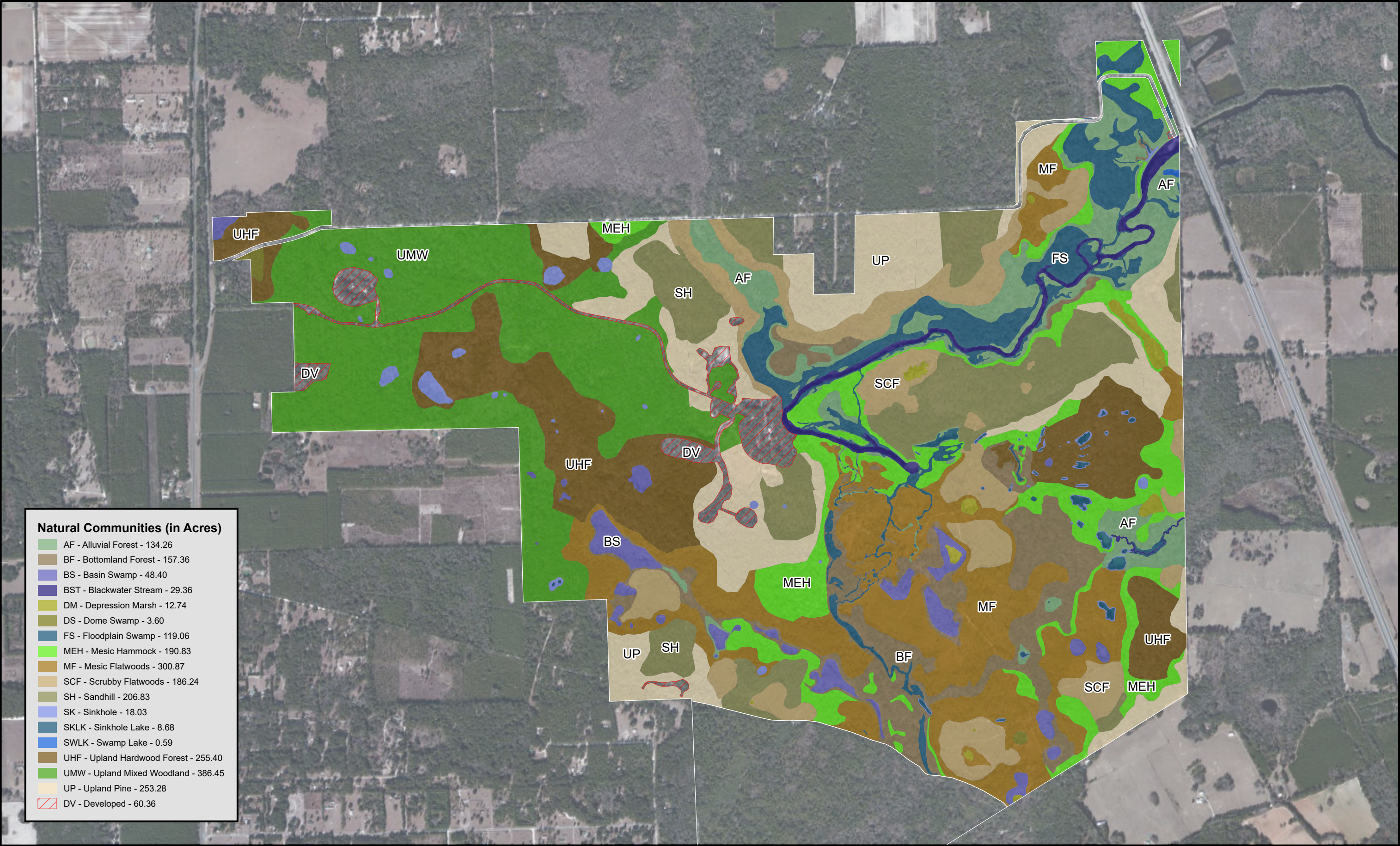


Sources: ESRI; Florida Department of Environmental Protection
This graphical representation is provided for informational purposes and should not be considered authoritative for navigational, engineering, legal, and other uses.

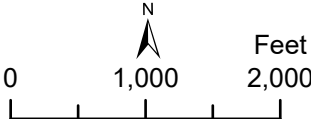
Natural Communities DFC - Acreage

- AF - Alluvial Forest
- BF - Bottomland Forest
- BS - Basin Swamp
- BST - Blackwater Stream
- DM - Depression Marsh
- DV - Developed
- FS - Floodplain Swamp
- LO - Limestone Outcrop
- MEH - Mesic Hammock
- MF - Mesic Flatwoods
- SCF - Scrubby Flatwoods
- SH - Sandhill
- SK - Sinkhole
- SKLK - Sinkhole Lake
- SWLK - Swamp Lake
- TCV - Terrestrial Cave
- UHF - Upland Hardwood Forest
- UMW - Upland Mixed Woodland
- UP - Upland Pine





O'LENO STATE PARK
Natural Communities - Desired Future Conditions



Sources: ESRI; Florida Department of Environmental Protection
This graphical representation is provided for informational purposes and should not be considered authoritative for navigational, engineering, legal, and other uses.

HYDROLOGY

O'Leno State Park and River Rise Preserve State Park are 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 Escarpment, 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 (also referred to as a siphon) 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 Interstate 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 (Suwannee River Water Management District 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 aquifer 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-Treehouse, Darby and Columbia springs, as well as from other vents in the river bottom. Hydrologic models have identified as many as 10 distinct springshed boundaries within the Santa Fe basin, with the three largest spring groups in the contributing area being Hornsby-Treehouse, Ichetucknee and Gilchrist Blue, (Kincaid 2011; Upchurch et al. 2011). River Rise has been referred to as the largest single “spring” in terms of total flow volume in the entire basin, however scientists categorize this karst feature as a resurgence of both surface and groundwater (Meyer et al. 2008; Butt et al. 2007; SRWMD 2010a).

Santa Fe Trace and its 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, the entire surface water flow 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 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 6-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 September 2017 after Hurricane Irma, July 2012 after Hurricane Isaac, August 2008 after Tropical Storm Fay and September 2004 following three significant tropical events (District 2 files). Overland flow also occurred in 1999 during the rains associated with Hurricane Floyd (Morgan Tyrone personal communication). All of this is important because O’Leno/River Rise is part of a DEP-regulated Priority Focus Area for springs protection (DEP 2023).

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 8 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 Lake to Downing Lake, and then on to River Rise Preserve State Park. 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 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 Treehouse Springshed (Butt et al. 2006). Another similar swallet, Alligator Siphon, is 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 swallet is Alligator Rise, located about 750 feet upstream of the U.S. Highway 27 bridge (Butt et al. 2007). Vinzant Landing swallet discussed above is a very similar karst feature.

One recent River Rise Preserve State Park acquisition that was finalized in 2022 is Columbia Spring. Columbia Spring vent discharges westerly through a 30-foot-wide, 600-foot-long spring run before it empties into the Santa Fe just downstream of the U.S. 441 bridge. Even though Columbia is considered a historic first-magnitude spring, aquatic cave researchers have determined that its discharge comes from two Santa Fe River siphons to its east that divert river water through a 1,100-foot cave system (Butt et al. 2007). Columbia Spring is part of the Hornsby-Treehouse Springshed.

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 3 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 is highly dependent on river stage (Smith et al. 2002; Sreaton 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, several University of Florida scientists have investigated these complex surface/groundwater/limestone matrix interactions within the Floridan aquifer of this region (Martin and Scream 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 Scream 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 (Foote 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 (Foote 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 the city of Alachua. 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 State Park near Hornsby Spring (Butt et al. 2006; Upchurch et al. 2011). A demonstrated underground conduit connection was made between Lee Sink and Hornsby Spring with a travel time of 28 days over 9 linear miles. O'Leno/River Rise karst features are all part of the Hornsby-Treehouse Springshed as well as part of a DEP Priority Focus Area (PFA) (DEP 2023).

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; U.S. Geological Survey 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 4,448 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 CFS during Hurricane Ivan on Sept. 10, 2004.

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 State Park 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 State Park has documented at least four distinct periods of total river capture at the swallet (District 2 Files). The relatively frequent recurrence of dry riverbed between the Vinzant Landing 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). During periods of very low flow when the Vinzant Landing Swallet completely captures the Santa Fe River well upstream of the swimming area, the river level at the suspension bridge ranges between 32.5 and 33.5 National Geodetic Vertical Datum (NGVD).

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). The River Rise represents a combination of both surface water from the River Sink and groundwater from the Upper Floridan aquifer (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, below River Rise there are several significant inputs including the River Sink, the Bellamy Cave System, deeper-aged waters of the Upper Floridan aquifer, 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 No. 02321975). SRWMD and DEP personnel monitor this site as a Temporal Variability Monitoring location (DEP 2012c). From 1992 to 2010, the average total discharge (6,556 measurements) of the Santa Fe as it passed under the U.S. 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 three 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 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 Suwannee River Water Management District (SRWMD), considered a groundwater divide of sorts between the SRWMD and the St. Johns River Water Management District (SJRWMD), has declined to the extent that a westward shift in groundwater potentiometric contours has occurred (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; Southwest Florida Water Management District 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.

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. 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. 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; Alachua County Environmental Protection Department 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 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.

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 (DEP 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). 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 DEP are cooperatively conducting a long-term trend analysis at the U.S. 441 bridge on the Santa Fe River (DEP 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 karst features in the park and the Santa Fe River. 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. 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 (DEP 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, DEP initiated a formal, statewide monitoring program for surface waters and groundwater, including those within the Santa Fe River Basin (Maddox et al 1992; DEP 2005; DEP 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 DEP'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 (DEP 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, which occurred in 2008 (Hallas and Magley 2008). In 2011, a Basin Management Action Plan (BMAP) for the Santa Fe River basin was completed (DEP 2012d). O'Leno/River Rise lies within the Santa Fe River Basin Management Action Planning (BMAP) region and a Springs PFA, both regulated by DEP (DEP 2023).

Submerged Aquatic Vegetation

Columbia Spring is the only known significant area of the park where submerged aquatic vegetation (SAV) is found. Inland freshwater Florida spring ecosystems like Columbia Spring were historically characterized by thick beds of five dominant submerged aquatic plants, including spring-tape (*Sagittaria kurziana*), American eelgrass (*Vallisneria americana*), southern waternymph (*Najas guadalupensis*), creeping primrosewillow (*Ludwigia repens*) and muskgrass (*Chara* sp.) (Whitford 1956). The presence of these five dominant SAV taxa have long characterized an ecologically healthy "underwater forest" within Florida's spring ecosystems (Odum 1957; Wetland Solutions Incorporated 2010; Heffernan et al. 2010).

