Edward Ball Wakulla Springs State Park

Acquisition and Restoration Council Approved Unit Management Plan

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Division of Recreation and Parks

December 2022

FLORIDA DEPARTMENT OF
Environmental Protection

Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, FL 32399

December 13, 2022

Mr. Daniel Alsentzer
Division of Recreation and Parks
Department of Environmental Protection
3900 Commonwealth Boulevard, MS 525
Tallahassee, Florida 32399-3000

RE: Edward Ball Wakulla Springs State Park – Lease No. 3463

Dear Mr. Alsentzer,

On **December 9, 2022**, the Acquisition and Restoration Council (ARC) recommended approval of the **Edward Ball Wakulla Springs State Park** management plan. Therefore, Division of State Lands, Office of Environmental Services (OES), acting as agent for the Board of Trustees of the Internal Improvement Trust Fund, hereby approves the **Edward Ball Wakulla Springs State Park** management plan. The next management plan update is due December 9, 2032.

Pursuant to s. 253.034(5)(a), F.S., each management plan is required to "describe both short-term and long-term management goals and include measurable objectives to achieve those goals. Short-term goals shall be achievable within a 2-year planning period, and long-term goals shall be achievable within a 10-year planning period." Upon completion of short-term goals, please submit a signed letter identifying categories, goals, and results with attached methodology to the Division of State Lands, Office of Environmental Services.

Pursuant to s. 259.032(8)(g), F.S., by July 1 of each year, each governmental agency and each private entity designated to manage lands shall report to the Secretary of Environmental Protection, via the Division of State Lands, on the progress of funding, staffing, and resource management of every project for which the agency or entity is responsible.

Pursuant to s. 259.032, F.S., and Chapter 18-2.021, F.A.C., management plans for areas less than 160 acres may be handled in accordance with the negative response process. This process requires small management plans and management plan amendments be submitted to the Division of State Lands for review, and the Acquisition and Restoration Council (ARC) for public notification. The Division of State Lands will approve these plans or plan amendments submitted for review through delegated authority unless three or more ARC members request the division place the item on a future council meeting agenda for review. To create better efficiency, improve customer service, and assist members of the ARC, the Division of State Lands will notice negative response items on Thursdays except for weeks that have State or Federal holidays that fall on Thursday or Friday. The Division of State Lands will contact you on the appropriate Friday to inform you if the item is approved via delegated authority or if it will be placed on a future ARC agenda by request of the ARC members.

Pursuant to s. 259.036(2), F.S., management areas that exceed 1,000 acres in size, shall be scheduled for a land management review at least every 5 years.

Conditional approval of this land management plan does not waive the authority or jurisdiction of any governmental entity that may have an interest in this project. Implementation of any upland activities proposed by this management plan may require a permit or other authorization from federal and state agencies having regulatory jurisdiction over those particular activities. Pursuant to the conditions of your lease, please forward copies of all permits to this office upon issuance.

Sincerely,

Deborah Burr Digitally signed by Deborah Burr Date: 2022.12.13 12:04:43 -05'00'

Deborah Burr
Office of Environmental Services
Division of State Lands

EDWARD BALL WAKULLA SPRINGS STATE PARK
Unit Management Plan
Executive Summary
Purpose and Significance of the Park

Park History

Wakulla Springs State Park was initially acquired on September 17, 1986, with funds from the Conservation and Recreation Lands Program (CARL). Currently, the park comprises 6,786.41 acres.

Park Significance

The park protects a first magnitude spring, which flows at a rate of 250 million gallons per day, that includes one of the world's largest basins and deepest cave systems as well as numerous other springs and sinkholes. The park protects natural communities such as upland hardwood forest, floodplain swamps and spring-run stream that provide scenic landscapes for park visitors and important habitat for imperiled species.

EDWARD BALL WAKULLA SPRINGS STATE PARK
Unit Management Plan
Executive Summary
Park Interpretive Themes

Central Park Theme

The vast flow of Wakulla Springs and its connected environments is a window into the ancient and continuing relationships between people, wildlife, and water.