In 2022, researchers from Alachua County Environmental Protection Department (ACEPD) and Karst Environmental Services (KES) set up systematic SAV monitoring transects to quantify aquatic plant bed abundance throughout Columbia Spring (Morris et al. in press). During that work, three native SAV taxa were documented including spring-tape (*Sagittaria kurziana*), creeping primrosewillow (*Ludwigia repens*) and muskgrass (*Chara* sp). Additionally, one non-native SAV species has been documented in Columbia, namely Indian swampweed (*Hygrophila polysperma*), which is not surprising because its presence is throughout the Lower Santa Fe River (District 2 files).

As of 2023, the overall ecological health of aquatic vegetation in Columbia Spring is in poor to good condition when considering that only three native SAV species are present.

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 (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 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 river.
- Action 2 - Continue to monitor permit requests and land use/zoning changes in the region and offer comments as appropriate.
- 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.
- 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.
- Action 5 - Establish a monitoring program within O'Leno State Park along the Santa Fe River above the River Sink to document ecological impacts of low flows.

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 and USGS will be relied on to keep 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 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, 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.

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, 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). 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 with invaluable information about the various sources of springs and the timing of surface to groundwater interactions.

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, DRP will continue efforts to preserve Columbia Spring, located on private property adjacent to River Rise Preserve State Park. One potential activity worthy of DRP support is the 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 and circa 1 acre of spring-run stream natural community.

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

- Action 1 - Monitor the Bible Camp Road restoration project.
- Action 2 - Evaluate other sites within the two parks where natural hydrology may have been altered and initiate corrective actions as needed.
- Action 3 - Develop and implement monitoring protocol for semi-annual SAV assessments and continuous monitoring in Columbia Spring and associated spring-run stream.
- Action 4 - Develop and implement a monitoring protocol to track brownouts, turbidity and changes in water clarity of Columbia Spring.

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. DRP staff worked closely with Columbia County and Florida Fish and Wildlife Conservation Commission (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.

District and park staff will design and implement a monitoring plan to track changes in the SAV health of Columbia Spring and spring-run stream. If data indicate that the natural resources of the spring or karst features are becoming significantly degraded, additional recreational use limits may need to be implemented to protect them from further damage.

The monitoring plan implemented will be semi-annual assessments to document SAV diversity and coverage within Columbia Spring, including SAV characterization along a known transect, spatial mapping of major aquatic plant beds and continuous monitoring by on-site staff for notable changes. Additional details of the semi-annual assessments are located below in the *Natural Communities* section under *Spring-Run Stream*.

It is important that DRP initiate an aggressive monitoring protocol to track all significant changes in aquatic plant beds, especially SAV diversity and brownouts within the park's major spring systems as part of documenting the ecological responses to recreational use, decreased spring discharge, or Santa Fe River flooding as described above under the *Hydrology* section and below in the *Natural Communities* section under *Spring-Run Stream*.

Additionally, park staff will continuously document and track notable changes in aquatic plant beds at Columbia Spring. Staff will note significant increases in sedimentation, loss of native SAV and increases of non-native SAV. Staff will also continuously document and track brownouts and water clarity at select karst features in the parks to identify significant changes that might be occurring in these natural communities. Details concerning Santa Fe River flooding and spring brownouts is found above under the *Hydrology* section of this plan.

Efforts to educate visitors that recreate in Columbia Spring should focus on best management practices to protect the spring bottom from erosion and reducing damage to aquatic plant beds.

In addition to the continuous monitoring by park staff, DRP will work with SRWMD to understand water quality/quantity changes of Columbia Spring, especially any impacts that might be associated with recreational use. DRP will work with all stakeholders involved with water quality monitoring including DEP, SRWMD and other water scientists.

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.
- 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.
- Action 3 - Identify unauthorized trails along river levees and other vulnerable areas in the parks and eliminate visitor access where necessary.

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 Preserve State Park 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 State Park 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.
- 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.
- 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.

DRP staff 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 DEP. 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, DRP will continue to develop and implement baseline surveys and monitoring programs for the Old Bellamy Cave System, assessing biological and physical conditions. DRP staff 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. DRP may be able to use data from the Old 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 troglodytes.

NATURAL COMMUNITIES

Limestone Outcrop

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 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 invasive plant infestations currently. 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*).

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 invasive 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

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, most of the flatwoods are in the poor to fair category. Although O'Leno State Park has been under state management since the 1930s and some prescribed fire was accomplished during the early decades, most of the prescribed fires in those years targeted sandhill areas. Dedicated burning of the mesic flatwoods at O'Leno State Park did not begin in earnest until the 1980s. The same holds true for the flatwoods at River Rise Preserve State Park. Presently, zones OL-1De and OL-1G in O'Leno State Park contain some areas of good quality mesic flatwoods, although the pine canopy is still inadequate due to past timbering practices.

Logging, turpentine 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 2001.

Restoration of previously logged areas has proceeded steadily, mainly using prescribed fire, the cutting and chipping of off-site hardwoods and the planting of containerized longleaf pines. Most of the mesic flatwoods in the two parks will require much more frequent burning if their condition is to improve, supplemented by off-site hardwood removal and replanting with appropriate flatwoods species.

Mesic Hammock

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, coastal plain staggerbush, sparkleberry, deerberry (*Vaccinium stamineum*), highbush blueberry, red bay (*Persea borbonia*), American holly and horse sugar (*Symplocos tinctoria*). Groundcover is sparse, with occasional bracken fern (*Pteridium aquilinum*) and low panic grasses (*Panicum* spp.).

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 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 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

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-to-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 off-site 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 prescribed fire 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 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 State Park 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 off-site 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 and River Rise Preserve state parks currently contain many acres of altered landcover. The Florida Natural Areas Inventory (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.

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

The scrubby flatwoods community 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, as well as 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 the parks 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 and Columbia counties. 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.

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 three to eight years.

Sinkhole

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.

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

Both parks 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 State Park, within zones RR-2Fs and RR-2J in River Rise Preserve State Park east of U.S. 441 and within zone RR-3F west of U.S. 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.

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

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. Also known as “red oak woods” (Duever and Tillman 1997), upland mixed woodland 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. 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 off-site hardwoods. These 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 of or application of herbicide to dense stands of off-site hardwoods will be critical to preparing overgrown upland mixed woodland sites for prescribed fire. Initial girdling efforts have concentrated on hardwood-invaded sites that happen to be adjacent to fair to good condition upland mixed woodlands. 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.

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. 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

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. 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. 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 State Park. 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 State Park west of U.S. 441 have targeted invasive off-site hardwood species for removal. The goal is to herbicide laurel oaks, water oaks and black cherries 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 State Park 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 off-site hardwoods are beginning to have a detrimental impact. Contracted herbiciding of off-site 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 to increase the acreage of good quality upland pine habitat in as short a time as possible.

DRP needs to target additional upland pine remnants for restoration work. Girdling or herbiciding of dense stands of off-site hardwoods will be critical to preparing overgrown sites for prescribed fire. 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.

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 both parks.

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

Xeric hammock occurs in only limited areas, mostly within River Rise Preserve State Park. 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.

DRP 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

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 the 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. However, with the exception of a diminished presence of old growth hardwoods and remnant traces of old logging roads, the effects of that past timbering are no longer readily apparent.

Nevertheless, DRP biologists 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.

Alluvial forests require little active management other than protection from excessive erosion and control of invasive 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

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.

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 off-site loblolly pines may be necessary to improve the condition of some of the basin swamps. Restoration of the natural hydrological regime may require adding culverts or removing or modifying existing causeways or roads. Protecting basin swamps from the impacts of erosion is another potential management need.

Bottomland Forest

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. However, with the exception of a diminished presence of old growth hardwoods and remnant traces of old logging roads, the effects of that past timbering are no longer readily apparent. Nevertheless, DRP biologists 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.

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. 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 plant species and feral hogs will continue.

Depression Marsh

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 fire 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.

Where appropriate, the park should apply prescribed fire to 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 species. Removal of well-established loblolly pines and oaks may require additional measures such as timbering or herbiciding.

Dome Swamp

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.

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 off-site 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 plant species and remove any found.

Floodplain Swamp

Floodplain swamps at O'Leno/River Rise occur in floodways paralleling the Santa Fe River and in the deepest parts of drainageways 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 re-sprouting 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 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.

Floodplain swamps require little active management other than erosion protection and control of invasive 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 plants and animals, including feral hogs. DRP 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

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 (Yunker 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.

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

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 drainageway 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. swamp lakes are presently in good to excellent condition.

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

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 State Park 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 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 River 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.

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 DEP and the SRWMD. The continued monitoring and mitigation of riverbank erosion will remain important as well.

Spring Run Stream

Columbia Spring is a resurgence spring fed primarily through a single, large aquatic cave opening and is part of the Hornsby-Treehouse Springshed. The vent discharges into a large oval-shaped surface pool measuring about 75-by-100 feet from east to west. The depth of the pool is about 25 feet. The spring discharges over a distinctive limestone barrier that bisects the entire run into a short spring-run stream before joining the Santa Fe River about 600 feet to the west. Please see additional springs information above under the *Hydrology* section.

Nearly all the lower spring run is shallow with dense constantly undulating beds of SAV, primarily springtape. Because the spring-run stream has a continuous strong discharge with shallow conditions, the health of springtape beds appear to be thriving and in excellent ecological health with typically a high amount of visual flowering from within the SAV beds. When the Santa Fe River is under extreme flood conditions, Columbia Spring can undergo brownout conditions. Nonetheless the SAV beds appear to be resilient to darkened water conditions, probably due to the shallow water levels.

The Santa Fe has long been an attractive destination for outdoor recreation enthusiasts who use paddle craft to float down the river. Many paddlers try to enter the spring run to catch a glimpse of this

characteristic karst feature. Nonetheless, the discharge from the Columbia vent is generally strong enough to keep most from paddling up the entire run. However, individuals can potentially exit their vessels and walk on the rocky limestone bottom to gain a visual of the main spring vent. For this reason, Columbia spring run can experience intensive and potentially destructive pressures associated with wading or walking on the spring bottom during recreation activities. Damage can occur to both stream vegetation and bottom sediments.

There are two highly invasive non-native SAV species that are found throughout the Santa Fe River and therefore potentially at Columbia, namely hydrilla (*Hydrilla verticillata*) and Indian swampweed (*Hygrophila polysperma*). FWC has long had an herbicide program to control hydrilla in the Santa Fe River.

Based on these factors, plus recently declining flows in the Lower Santa Fe River, the Columbia spring run stream is considered in good condition.

Since many factors affecting the spring run stream originate outside the park within the Hornsby-Treehouse Springshed, management considerations must necessarily extend beyond the park boundary. Within this springshed, and especially within the DEP BMAP and PFA regions, DRP priorities should be focused on protection of groundwater sources, surface and groundwater quality and factors important to spring discharge, including maintenance of historic spring flows at the springs within the parks.

DRP staff will monitor and mitigate any stormwater runoff or other contamination threats that might occur within surface waterbodies of the park and especially associated with developed areas adjacent to springs or other sensitive karst features. DRP will upgrade the park septic systems to the highest level feasible and use advanced treatment technologies.

Subterranean Cave—Terrestrial and Aquatic

Aquatic Cave

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 8 miles of conduits, accessing them through more than 40 sinkholes as described earlier in the *Hydrology* section (Poucher 2008). Columbia Spring has a 1,100-foot cave system associated with its vent and a connection to the east with two known swallets. This is a resurgence spring associated with the Hornsby-Treehouse Springshed.

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 State Park 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 – Aquatic Caves

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 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 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. 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.

DRP staff 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 and Columbia Spring systems. 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

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 State Park 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 the Natural Communities Map. The terrestrial caves are considered to be in very good condition, with limited evidence of human intrusion.

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.

Abandoned Field/Abandoned Pasture

The long-range plan for the abandoned pastures at River Rise Preserve State Park 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 off-site 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).

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 resemble what FNAI describes as abandoned pasture. Those areas, located in zone RR-3E near U.S. 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 prescribed fire program.

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

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.

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.

Borrow pits located within pyrogenic communities should be incorporated into the treatment area when prescribed fires 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 backfilling of the pit can be initiated, followed by replanting with appropriate species.

Canal/Ditch

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.

A deep ditch, constructed around 1960, cuts through a portion of River Rise Preserve State Park 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. 441, extends westward through culverts under the highway and then passes through multiple natural communities in the park on the way 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. 441 and the residential area.

No active management is necessary other than occasional survey for invasive 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

The desired future condition for the clearing at O'Leno State Park will be upland pine (as defined by FNAI).

The only clearing in the two parks is at the north end of zone OL-1Js in O'Leno State Park 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 has been minimal since, basically consisting of planting a few longleaf pines in the 1990s. However, the site does have the potential to be fully restored.

There has been no serious effort to restore the 2-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

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

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 State Park is relatively undeveloped. Facilities there include a horse barn and a primitive campsite with restrooms, all located west of U.S. 441. An equestrian trailhead is located just east of U.S. 441 near the River Rise Preserve State Park gate. Also, east of U.S. 441, adjacent to Sweetwater Lake, is a primitive campsite for backpackers.

Resource management in the developed areas will focus on removal of all priority invasive plants (Florida Exotic Pest Plant Council Category I and II species). Other management measures will include maintenance of proper stormwater and wastewater management facilities and the designing of future development so that it is compatible with prescribed fire management in adjacent natural areas.

Clearcut Pine Plantation

The clearcut pine plantation areas will be restored in the future to the appropriate fire dependent natural community, which includes upland pine and upland mixed woodland.

A recent addition within River Rise Preserve State Park west of U.S. 441 included a 160-acre outparcel that was previously planted with a slash pine plantation. These pines were harvested along with most of the hardwoods onsite prior to state acquisition. Staff will be developing a restoration plan in the future to initiate restoration of the site.

Restoration Natural Community

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

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 off-site 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 aerial photographs, 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, off-site 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 5-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.

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 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

If 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.

A large borrow pit was excavated in the 1970s during construction of an extension of 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.

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 invasive plants and treatment as needed.

Successional Hardwood Forest

The long-term 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 off-site 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.

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 1,000 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 off-site 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 State Park 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 aerals, slash pines were subsequently planted in the cleared area, perhaps as early as 1949. Apparently, there was no site preparation 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 to 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.

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 targeted for intensive restoration activities such as off-site hardwood removal until the natural communities that are still relatively extant in the parks have been restored to the desired degree. However, prescribed fire in 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 two to three 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 the 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 fire 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.

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 prescribed fire plan.
- Action 2 - Manage fire-dependent communities by burning between 790 and 1,350 acres annually, as identified by the annual prescribed fire plan.
- Action 3 - Increase the frequency of prescribed fire in zones threatened by hardwood invasion.

The Prescribed Fire Management table 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.

Prescribed Fire Management		
Natural Community	Acres	Optimal Fire Return Interval (Years)
Sandhill	300	2-3
Mesic Flatwoods	545	2-3
Upland Pine	505	2-3
Upland Mixed Woodland	392	2-5
Scrubby Flatwoods	256	3-8
Depression Marsh	17	2-3
Successional Hardwood Forest	452	2-3
Clearcut Pine Plantation	160	2-10
Abandoned Field/ Abandoned Pasture	120	2-3
Restoration Natural Community	52	2-3
Clearing/Regeneration	2	2-3
Annual Target Acreage	790 - 1350	

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 toward 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 fire program. Much progress has been made where zones have been burned multiple times in the past decade.

The park manager and district staff revise the O'Leno/River Rise prescribed fire 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 fire 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.

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 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.

Objective B: Conduct habitat/natural community restoration activities on 227 acres of upland pine and upland mixed woodland communities.

- Action 1 - Develop a restoration plan for 67 acres of upland pine and upland mixed woodland communities in zones just north and south of Bellamy Road.
- Action 2 - Implement the restoration plan.
- Action 3 - Develop a restoration plan and begin implementation for the 160-acre inholding acquisition at River Rise west.

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 off-site 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 off-site hardwoods such as laurel oak and sweetgum, which then invade the interior of the zone.

DRP staff 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 off-site hardwoods in zones both north and south of Bellamy Road. The off-site 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 re-establish 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.

A 160-acre acquisition recently filled a hole in the "donut" at River Rise west. Prior to acquisition by the state, the landowners clear cut the existing pine plantation. The site, which does have some sinkholes, needs a restoration plan to restore the original natural communities of upland pine and upland mixed woodland.

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.
- Action 2 - Monitor the progress of off-site hardwood control and native groundcover propagation in both zones.

Native groundcover reintroduction, off-site hardwood removal and possibly some loblolly pine removal is 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 re-establishment of off-site hardwoods.

Hardwood sprouts will likely require retreatment. Prescribed fire is an integral part of this restoration project, particularly growing season fire. Staff should treat the zone with prescribed fire 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 off-site 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 off-site 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 sandhill restoration projects are second priority in comparison with the upland pine/upland mixed woodland restoration projects that are planned.

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. Conduct evaluation of habitat improvement needs in 3Gw.
- Action 2 - Monitor habitat improvement sites for native groundcover recovery, longleaf pine seedling survival and reappearance of invasive hardwoods.

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 off-site hardwoods in the zones occurred in 2004 and 2007, and the park subsequently burned the zones several times. Follow-up treatment of remaining off-site hardwoods is needed. The park also needs to plant longleaf pines, particularly where off-site 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 tend 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 off-site hardwoods in sandhills in zones OL-1A, OL-1C and OL-1De (higher priority) and in zones OL-1R and OL-1S (lower priority).
- Action 2 - Monitor sandhill improvement sites for native groundcover recovery, longleaf pine regeneration and re-sprouting of invasive hardwoods.

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 off-site hardwoods. To reverse that trend, invasive hardwoods such as laurel oak will be treated mechanically and chemically. For the first 10 years after treatment, the zone should be burned frequently and at the shortest end of the fire return interval 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.

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 10 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.

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.
- Action 2 - Plant longleaf pines in scrubby flatwoods after successful burns and monitor pine survival.

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 fire 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.

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, migratory bird counts and Christmas bird counts, mostly through the work of Audubon Society volunteers, have generated a substantial bird list, which includes several 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 State Park (Tan 1991). However, Tan did not collect in the majority of River Rise Preserve State Park. Additional imperiled species will likely be added to the plant list as more surveys are conducted within the park.

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 State Park 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 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 (*Cleistesiopsis divaricata*) and threebirds orchid (*Triphora trianthophoros*) are the product of botanical field work conducted at O'Leno State Aprk 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 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 DRP 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 fires 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 federally threatened species (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 State Park 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 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*), eastern indigo snake (*Drymarchon cooperi*), Florida pine snake (*Pituophis melanoleucus mugitus*) and southern hognose snake (*Heterodon simus*). 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 (*Dryobates borealis*), which was recorded at the park in the late 1930s and early 1940s by Oscar Baynard, a field ornithologist, park manager and naturalist (District 2 resource management files).

Historically, several turtle species have been harvested for food in the region, including the imperiled gopher tortoise 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 other than 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. Gerald 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).

FWC contracted with the Jones Ecological Center to conduct a gopher tortoise survey at O'Leno and River Rise Preserve state parks in 2014 using the standardized Line Transect Distance Sampling methodology (Smith et al 2009). The results of this survey estimate that the density of gopher tortoises is 2.1782 tortoises/hectare with an estimated population of 1,011 tortoises. This meets the criteria for a viable gopher tortoise population and was ranked as a 1-2 for population evaluation and habitat suitability which is defined as, "(1) High - Medium quality: Likely a viable population in suitable habitat. Site requires continued management and some restoration, but no population manipulation/augmentation is necessary (Smith and Howze 2016)." The survey protocol calls for monitoring every five to 10 years and uses either a two- or three-person survey team. Staff will continue to refer to the FWC Gopher Tortoise Management Plan (FWC 2012) to guide management of this imperiled species.

In 2012, DRP 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). DRP 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, several 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 southern 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.

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 currently being taken by DRP staff and identifies the current level of monitoring effort. The codes used under the column headings for management actions and monitoring level are defined following the table. Explanations for federal and state status as well as FNAI global and state rank are provided in Addendum 6.