Primary Interpretive Themes

Habitats— From ancient cypress domes and old growth forests to one of the world's largest freshwater springs, Wakulla Springs State Park contains diverse natural habitats that spotlight Florida's flora, fauna, and geology.

Historic use— The Lodge and surrounding historic artifacts of Wakulla Springs attest to the allure and utilization of Florida's natural wonders by humanity over millennia.

Recreational opportunities— Responsible recreation throughout the park and its surrounding community safeguards the water quality and habitat protection of this ecological treasure.

Water quality— The health of the Wakulla River relies on collaborative regional management efforts that prioritize nitrogen reduction and water conservation.

EDWARD BALL WAKULLA SPRINGS STATE PARK
Unit Management Plan
Executive Summary
Park Quick Facts

- Agency: Department of Environmental Protection - Division of Recreation and Parks
- Acreage : 6,786.41
- Location: Wakulla County
- Lease Management Agreement Number(s): 3463
- Use: Single
- Responsibility: Public Outdoor Recreation and Conservation
- Sublease: None
- Encumbrances: See Appendix 1 for details
- Public Involvement: See Appendix 2 for details
- Optimum Boundary: Approximately 4,903 acres (See Optimum Boundary Page)

EDWARD BALL WAKULLA SPRINGS STATE PARK
Unit Management Plan
Executive Summary
Park Accomplishments: 2007 — 2022

Previous Accomplishments

Since the 2007 Unit Management Plan for Wakulla Springs the park has made significant accomplishments in terms of resource management and continued protection of the park. The park has added approximately 750 acres to the park. Since 2008 the park treated 15,261 acres with prescribed fire and treated 118 infested acres of invasive species in the park.

Future Objectives

Moving forward in the next 10 years, the park plans to continue resource management efforts by restoring altered landcover types into their desired future conditions. Restoration activities will be done through the continued use of prescribed fire applications, invasive species removal, and other management activities. To improve visitor use, the park will be making improvements to 9 use areas and creating 2 new use area.

EDWARD BALL WAKULLA SPRINGS STATE PARK
Unit Management Plan
Executive Summary
Management Goals & Objectives
Hydrological & Natural Communities

Objective: Assess hydrological restoration needs, monitor water quality and quantity, and restore natural hydrological condition to 813 acres.

To restore the natural hydrological conditions, steps include reviewing all management zones in order to identify and prioritize any hydrological restoration needs. As there have been no major hydrological disruptions identified in the past, this is intended to be a comprehensive review in order to confirm/update this information. Additionally all wetlands delineated as protected areas and excluded from any new park development that would degrade or impact natural hydrological conditions.

Objective: Restore and improve approximately 1,140 acres of various natural communities, and apply fire to approximately 3,500 acres.

To restore and improve the natural communities, steps include developing a restoration plan for 890 acres of upland pine, 250 acres of upland mixed woodlands, and burning between 875-1,920 acres of fire dependent natural communities annually.

EDWARD BALL WAKULLA SPRINGS STATE PARK
Unit Management Plan
Executive Summary
Management Goals & Objectives Imperiled & Invasive Species

Imperiled Species Management
Goal: Maintain, improve, and restore imperiled species populations and habitats.

Objective: *Monitor and document 7 imperiled plant and animal species.*
Wakulla Springs State Park has documented populations of a number of imperiled animal species that would benefit from additional monitoring. The gopher tortoise, limpkin, manatee. Sweet shrub, eastern purple cone flower, green adder's mouth orchid, and little club spur orchid will be monitored and documented.

Invasive Species Management
Goal: Remove invasive species and conduct needed maintenance.

Objective: *Annually treat 5 infested acres of invasive plant species in the park.*
Various invasives including hydrilla, coral ardisia, and cogongrass are found within the park. Plans to remove these non natives include continuous treatment and survey. Removal will be done by park staff and contractors.

EDWARD BALL WAKULLA SPRINGS STATE PARK
Unit Management Plan
Executive Summary
Management Goals & Objectives
Recreational Use & Infrastructure

Recreation and Facilities Management

Goal: Develop and maintain use areas and support infrastructure

Objective: Improve 9 use areas and create 2 new use area.

To improve and expand visitor use at the park, plans include the improvements below:

Park Entrance

- Replace Ranger Station
- Multi-Use Trail Connection
- Traffic Pattern Alterations

Main Day Use Area

- Interpretive Center
- Redesign Parking Area
- Remove Dogwood Pavilion
- Playground Improvements
- 2 Additional Trails
- Cypress Dome Observation

Lodge

- Replace Windows and Doors
- Repair/Replace Elevator

Water Structures

- Inspect and Improve Water Tower
- Repair Boat Dock and Observation Dock
- Replace Floating Swim Platfoms
- Improve Dive Tower
- Maintain/Replace Tour Boats
- Enhance Ways Area for Park Boat Access
- Improve River Boundary Fence

River Sinks Day Use Area

- Perimeter Fencing
- Reconfigure Trails as Needed
- Enhance Interpretation

Emerald Sink Area

- Replace Stairs

Employee Entrance

- Improve Entrance
- Traffic Pattern Alterations
- Pedestrian Gate

Cherokee Sink

- Restroom
- Additional Swimming Option

Rock Road Trailhead

- Improve Trailhead

Sanctuary

- Designate as Wilderness Preserve

Ferrell Tract

- Stabilized Parking
- Trailhead Kiosk
- Potential Connection to State Forest
- Safety Enhancement with FDOT
- Configure Trails

Management Goals & Objectives Optimum Boundary

Several parcels are highlighted throughout the Wakulla region for acquisition. The primary objective is to protect the quality and flow of Wakulla Springs but also to protect the many springs and sinkholes in the region.

The optimum boundary for the park consists of 178 parcels that total approximately 4,903 acres. The properties are divided between numerous lands both large and small. For this description, the parcels have been divided into four geographic groups. The groups are Northwest, Northeast, Central, and South.

The Northwest Group consist of 11 parcels that total approximately 629 acres. None of the properties lie within the Wakulla Springs Protection Zone Florida Forever Project. These areas would help protect the springs recharge area, protect sinkholes and springs, and could provide a suitable site for future park activities.

The Northeast Group consist of 41 parcels that total approximately 1,773 acres. The majority of these (1,667 acres) are within the Wakulla Springs Protection Zone Florida Forever Project. These properties contain natural communities that would improve the buffer and the habitat protection potential of the park. They would also connect areas of the park that are currently disconnected, expand recreational opportunities, and protect the quality and flow of Wakulla Springs.

The Central Group consist of 59 parcels that total approximately 1,387 acres. Of this area 822 acres lie within the Wakulla Springs Protection Zone Florida Forever Project. These properties would connect the newly acquired Ferrell tract to the main park property, reduce inholdings and unify the park boundary, ensure additional protection of the springshed of Wakulla Springs, and would provide road access to Turner Sink via Bloxham Cutoff Road.

The South Group consist of 67 parcels that total approximately 1,114 acres. Of these, 886 acres are within the Wakulla Springs Protection Zone Florida Forever Project. These properties would provide further protection of the Wakulla springshed, protect additional habitat for imperiled species, reduce inholdings, further protect Cherokee Sinks, and would facilitate additional fire and invasive management practices.

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RESOURCE MANAGEMENT COMPONENT

LAND USE COMPONENT

IMPLEMENTATION COMPONENT

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INTRODUCTION

Edward Ball Wakulla Springs State Park (Wakulla Springs State Park) is located in Wakulla County (see Vicinity Map). Access to the park is from U.S. 319/Crawfordville Highway, SR61/Wakulla Springs Road, and SR267/Bloxham Cutoff Road (see Reference Map). The Vicinity Map also reflects significant land and water resources existing near the park.

Wakulla Springs State Park was initially acquired on September 17, 1986, with funds from the Conservation and Recreation Lands Program (CARL). Currently, the park comprises 6,786.41 acres. The Board of Trustees of the Internal Improvement Trust Fund (Trustees) hold fee simple title to the park and on October 20, 1986, the Trustees leased (Lease Number 3463) the property to DRP under a 50-year lease. The current lease will expire on October 19, 2036.