Imperiled Species Inventory						
Common and <i>Scientific Name</i>	Imperiled Species Status				Management Actions	Monitoring Level
	FWC	USFWS	FDACS	FNAI		
PLANTS						
Incised agrimony <i>Agrimonia incisa</i>			LT	G3, S2	1,6,7	Tier 1
Modest spleenwort <i>Asplenium verecundum</i>			LE	G1, S1	4,10	Tier 2
Southern lady fern <i>Athyrium filix-femina</i>			LT		4,10	Tier 1
Woodland poppymallow <i>Callirhoe papaver</i>			LE	G5, S2	1,6,7	Tier 1
Sand butterfly pea <i>Centrosema arenicola</i>			LE	G2Q, S2	1,6,7	Tier 1
Autumn coralroot <i>Corallorhiza odontorhiza</i>			LE	G5, S1		Tier 2
Angularfruit milkvine <i>Gonolobus suberosus</i>			LT		1	Tier 1
Spiked crested coralroot <i>Hexalectris spicata</i>			LE			Tier 2
Pine lily <i>Lilium catesbaei</i>			LT		1	Tier 1
Florida spiny pod <i>Matelea floridana</i>			LE	G2, S2	1	Tier 1
Plume polypody <i>Pecluma plumula</i>			LE	G5, S2	4,10	Tier 2
Rosebud orchid <i>Cleistesiospsis divaricata</i>			LE	G4, S1	1,6	Tier 2

Imperiled Species Inventory						
Common and Scientific Name	Imperiled Species Status				Management Actions	Monitoring Level
	FWC	USFWS	FDACS	FNAI		
Giant orchid <i>Pteroglossaspis ecristata</i>			LT	G2G3, S2	1,6,7, 10	Tier 2
Florida mountain-mint <i>Pycnanthemum floridanum</i>			LT	G3, S3	1,6	Tier 1
Longlip ladiestresses <i>Spiranthes longilabris</i>			LT		1,6	Tier 2
October ladiestresses <i>Spiranthes ovalis</i> var. <i>erostellata</i>			LE			Tier 2
Little ladiestresses <i>Spiranthes tuberosa</i>			LT			Tier 2
Threebirds orchid <i>Triphora trianthophoros</i>			LT			Tier 2
INVERTEBRATES						
Seminole Texan crescent <i>Anthanassa texana seminole</i>				G5T3 T4, S2S3	1	Tier 2
Sweader's juniper hairstreak <i>Callophrys gyrneus sweadneri</i>				G5T2, S2	1	Tier 2
Suwannee moccasinshell <i>Medionidus walkeri</i>	FT	LT		G1, S1	4,9	Tier 2
North peninsular mycotrupes beetle <i>Mycotrupes gaigei</i>				G2, S2	1	Tier 1
Smoky shadowfly <i>Neurocordulia molesta</i>				G4,S1	4	Tier 2
Oval pigtoe <i>Pleurobema pyriforme</i>	FE	LE		G2, S1S2	4,9	Tier 2
Pallid cave crayfish <i>Procambrus pallidus</i>				G2G3, S2S3	4	Tier 1
King's hairstreak <i>Satyrium kingi</i>				G3G4, S2	1	Tier 2
AMPHIBIANS						
Holbrook's southern dusky salamander <i>Desomognathus auriculatus</i>				G3, S1	4	Tier 2
REPTILES						
American alligator <i>Alligator mississippiensis</i>	FT (S/A)	SAT		G5, S4	4,10, 13	Tier 1

Imperiled Species Inventory						
Common and <i>Scientific Name</i>	Imperiled Species Status				Management Actions	Monitoring Level
	FWC	USFWS	FDACS	FNAI		
Eastern indigo snake <i>Drymarchon cooperi</i>	FT	LT		G3, S2?	1,6, 7, 13	Tier 1
Gopher tortoise <i>Gopherus polyphemus</i>	ST			G3, S3	1,6,7, 10,13	Tier 3
Southern hognose snake <i>Heterodon simus</i>				G2, S2S3	1,6	Tier 1
Suwannee Alligator Snapping Turtle <i>Macrochelys suwanniensis</i>	ST	PT		G2, S2	4,9, 13	Tier 3
Florida pine snake <i>Pituophis melanoleucus mugitus</i>	ST			G4, S3	1,6	Tier 1
BIRDS						
Short-tailed hawk <i>Buteo brachyurus</i>				G4G5, S1		Tier 2
Little blue heron <i>Egretta caerulea</i>	ST			G5, S4	4	Tier 2
Tricolored heron <i>Egretta tricolor</i>	ST			G5, S4	4	Tier 2
Swallow-tailed kite <i>Elanoides forficatus</i>				G5, S2	1	Tier 2
Merlin <i>Falco columbarius</i>				G5, S2		Tier 2
Wood stork <i>Mycteria americana</i>	FT	LT		G4, S2	4	Tier 2
Red-cockaded woodpecker ^x <i>Dryobates borealis</i>	FE	LE, PT		G3, S2	1,6	Tier 2
Roseate spoonbill <i>Platalea ajaja</i>	ST			G5, S2	4	Tier 2

^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.

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

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.

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 (1991) conducted a comprehensive floristic study of O'Leno State Park and a small part of River Rise Preserve State Park in 1989-91, much of River Rise State Park has not been subject to comprehensive plant inventory. To improve documentation of imperiled plant and animal species at O'Leno/River Rise, 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: Continue existing monitoring protocols for six selected imperiled animal species in the two parks (King's hairstreak, Sweadner's juniper hairstreak, Seminole Texan crescent, oval pigtoe mussel, southern dusky salamander and gopher tortoise).

- Action 1 - Coordinate with the North American Butterfly Association (NABA) and FNAI in monitoring three imperiled butterfly species.
- Action 2 - Monitor the oval pigtoe, an endangered mussel, in cooperation with FWC and USFWS as part of the Bible Camp Road Restoration Project.
- Action 3 - Implement a monitoring protocol for the southern dusky salamander in coordination with FWC and the Florida Museum of Natural History.
- Action 4 - Coordinate with FWC for future line transect distance surveys (LTDS) of gopher tortoises.

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. 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.

DRP staff will coordinate with FWC on future LTDS surveys of gopher tortoises since surveys are recommended every 5-10 years.

Objective C: Monitor and document three selected imperiled plant species in the two parks (incised agrimony, modest spleenwort and plume polyploidy).

- Action 1 - Develop monitoring protocols for three imperiled plant species (incised agrimony, modest spleenwort and plume polyploidy) in cooperation with FNAI.
- Action 2 - Implement monitoring protocols for the three imperiled plant species listed in Action 1.

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 polyploidy. Specific protocols will be developed and implemented for these species.

INVASIVE SPECIES

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

The primary means by which invasive 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 (*Triadica 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 plants and staff will continue to survey for them on a regular basis. Management of invasives 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 plants have been treated at O'Leno/River Rise.

In addition to Florida Invasive Species Council (FISC) Category I and Category II invasive 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. It is also being moved along the fire lines during fire preparation. In these instances, it is beginning to invade good quality sandhill and upland mixed woodland in several areas in the park.

The most significant invasive 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 (Parker et al *in press*). Game camera and river surveys in the park and along the Santa Fe River failed to detect any capybara in 2017 (Anderson 2017). 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. 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 re-sprout from their roots. It may be that members of the Lauraceae family will continue to survive in shrub form as the remnant tree root systems continue to re-sprout. 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.

Species Name <i>Scientific Name</i> - Common Name	FLEPPC Category	Distribution	Zone ID
<i>Albizia julibrissin</i> - Mimosa	I	Single Plant or Clump, Scattered Plants or Clumps	OL-1A, OL-1E
<i>Cinnamomum camphora</i> - Camphor-tree	I	Single Plant or Clump, Scattered Plants or Clumps	OL-4A, OL-1Lw, OL-1Qw
<i>Imperata cylindrica</i> - Cogon grass	I	Scattered Plants or Clumps	OL-1M, OL-1N, OL-1X
<i>Lonicera japonica</i> - Japanese honeysuckle	I	Single Plant or Clump, Scattered Plants or Clumps	OL-1U, OL-1P
<i>Lygodium japonicum</i> - Japanese climbing fern	I	Single Plant or Clump, Scattered Plants or Clumps	OL-1De, OL-1Lw, OL-1N, OL-1B, OL-1E, OL-1Le, OL-1Lw, OL-1P, OL-1Qw, OL-1S, OL-1U, OL-4A
<i>Nandina domestica</i> - Nandina	I	Single Plant or Clump	OL-1B

<i>Wisteria sinensis</i> - Chinese wisteria	II	Scattered Plants or Clumps	OL-1Lw
---	----	----------------------------	--------

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

- Action 1 - Treat all known infestations of invasive plants annually, preferably before reproduction occurs.
- Action 2 - Survey for and map new invasive plants in every zone at least twice within the next 10 years.
- Action 3 – Treat all cogongrass and running bamboo twice annually.

Recently, a species of running bamboo was found in the southwest corner of zone RR-3Ge on park and private property. Treatment of this species is the highest priority because of its ability to run and invade the adjacent high-quality upland mixed woodland. It should be treated at least twice per year until it is eradicated.

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

To help the parks remain relatively free of invasives and prevent new invasive plant populations from expanding, park staff will survey for and map new invasives in every zone at least twice within the next 10 years. It is important to know what invasive 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 invasives so that those areas can be kept invasive-free. This is particularly true for high-quality or ecologically important habitats.

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

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

Invasive plants often invade an area accidentally through preventable methods of entry. To limit accidental introduction and movement of invasive 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 invasives through contaminated equipment. Fill dirt, lime rock, potted horticultural plants and mulch are all

potentially contaminated by invasives even if they are not readily visible at the time of entry into the park. Some new infestations of invasives may be preventable by ensuring that contractors clean their equipment before entering the park. The further spread of invasives already established in the park may be avoided by making sure that staff and contractors do not move equipment from a contaminated area to an invasive-free area within the park without first cleaning their equipment.

Objective C: Implement control measures on three nuisance and invasive animal species (feral hogs, dogs, and cats).

- Action 1 - Remove feral hogs as resources permit, focusing on the most damaged areas.
- Action 2 - Coordinate with Alachua County or Columbia County animal services in removing feral or stray cats and dogs from the parks.
- Action 3 - Monitor the presence of capybaras in the parks.