A new acquisition was added to Edward Ball Wakulla Springs State Park in October of 2019. This tract is located along SR61 and Old Shell Point Road (see Reference Map). The 717-acre “Ferrell Tract” addition was acquired by the State of Florida utilizing funds from the USDA’s Forest Legacy Program (FLP), administered by the program State Lead Agency in Florida, the Department of Agriculture and Consumer Services, Florida Forest Service. The FLP was established in 1990 through an amendment to the Cooperative Forestry Assistance Act (CFAA) of 1978. The purpose of the FLP is to identify and protect environmentally important private forestlands that are threatened by conversion to non-forest uses and provide the opportunity for continuation of traditional forest uses, such as forest management activities and outdoor recreation. The U.S. Department of Agriculture, U.S. Forest Service, implements the FLP through State participation, consistent with current National FLP Implementation Guidelines, and as described in each State Forest Action Plan.

FLP requirements applicable to the Ferrell Tract include, but are not limited to:

- Maintain at least 75% forested land
- Prohibit incompatible uses including, but not limited to:
    - Mineral Reservations
    - Linear non-forest corridors
    - Hotel and resort development
    - Commercial signage
    - Unmanaged off-road vehicle use
    - Office building or residential subdivision development
    - Inconsistent Third-Party Interests
- State Lead Agency evaluation of adherence to FLP requirements every 5 years
- Update a multi-resource management plan at least every 10 years
- Obtain State Forester approval of any modifications or updates to the multi-resource management plan

Please refer to the following link for current FLP guidelines and requirements:https://www.fs.usda.gov/sites/default/files/fs_media/fs_document/15541-forest-service-legacy-program-508.pdf

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

Purpose and Significance of the Park

The purpose of Edward Ball Wakulla Springs State Park is to preserve a landscape that has an extensive 15,000-year history of human habitation. In addition, the park protects the Edward Ball legacy and the significant mark he left on the social, economic, and political life of the Floridian people

Park Significance

- The park protects a first magnitude spring, which flows at a rate of 250 million gallons per day, that includes one of the world's largest basins and deepest cave systems as well as numerous other springs and sinkholes.

- The park contains extensive archaeological evidence of historic and prehistoric settlements, protects these sensitive cultural resources, and provides interpretive opportunities for understanding the relationship between natural resources and various human cultures across multiple time periods.

- The Wakulla Springs Lodge Complex and other historic buildings affiliated with Edward Ball form a National Historic District and provide for unique recreational and interpretive opportunities for visitors.

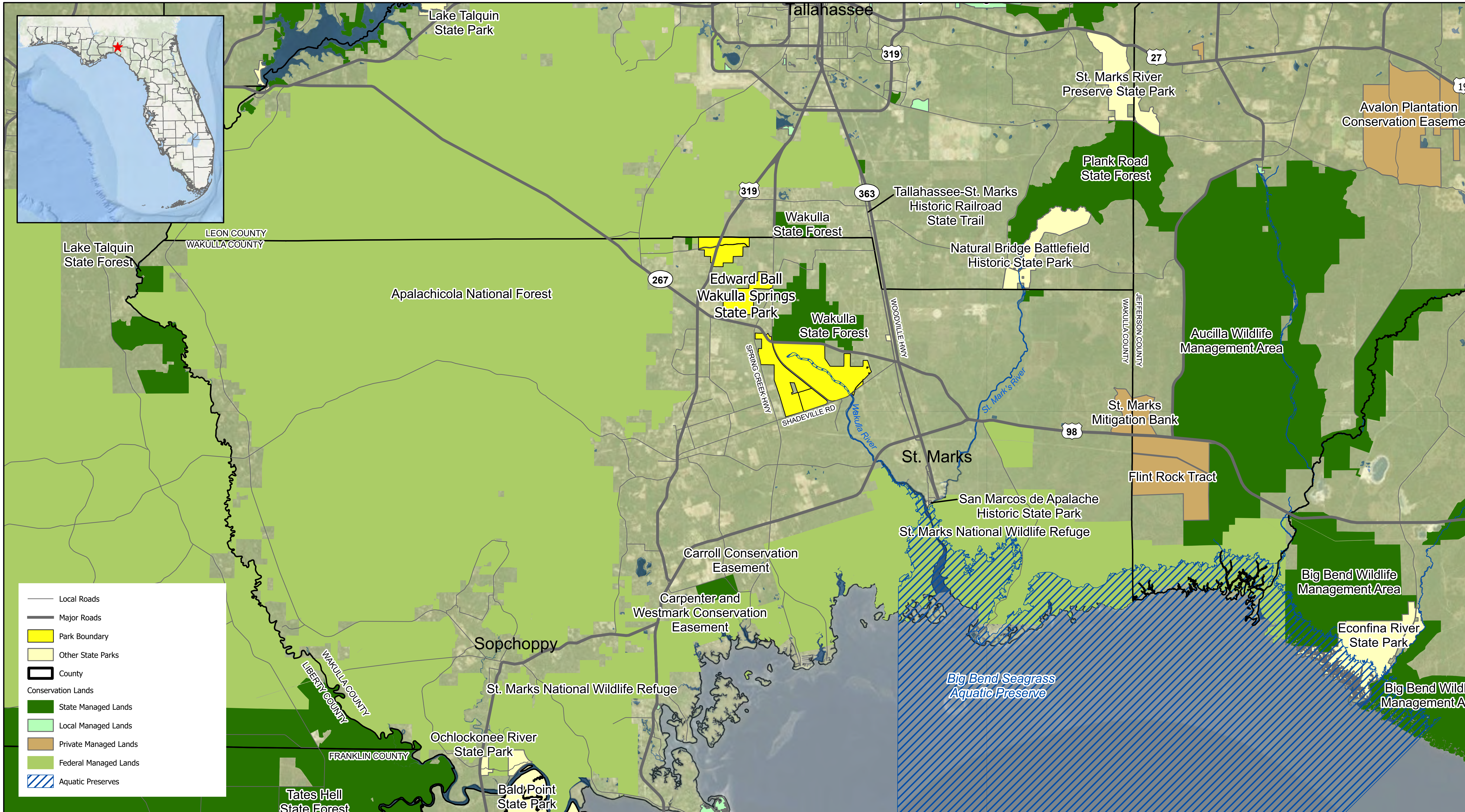
- The park protects natural communities such as upland hardwood forest, floodplain swamps and spring-run stream that provide scenic landscapes for park visitors and important habitat for imperiled species.

- In addition to the rich interpretive opportunities available, the park also offers resource-based recreation in the form of hiking and wildlife viewing, swimming at the springhead, and boat tours of the Wakulla River and springhead.

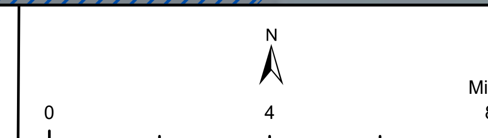
Wakulla Springs State Park is classified as a state park in the DRP's unit classification system. In the management of a state park, a balance is sought between the goals of maintaining and enhancing natural conditions and providing various recreational opportunities. Natural resource management activities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

Park Interpretation

Interpretation is a mission-based communication process that forges emotional and intellectual connections between the interests of the audience and meanings inherent in the resource. Interpretive themes are the key concepts for communicating the meanings inherent in a Florida State Park. A central park theme is a short, dynamic interpretive statement that reflects the significance of a park by highlighting distinctive features and essential visitor experiences. In addition to a central park theme, each park has primary interpretive themes. These themes serve as a starting point for park staff to plan interpretive and educational content by outlining the main stories of the park's natural and cultural resources. Further interpretive planning can branch off from these themes but should ultimately help reinforce the main interpretive messages of the park.