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 RESOURCES

Prehistoric and Historic Archaeological Sites

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 Works Progress Administration/Civilian Conservation Corps 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 75 archaeological sites and seven resource groups (historic road sites) recorded with the Florida Master Site File (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.

The pre-European or early colonial signs of human presence identified at the parks' archaeological sites, such as campsites, village sites and prehistoric and historic quarry or extractive sites, represent the Late

Archaic (3000-500 B.C.), Cades Pond (300 B.C.-800 A.D.), Hickory Pond (800-1250 A.D.) and Alachua (1250-1600 A.D.) periods. In many cases, the assemblage of artifacts at the sites is insufficient to determine cultural period. Several historic era archaeological sites appear 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 State Park 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 State Park in 1991. This survey encompassed the entire preserve, whereas the Bellamy Road survey focused on an area of 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 locations and boundaries confirmed.

Condition Assessment: All 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.

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 a considerable number of these sites ineligible for the National Register of Historic Places per the opinions 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) or 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 thought to be locally significant 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, and evaluation is needed to confirm the sites' significance.

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 12 somewhat evenly spaced wooden stakes driven into clay-filled crevices that have been dated to the Deptford period (500 B.C.-200 A.D.). 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, an 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 3 miles to the south in River Rise Preserve State Park. This 3-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 sawmill. 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.

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

O'Leno State Park is one of nine parks now in the Florida State Parks 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 D. Roosevelt. The New Deal was a series of domestic programs enacted between 1933-36 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. 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 structure to one group or the other.

There are 75 historic structures still in existence at O'Leno State Park and several that are located on a recently acquired parcel on the river that are likely historic. No structure from the old town of Leno (Leno) remains, 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 18, 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 State Park 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 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 State Park is one of only a very few such stretches contained within a state park and, as such, is quite significant.

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. Seven of eight cabins are in good condition but need new metal roofs. The eighth cabin, CO1359, was destroyed by a falling tree during a storm.

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 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 fair condition and is closed to public access due to previous storm and tree damage. A structural assessment was completed in 2023 to evaluate the structure and to guide necessary repairs. No historic structures are planned for demolition at this time.

Most 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 1935-36 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 1938-39 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 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 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.

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. 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

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 Col. Mike Whetstone, the developer of Leno, 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 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 with a 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 State Park. After 2009, the local CCC alumni 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 which is a 10-foot by 30-foot WPA/CCC structure known as the Tower House (CO385). The grist mill and machinery, however, are displayed in an outdoor pavilion. Additional cultural collection material is stored in the Original Entrance Station (CO1152). The condition of the O'Leno State Park collection is good. Both the park museum and the Original Entrance Station 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. All taxidermied animals should be checked regularly for bugs and other evidence of deterioration.

All of the cultural and natural history collections are from the park or are directly related to the WPA/CCC era of the forestry camp. The significance of the WPA/CCC material is its pertinence to O'Leno State Park 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.

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.

Cultural Sites Listed in the Florida Master Site File					
Site Name and FMSF #	Culture/Period	Description	Significance	Condition	Treatment
AL1 Santa Fe Sink	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	NE	P	P
AL180 Sweetwater Lake Mound B	Prehistoric unspecified	Archaeological Site	NE	G	P
AL2608 Unnamed	Prehistoric	Archaeological Site	NS	G	P
AL2886 Sweetwater Village	Weeden Island	Archaeological Site	NE	G	P
AL2926 Santa Fe Fish Weir	Deptford	Archaeological Site	NE	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
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, 1 st Spanish	Archaeological Site	NS	G	P

Cultural Sites Listed in the Florida Master Site File					
Site Name and FMSF #	Culture/Period	Description	Significance	Condition	Treatment
AL3251 Bellamy Road #24	Cades Pond	Archaeological Site	NS	G	P
AL3252 Bellamy Road #25	Late Archaic	Archaeological Site	NS	G	P
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 19 th 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	NE	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
AL5666 Bellamy Road/ Old Spanish Trail/Old Indian Trail	Historic/ Spanish/ Prehistoric	Resource Group	NE	G	P
AL7366 O'Leno and River Rise Preserve State Parks	Prehistoric unspecified	Archaeological Site	NE	G	P
CO19 Register Field	Prehistoric unspecified	Archaeological Site	NE	G	P
CO21 Davidson's Field	Unspecified	Archaeological Site	NE	G	P

Cultural Sites Listed in the Florida Master Site File					
Site Name and FMSF #	Culture/Period	Description	Significance	Condition	Treatment
CO23 Columbia Springs	Weeden Island	Archaeological Site	NE	G	P
CO28 Trestle	Unspecified	Archaeological Site	NE	G	P
CO32 O'Leno Mill	Prehistoric unspecified	Archaeological Site	NE	G	P
CO34 Unnamed	Unknown	Archaeological Site	NE	G	P
CO44 Buzzard's Roost Prairie	Archaic	Archaeological Site	NE	G	P
CO50 Natural Bridge	Prehistoric to 19 th Century	Archaeological Site	NE	G	P
CO51 O'Leno - also Old Leno (Keno)	19th Century	Archaeological Site	NE	G	P
CO57 Bellamy Road/ Old Spanish Trail/Old Indian Trail	Historic/ Spanish/ Prehistoric	Resource Group	NE	G	P
CO69 Unnamed	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

Cultural Sites Listed in the Florida Master Site File					
Site Name and FMSF #	Culture/Period	Description	Significance	Condition	Treatment
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
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	NS	G	P
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

Cultural Sites Listed in the Florida Master Site File					
Site Name and FMSF #	Culture/Period	Description	Significance	Condition	Treatment
CO736 Bellamy Road #17	Prehistoric unspecified	Archaeological Site	NS	G	P
CO753 Service Station	1930	Historic Structure	NE	NE	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
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, BL060032	1961	Historic Structure	NR	G	RH
CO1147 Garage & Laundry, BL060033	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

Cultural Sites Listed in the Florida Master Site File					
Site Name and FMSF #	Culture/Period	Description	Significance	Condition	Treatment
CO1151 Old Men's Restroom, BL060039	1961	Historic Structure	NR	G	RH
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
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

Cultural Sites Listed in the Florida Master Site File					
Site Name and FMSF #	Culture/Period	Description	Significance	Condition	Treatment
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
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

Cultural Sites Listed in the Florida Master Site File					
Site Name and FMSF #	Culture/Period	Description	Significance	Condition	Treatment
CO1179 Rock Steps to Rec Hall	CCC New Deal	Historic Structure	NR	G	RS
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	NE	F	P
CO1202 New Dining Hall BL060041	1958	Historic Structure	NE	G	RH
CO1203 Flatwoods Bridge	New Deal or earlier	Bridge	NE	F	P
CO1204 Alligator Road or Wire Road	Mid-1800s or earlier	Resource Group	NE	G	P
CO1260 O'Leno State Park	CCC New Deal	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 20 th Century	Archaeological Site	NE	G	P

Cultural Sites Listed in the Florida Master Site File					
Site Name and FMSF #	Culture/Period	Description	Significance	Condition	Treatment
CO1339 3C Home Site	American 20 th 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
CO1350 O'Leno Park Road	CCC New Deal	Resource Group	NE	G	P
CO1351 Retention Wells	1935	Historic Structure	NE	NE	P
CO1352 Cook's Cottage	1936	Historic Structure	NE	NE	P
CO1353 Handcraft Lodge	1937	Historic Structure	NE	NE	P
CO1354 Canteen	1937	Historic Structure	NE	NE	P
CO1355 Bathroom (East)	1954	Historic Structure	NE	NE	P
CO1356 Bathroom (West)	1954	Historic Structure	NE	NE	P
CO1357	1958	Historic Structure	NE	NE	P

Cultural Sites Listed in the Florida Master Site File					
Site Name and FMSF #	Culture/Period	Description	Significance	Condition	Treatment
Dining Hall					
CO1358 Camper Cabin #1	1936	Historic Structure	NE	NE	P
CO1359 Camper Cabin #2	1936	Historic Structure	NE	P	P
CO1360 Camper Cabin #3	1936	Historic Structure	NE	NE	P
CO1361 Camper Cabin #4	1936	Historic Structure	NE	NE	P
CO1362 Camper Cabin #5	1936	Historic Structure	NE	NE	P
CO1363 Camper Cabin #6	1936	Historic Structure	NE	NE	P
CO1364 Leader Cabin #1	1936	Historic Structure	NE	NE	P
CO1365 Leader Cabin #2	1936	Historic Structure	NE	NE	P
CO1366 Leader Cabin #3	1936	Historic Structure	NE	NE	P
CO1367 Amphitheater	1936	Historic Structure	NE	NE	P
CO1368 Small Amphitheater	1936	Historic Structure	NE	NE	P

Objective A: Assess and evaluate 159 of 159 recorded cultural resources in the parks.

- Action 1 - Develop a protocol for tracking changes at each archaeological site.
- Action 2 - Complete assessments/evaluations of 75 archaeological sites, seven resource groups, 75 historic structures and three historic bridges, prioritizing sites in need of preservation and stabilization.
- Action 3 - Develop and implement a plan for more frequent surveillance of archaeological sites that have been looted in the past.
- Action 4 - Complete Historic Structures Reports (HSRs) for 18 CCC/WPA structures, including one on public land adjacent to O'Leno State Park. Prioritize projects identified by the HSRs for stabilization, restoration, or rehabilitation.

Park staff 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 the park 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 and the historic structures on the recently acquired Columbia Spring property, are recorded or updated in the Florida Master Site File (FMSF).
- Action 2 - Relocate with GPS and map archaeological sites whose exact locations are currently unknown and update FMSF forms as needed.
- Action 3 - Conduct a comprehensive Phase 1 archaeological survey of O'Leno State Park, covering more than the high probability areas identified by the predictive model.
- Action 4 - Determine which areas in River Rise Preserve State Park identified by the predictive model should receive a Phase 1 archaeological survey. Conduct the survey.
- Action 5 - Conduct additional research to determine if O'Leno State Park was the location of a Seminole War fort or Cantonment Winfield Scott.
- Action 6 - Accurately survey and obtain additional information about historic road CO1176 that connects Wire Road with Bellamy Road.
- Action 7 - Determine the age of the historic wooden bridge on Wire Road.
- 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.
- Action 9 - Conduct additional research into the settlement of Leno (Keno) to determine if the community was a town or a small industrial area.