EDWARD BALL WAKULLA SPRINGS STATE PARK
Vicinity Map



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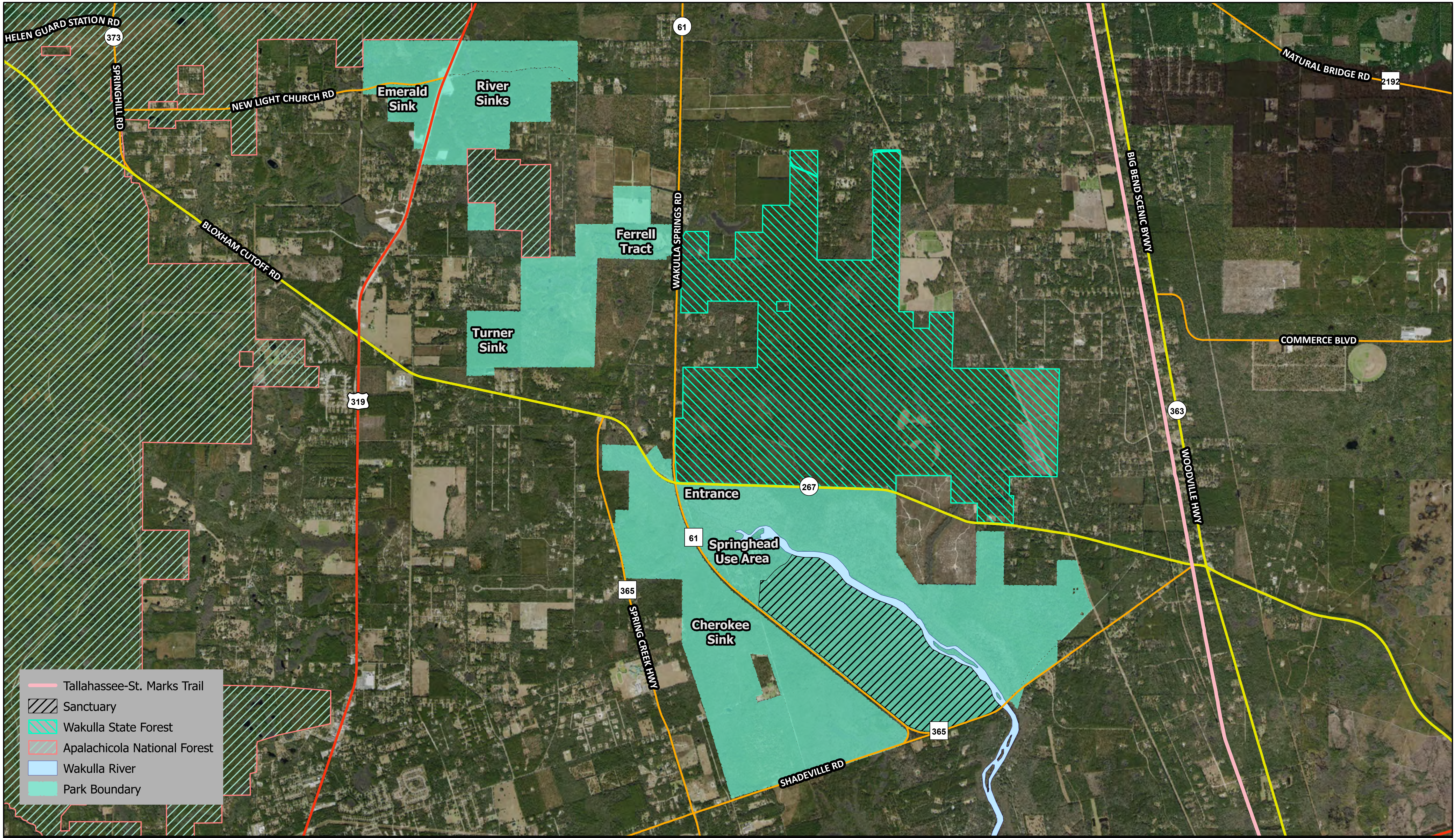
Sources: ESRI; Florida Department of Environmental Protection
This graphical representation is provided for informational purposes and should not be considered authoritative for navigational, engineering, legal, and other uses.



Edward Ball Wakulla Springs State Park
Reference Map

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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.

Central Park Theme

The vast flow of Wakulla Springs and its connected environments is a window into the ancient and continuing relationships between people, wildlife, and water.