- Action 10 - Continue to document the period of CCC/WPA development and early Florida Park Service administrative history and construction at O'Leno State Park and promptly document historic graffiti in the interior of one CCC/WPA structure, the Canteen (CO1142).
- Action 11 - Develop a housekeeping manual for the collection items at O'Leno State Park, then implement procedures outlined in the manual.
- Action 12 - Develop a Scope of Collections Statement for River Rise Preserve State Park.

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 State Park 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, DRP needs to determine which areas identified by the predictive model merit a Phase 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 State Park, 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.

Park staff will continue to document the period of WPA/CCC development and early Florida 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 State Park does not have any collections. To guide future park management, a Scope of Collections Statement should be prepared for River Rise State Park, indicating that the park does not have a collection and does not accept or acquire items for any collection.

Objective C: Bring five of 159 recorded cultural resources into good condition.

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

Most of the cultural sites at the park are in good condition. However, 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 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 and 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.

LAND USE COMPONENT

VISITATION

Located along the banks of the Santa Fe River, O'Leno State Park has been providing public resource-based recreation since 1940. As one of Florida's nine original state parks, it has a rich Civilian Conservation Corps (CCC) history. Popular recreational activities at O'Leno State Park include camping, hiking and swimming. The group camp is used by larger groups for family reunions and educational trainings.

River Rise Preserve State Park is adjacent to O'Leno State Park, and the two units are managed jointly. River Rise Preserve State Park is a popular location for equestrian groups, with over 35 miles of trails with day-use areas and overnight camping for accommodations. Unique to the park is the reappearance of the Santa Fe River at River Rise East after flowing underground for 3 miles.

Trends

Between 2009 and 2019, O'Leno State Park received an annual average of 91,814 visitors. This included a high of 133,373 visitors in 2013 and a low of 73,324 visitors in 2017. Yearly events are hosted by the park's citizen support organization (CSO), which often attract large crowds.

Between 2009 and 2019, River Rise Preserve State Park received an annual average of 118,477 visitors. This included a high of 143,262 visitors in 2013 and a low of 81,292 visitors in 2017.

EXISTING FACILITIES AND INFRASTRUCTURE

Spanning over 2,372 acres, O'Leno State Park provides multiple use areas for outdoor recreation. The Santa Fe Use Area is centrally located within the park at the terminus of the main park road, thus providing a sense of arrival. This main use area is the focal point for interpreting the park's significant natural and cultural resources, including a small museum dedicated to the history of the Civilian Conservation Corps. The use area also provides orientation to the park's extensive trail system and other outdoor recreational opportunities. Amenities and infrastructure found within the Santa Fe Use Area include restrooms, pavilions, a swimming area, paddle launch dock, suspension bridge, parking area and the original CCC-constructed ranger station.

West of the main day-use area is the cabin area with 13 primitive cabins, an infirmary, dining hall, recreation hall, two bathhouses, a cook's cabin and craft building.

Two full-service campgrounds provide sites for RV and tent camping. Dogwood Campground is located just past the entrance station at the western side of the park and consists of 30 campsites and a bathhouse. The Magnolia Campground is located nearer the center of the park, just southwest of the Santa Fe Use Area. Magnolia Campground consists of 31 campsites and a bathhouse.

Two primitive group camps along with bathhouses are located a short distance south of the Magnolia Campground. Both camps contain picnic pavilions, restrooms and a bathhouse. The primitive group camps are accessed via an unimproved road leading south from the Magnolia Campground.

For operational purposes, River Rise Preserve State Park is divided into eastern and western tracts by U.S. Highway 41. River Rise West consists of an equestrian campground with 30 campsites, a bathhouse, pavilion, barn, horse washing stations and additional space for parking horse trailers. Although designed and intended for equestrians, this campground serves as overflow for O'Leno State Park if campsites are available.

Three trailheads are distributed across the park situated along the perimeter, one each for River Rise East and West and a northern trailhead stemming from the Bellamy Road within O'Leno State Park. The main destination feature that is accessible to both hikers and equestrians is the River Rise from either River Rise East or West, while Sweetwater Lake is only accessible to hikers from the north.

Also located on the western side of the preserve is a Columbia County-maintained boat ramp. This facility consists of a small cement ramp and modest-sized paved parking area.

River Rise East consists of a hiking and equestrian trailhead with parking, a picnic area and informational and interpretive kiosks.

Facilities Inventory

<i>Park Entrance</i>	
Entrance Station	1
<i>Santa Fe Day-Use Area</i>	
Parking Area	1
Restroom	1
Suspension Bridge	1
Picnic Pavilion	8
Museum	1
Playground	1
<i>Cabin Area</i>	
Primitive Cabins	13
Bathhouse	2
Infirmery	1
Dining Hall	1
Cook's Cabin	1
Craft Building	1
<i>Dogwood Campground</i>	
Campsites	30
Bathhouse	1
<i>Magnolia Campground</i>	
Campsites	31
Bathhouse	1
Playground	1
<i>Primitive Group Camp</i>	
Group Camp Area	2
Bathhouse	2

<i>Bible Camp Road</i>	
Boat Ramp	1
Interpretive Kiosk	1
<i>Support Areas</i>	
Residence	3
Shop Building	2
Storage Building	4
Administrative Office	1
Law Enforcement Office	1
Smokehouse	1
Dump station	1
<i>River Rise - East</i>	
Unimproved Parking Area	1
Horse Washing Station	1
Interpretive Kiosks	5
<i>River Rise - West</i>	
Equestrian Camping Area (30 sites)	1
Horse Barn	1
Horse Washing Station	1
Medium Picnic Pavilion	1
Bathhouse	1
Trailer Parking (spaces)	40
Boat Ramp	1

CONCEPTUAL LAND USE PLAN

Detailed Conceptual Land Use Plan Objectives

Ten use areas at O'Leno State Park and River Rise Preserve State Park are listed below for improvements to be implemented within the 10-year planning cycle. Specific plan details are available in the next section.

Santa Fe Day-Use Area

Objective: Inspect, renovate, and repair structures in the day use area, including the CCC visitor center interior.

Actions:

- *Inspect and renovate suspension bridge as needed.*
- *Provide pavilion alternative(s) at a less flood-prone location as necessary.*
- *Repair and renovate structures in main day-use area.*
- *Plan and implement upgrades to the interpretive displays in the CCC visitor center to modern, professional standards.*

Several buildings in this riverside day-use area require in situ renovations including the restroom, CCC visitor center (along with modernization of displays) and the original CCC park ranger station. Renovations to these aging buildings should begin with structural assessments to identify and prioritize repair needs. The intent of renovation work should be to modernize functionality and serviceability while preserving the historic appearance and cultural legacy of the buildings. General repairs and

renovations to the CCC visitor center should provide for the concurrent or subsequent modernization of displays, while renovation work on the original CCC park ranger station should support the repurposing of the building to function as a park administrative office.

The Cypress Log Pavilion (CO386), Recreation Hall (CO387) and Craft Building (CO1140) need treatment and repairs associated with termite damage. Damage to the Recreation Hall (CO387) includes rotting timbers as described in the *Cultural Resources* section of this plan. Additionally, 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 will need a new roof within this planning cycle. The Craft Building (CO1140) will also require a new tin roof within this planning cycle. DRP staff will obtain an engineering assessment of damages to the three structures and implement repairs.

After a 2022 treefall event, a similar structural inspection of the suspension bridge is needed. Any structural concerns and corresponding repair needs will be addressed to preserve the unique design and visitor experience of this bridge.

As the recreational hub of the park, the Santa Fe Use Area should serve as the main gateway to the combined O'Leno-River Rise trail system. A large interpretive panel orienting visitors to the trail system should be strategically placed near the suspension bridge to effectively incorporate this CCC structure into the historical ambiance and sense of embarkment.

Delineation of internal pathways between the use area structures is also lacking and the corresponding spread of foot traffic tramples vegetation, largely precluding the establishment of effective xeriscaping. An assessment should be conducted to determine the best routing of internal pathways as well as designs and materials that would minimize ground disturbance and alterations to hydrology.

The impacts of periodic river flooding and changing perceptions of personal safety and comfort level have all contributed to declined use of this swimming area. The seven small picnic pavilions located here are therefore increasingly underutilized. Management proposals for the Santa Fe Use Area will include a provision to de-emphasize use of the swimming area by removing the underutilized pavilions, which are highly visible from the suspension bridge. Two distinct proposals for the swimming and picnicking portion of the Santa Fe Use Area include:

- Continuation of numerous small pavilions and access to the river for swimming and fishing with necessary erosion abatement measures including filling of gullies, minor recontouring to redirect sheet flow, naturalization, or targeted planting of native vegetation, as necessary, to help anchor the soil. Restoration should also include assessment and stabilization of the original CCC-terraced stone wall. To preserve the low impact use and discrete structural profile, enhancement, enlargement or expansion of the pavilions is not indicated.
- Removal of the numerous small pavilions and restoration of this slope, entailing improvement of the natural aesthetics and function of the approximately 1-acre site. Such naturalization would yield multiple benefits, including the reduction of erosion, buffering from river flooding and generalized landscape beautification. If deemed necessary, two medium-sized pavilions can be constructed in a more suitable, non-flood-prone location such as the space between the day-use parking area and the cabins. Efforts to address erosion within the former picnic area may include measures listed above.

Regardless of direction, emphasis of this use area should be placed on interpretation of the Santa Fe River (particularly at this prominent riverbend shortly before the swallet), the various CCC architectural and historical elements and trail user orientation. Accordingly, the infrastructural focal point for this use area should be the centerpiece CCC-era pavilion.

Group Cabin Complex

Objective: Perform renovations to three structures within the group cabin complex.

Actions:

- *Renovate bathhouses, dining hall and craft building.*

Structures within the cabin complex that require renovations include the dining hall, craft building, and both bathhouses. The Recreation Hall (CO387) and Craft Building (CO1140) need treatment and repairs associated with termite damage. Damage to the Recreation Hall (CO387) includes rotting timbers as described in the *Cultural Resources* section of this plan. Additionally, the front wooden steps need regular replacement, particularly after flood events. All these structures are showing signs of age regarding appearance and serviceability. Utility upgrades and period-sensitive exterior renovations are needed to improve service while maintaining the buildings' distinct cultural aesthetics. While cabins are a traditional component of the overnight experience at O'Leno State Park, there is provision for modifications or replacement. If cabins are replaced, such as the structure that was damaged beyond repair in a storm, they should be replaced in situ and provide essential upgrades for modern comfort.

In conjunction with renovations and/or replacement, conversion to individual rentals versus the traditional group rental concept may be considered. To preserve the traditional cabin arrangement and minimize ground disturbance associated with new utilities, the communal bathhouses should be retained (i.e., cabins will not be outfitted with bathroom amenities).

Campgrounds – Dogwood and Magnolia

Objective: Upgrade, renovate, and repair campground infrastructure.

Actions:

- *Upgrade utilities at both campgrounds.*
- *Resurface campground roads.*
- *Renovate or replace both bathhouses.*

Dogwood Campground

- The existing bathhouse needs to be renovated or replaced. An assessment of the campground's utilities is also needed. If deemed necessary, electrical and/or plumbing renovations/upgrades should be implemented.

Magnolia Campground

- Portions of the one-way loop are narrow due to tree crowding that creates bottlenecks. Trees should be selectively removed to achieve a desired balance between shading, natural aesthetics and essential access improvements.
- The bathhouse is showing signs of age and needs renovation or replacement, pending assessment.

- The water utility infrastructure located within the middle of the campground detracts from natural beauty. This infrastructure should be hidden from view with vegetation or, if feasible without new resource impacts, relocated to the campground periphery.

Parkwide Trail System

Objective: Develop a comprehensive primary trailhead and install a network wayfinding system.

Actions:

- *Develop a comprehensive park trails panel to serve as the gateway to the combined O'Leno-River Rise interconnected trail system.*
- *Improve interpretive and wayfinding signage along all trails to ensure consistency with the parkwide trail orientation panel.*

Winding through canopied forests and past intriguing riverine and karst features, park trails should be increasingly emphasized as the best way to experience the diverse natural environments of both parks. As described above, the parkwide trail system should be enhanced by improved orientation and sense of embarkment from the Santa Fe Use Area.

Three main trails for hiking and biking, as well as an extensive equestrian component, take visitors through a wide array of natural communities including upland hardwood forest, scrubby flatwood and sandhill. All trails should be maintained in good condition regarding grade, encroachment of vegetation and threats of erosion. Sections of each of these trails contain wooden boardwalks and pathways that will be repaired or replaced as needed. Along with a combined trailhead orientation panel near the CCC suspension bridge, new interpretive and wayfinding panels should be developed and placed along the trail system for better guidance.

Bible Camp Road and Boat Ramp

Objective: Coordinate improvements of boat ramp and access road with Columbia County.

A boat ramp at the end of Bible Camp Road provides access to the Santa Fe River. The road and the boat ramp are currently managed by Columbia County. Both will be maintained in coordination with the county.

Old Bellamy Road Trailhead

Objective: Improve interpretation to provide for sense of arrival and orientation to the park's trail system.

The Old Bellamy Road trailhead is located at the internal border of O'Leno State Park and River Rise Preserve State Park. This trailhead has approximately 20 parking spaces and one interpretive kiosk. The trailhead has low visitor use throughout much of the year. Improved trail user orientation and wayfinding is needed at the trailhead and along the trails to highlight its central location and connections between the adjacent state parks.

Support Area

Objective: Replace, add, and consolidate support infrastructure.

Actions:

- *Assess aged and adjunct shop structures to determine feasibility of either renovation or replacement.*
- *Add up to three pole barns.*

- *Consolidate volunteer sites within the support area (shop compound).*

The support area includes one residence, one office and several shop/equipment storage buildings. To better support staff, the area needs reorganization and improved shop facilities. The aging shop buildings are largely adjunct in design and functionality. These buildings require investigation to determine their historical significance. If the shop buildings are considered historic, an evaluation will be required to determine if suitable modification and renovation could achieve a level of improvement that would meet the park's needs. If it is determined that modification and renovation is not feasible, the aged shop structures should be replaced with up to two new shop buildings.

Up to three pole barns are also needed to meet the park's resource management and operational demands.

River Rise East

Objective: Improve parking and wayfinding at the River Rise East Trailhead.

Actions:

- *Formalize trailhead with improved delineation of parking and wayfinding.*
- *Update interpretive kiosk to better orient visitors to the trail system.*

Trailhead

A unique feature of River Rise East is the reappearance of the Santa Fe River after flowing underground for 3 miles. The existing panel at the rise of the Santa Fe River should be replaced to better interpret this significant hydrological feature, the associated karst topography and natural communities.

Enhancement of interpretation and addition of trailhead amenities should create a sense of place such that trail users will embark from this site with greater context and knowledge of destination – the park's namesake river rise. Trailhead amenities should remain basic. A small picnic shelter integrated with interpretation would be appropriate, whereas restrooms are deemed unnecessary given the low volume of visitor use.

Many of the trails extending from this trailhead double as fire lines and are routinely disked, turning over fresh soil that is strenuous to traverse. Half of the trail width should be maintained in a manner that preserves natural aesthetics and usability for both hikers and equestrians.

River Rise West

Objective: Develop a full equestrian campground.

Actions:

- *Develop a full equestrian campground with tent-only sites included.*
- *Add one bathhouse.*

Equestrian Trailhead

The equestrian trailhead should be distinguished from the proposed equestrian campground to ensure adequate day-use capacity and provide a welcoming experience for non-campers. If restrooms are deemed necessary, consideration should be given to providing day users access to the bathhouse within the nearby Equestrian Campground, thus avoiding the need for a second restroom facility. Improved trail orientation and wayfinding are also needed at this site.

Equestrian Campground

Facilities at River Rise West support equestrian use. Specific amenities include a large horse stable, washing stations and 30 campsites. These campsites also serve as overflow camping from O'Leno State Park.

To better accommodate the equestrian user group at River Rise West, the equestrian campground will be redeveloped as necessary to improve the bathhouse and provide campsites for RVs, pop-ups, tent campers and accommodate host sites. Improved horse trailer parking will also be addressed. Designs should increase organization and preserve the tree canopy to maximize natural scenery, shade and wandering between sites. Sensitivity to the adjacent sinkhole must be considered. Campground redevelopment plans should ensure that the equestrian trailhead is sufficiently separated from the campsites to preserve viability for day users.

Support Area

The need for proximity operational support and oversight at River Rise Preserve State Park should be adequately met by the current staff residence at Columbia Spring and the campground host. Need for additional immediate support infrastructure should be evaluated. The primary maintenance shop at O'Leno State Park should be relied on as feasible.

OPTIMUM BOUNDARY

Multiple parcels along the south side of Bible Camp Road are identified. These relatively small contiguous parcels total approximately 26 acres. Several of the parcels have active residences, but the majority of the land is undeveloped or forested. Acquisition of this block of parcels would provide continuity of park lands south of Bible Camp Road within the immediate watershed of the Santa Fe River.

Immediately north of Bible Camp Road is a large contiguous block comprised of over 60 parcels of forested or rural lands. This area would expand conservation lands that function as wildlife habitat and protect a significant portion of the Santa Fe River watershed.

Four other parcels are identified at the northwestern corner of the park along U.S. Highway 441. These parcels are undeveloped or in silvicultural use. Acquisition would provide much needed buffering from major roadways near the park entrance road.

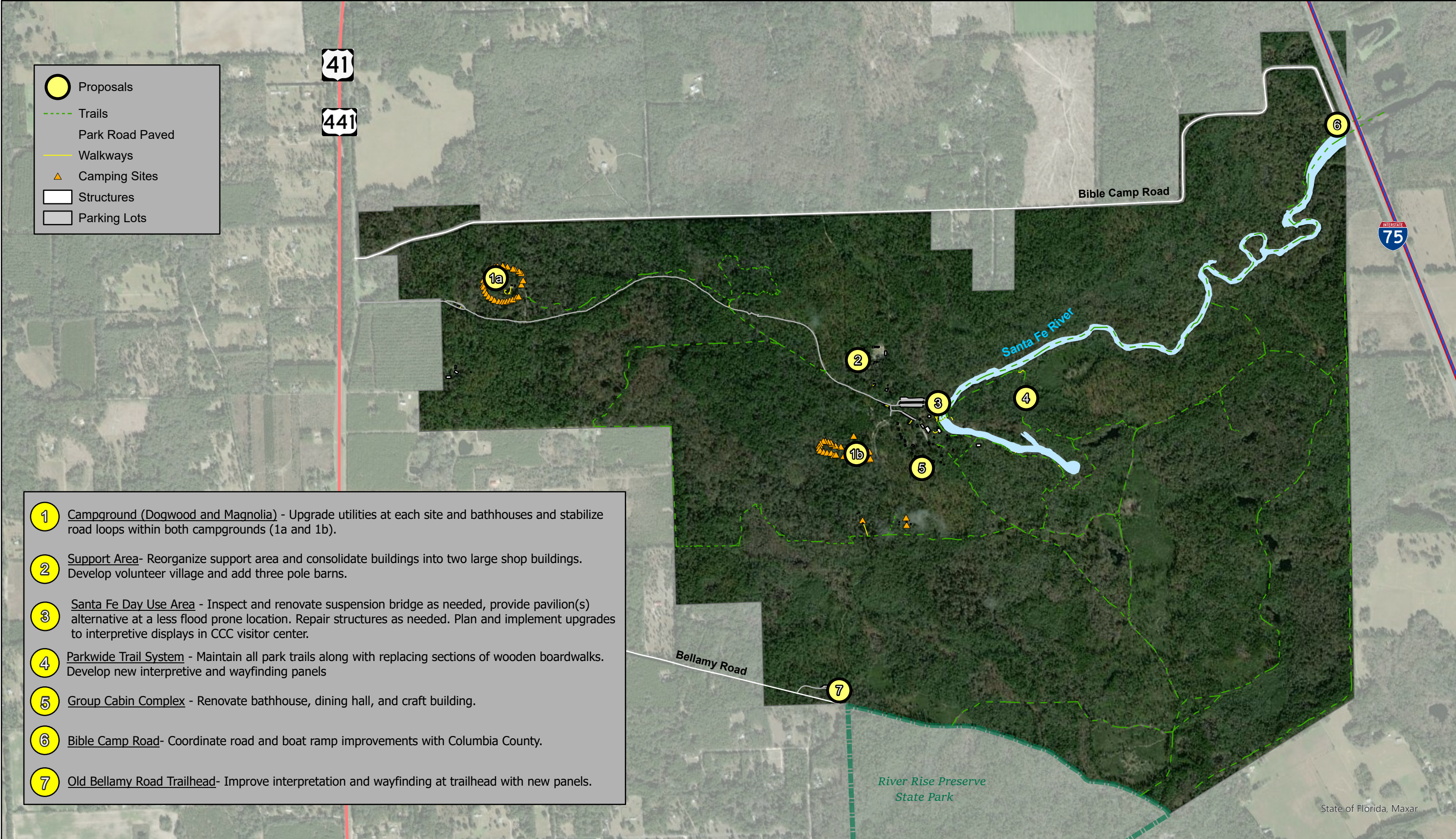
A block of 10 contiguous parcels is identified along the western park boundary (south of Old Bellamy Road and east of Southeast Brawley Terrace. These largely unoccupied, forested lands would expand the park's conservation boundary, providing increased buffering of sensitive karst windows and associated cave systems.

One parcel is identified farther south, along the park's western boundary (south of Southeast Happy Valley Glen). This forested parcel would expand wildlife habitat, watershed protection and buffering of the Santa Fe River Rise.

A large optimum boundary block of contiguous parcels is identified at the south end of the park. Acquisition would protect lands along both sides of the Santa Fe River. The block of five contiguous parcels located along the park's eastern boundary (west of Northwest Old Bellamy Road and north of Northwest 227th Drive) would expand protection/buffering of the karst features associated with the natural bridge of the Santa Fe River.

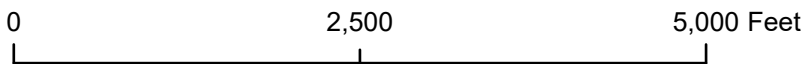
Just north of the lands described in the preceding paragraph, is a block of 10 contiguous parcels. These lands would extend the park boundary east to Interstate 75 and expand wildlife habitat and watershed protection.

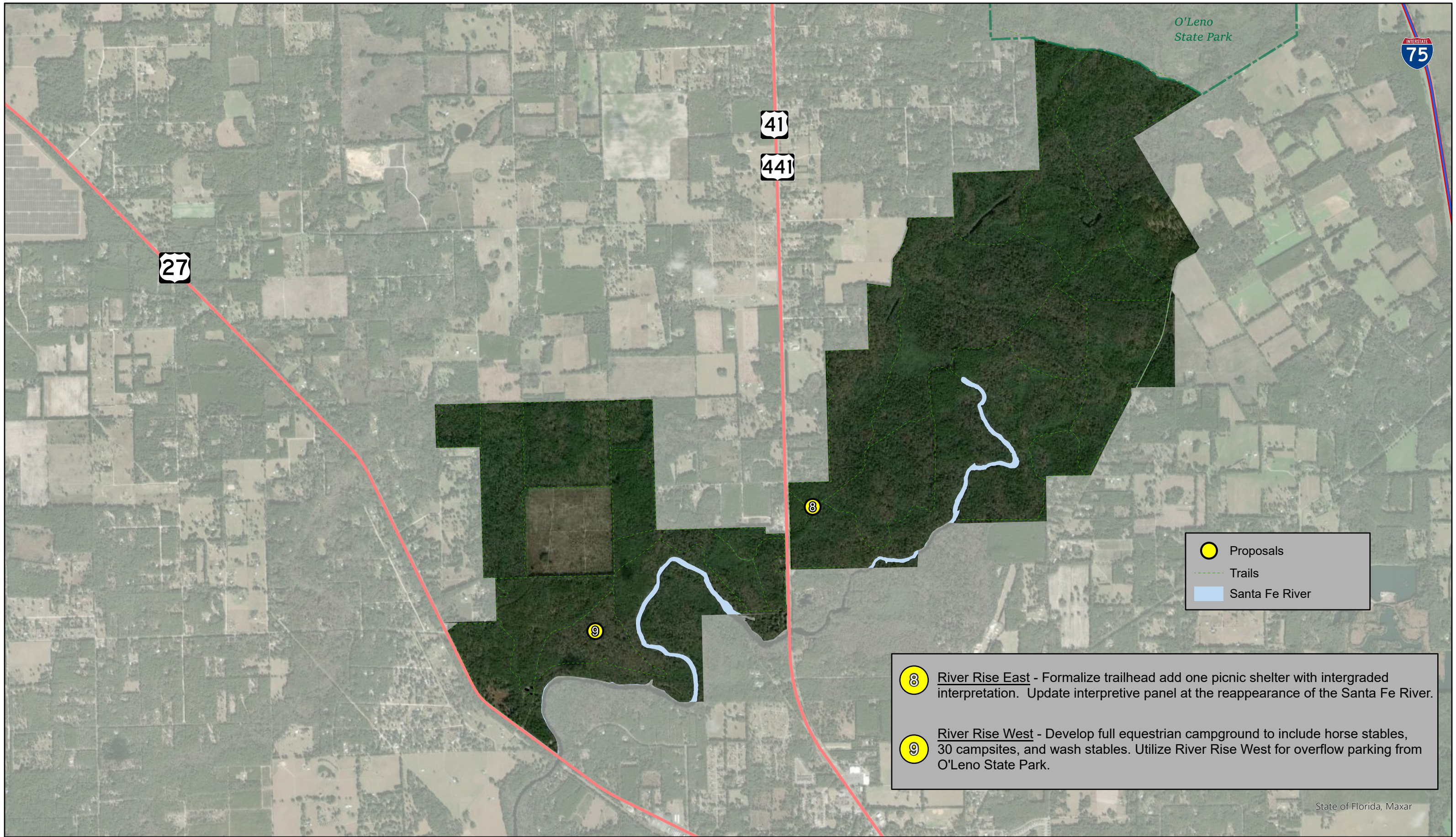
There are several contiguous parcels that extend east of Interstate 75. Acquisition of these parcels would preserve undeveloped watershed along the north and south sides of the Santa Fe River and provide connection to existing SRWMD conservation lands.



O'Leno State Park

Conceptual Land Use Plan 1 of 2



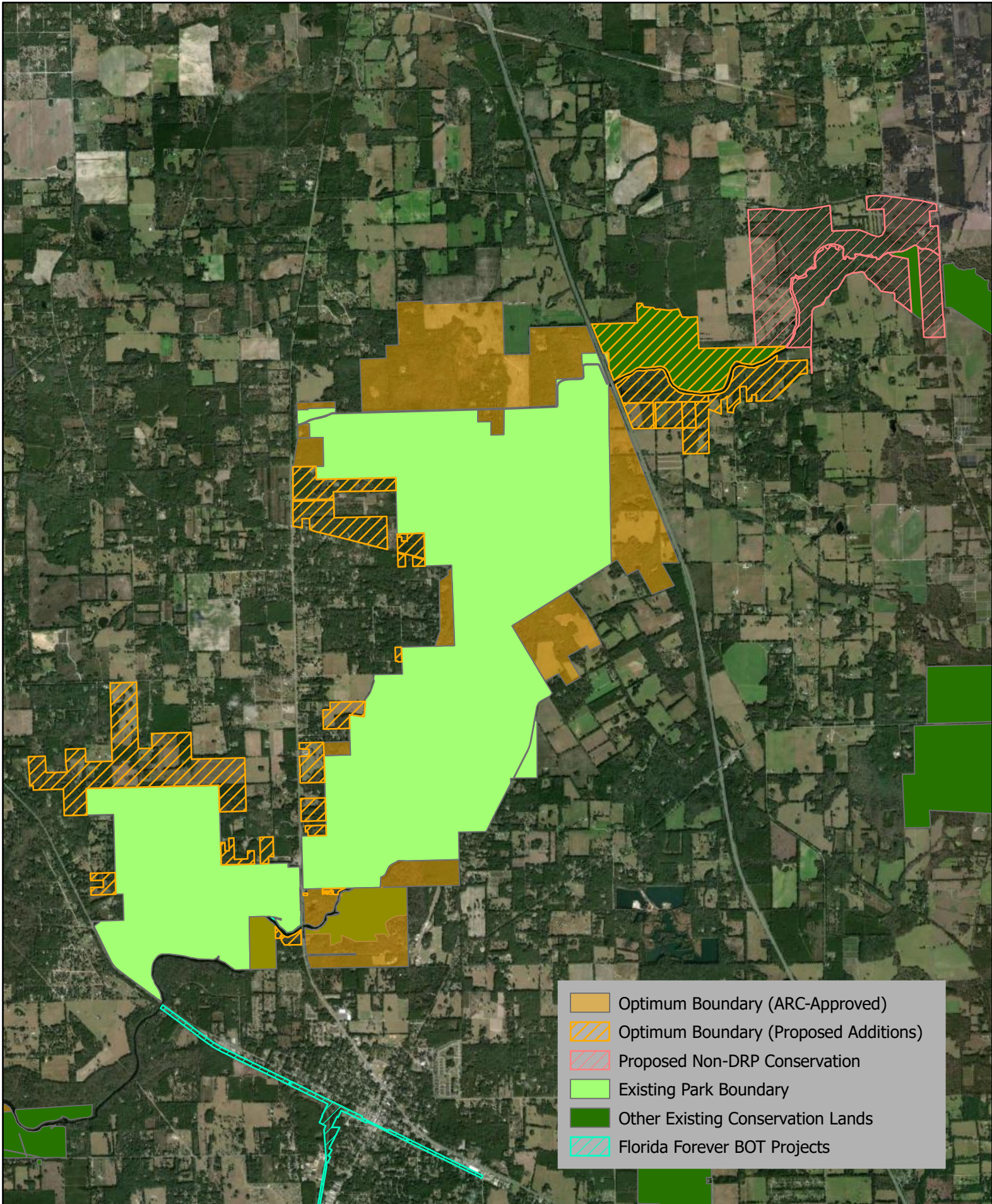


River Rise Preserve State Park

Conceptual Land Use Plan 2 of 2

0 2,500 5,000 Feet





- Optimum Boundary (ARC-Approved)
- Optimum Boundary (Proposed Additions)
- Proposed Non-DRP Conservation
- Existing Park Boundary
- Other Existing Conservation Lands
- Florida Forever BOT Projects



O'Leno State Park
River Rise Preserve State Park
Optimum Boundary