Primary Interpretive Themes

Habitats

From ancient cypress domes and old growth forests to one of the world's largest freshwater springs, Wakulla Springs State Park contains diverse natural habitats that spotlight Florida's flora, fauna, and geology.

Historic use

The Lodge and surrounding historic artifacts of Wakulla Springs attest to the allure and utilization of Florida's natural wonders by humanity over millennia.

Recreational opportunities

Responsible recreation throughout the park and its surrounding community safeguards the water quality and habitat protection of this ecological treasure.

Water quality

The health of the Wakulla River relies on collaborative regional management efforts that prioritize nitrogen reduction and water conservation.

Interpretive Application

Interpretation is a DRP priority for the inherent value of visitor engagement and as a tool for promoting stewardship and conservation. Interpretation also plays an important role in achieving many other park management objectives.

Non-Personal Interpretation

Interpretive elements which do not require a person to deliver a message (signs, exhibits, brochures, kiosks, etc.).

Personal Interpretation

One person or persons providing interpretation to another person or persons. It can be planned or impromptu.

Purpose and Scope of the Plan

This plan identifies the goals, objectives, actions and criteria or standards that guide each aspect of park administration and sets forth the specific measures that will be implemented to meet management objectives and provide balanced public utilization. The plan is intended to meet the requirements of Sections 253.034 and 259.032, Florida Statutes, Chapter 18-2, Florida Administrative Code, and is intended to be consistent with the State Lands Management Plan. With approval, this management plan will replace the 2007 approved plan.

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

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

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

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

In the development of this plan, the potential of the park to accommodate secondary management purposes was analyzed. These secondary purposes were considered within the context of DRP's statutory responsibilities and the resource needs and values of the park. This analysis considered the park's natural and cultural resources, management needs, aesthetic values, visitation, and visitor experiences.

Uses such as, water resource development projects, water supply projects, stormwater management projects, linear facilities and sustainable agriculture and forestry (other than those forest management activities specifically identified in this plan) are not consistent with this plan or the management purposes of the park.

The potential for generating revenue to enhance management was also analyzed. Visitor fees and charges are the principal source of revenue generated by the park. Collection of fuel wood and hardwood chippings, as well as timber harvesting could be appropriate at the outparcels of the park as additional sources of revenue for land management since they are compatible with the park's primary purpose of resource-based outdoor recreation and conservation. Harvesting should not occur in the areas designated as "Legacy Property" by the Old Growth Forest Network. These compatible purposes are addressed in the Resource Management Component of the plan.

Feasibility of Wakulla Springs State Park serving as a recipient site for gopher tortoises was analyzed with determination that the park is not suitable under current conditions. A

2016 study contracted by FWC is included in Appendix 11 of this plan. Much of the habitat, which consists predominately of upland pine and mixed hardwood coniferous land, requires restoration to reduce the canopy and midstory cover to support a viable population. This restoration effort is in early stages as of 2022. Additionally, extant tortoises are concentrated in three disparate areas, which impedes tortoise movement between sites within the park (Jones 2016). Over the course of this planning period, the proposed monitoring of existing populations and habitat conditions will allow the park to reassess its status of becoming a gopher tortoise recipient site in the future. If habitat conditions are found to be suitable for receipt of gopher tortoises, the DRP will adopt the given protocols by amendment or Interim Management Guidelines.

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

Management Authority and Responsibility

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

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

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

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

Park Management Goals

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

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

Management Coordination

The park is managed in accordance with all applicable laws and administrative rules. Agencies having a major or direct role in the management of the park are discussed in this plan. The Florida Department of Agriculture and Consumer Services (FDACS), Florida Forest Service (FFS), assists DRP staff in the development of wildfire emergency plans and provides the authorization required for prescribed burning. The Florida Fish and Wildlife Conservation Commission (FWC) assists staff in the enforcement of state laws pertaining to wildlife, freshwater fish, and other aquatic life existing within the park. In addition, the FWC aids DRP with wildlife management programs, including imperiled species management. The Florida Department of State (FDOS), Division of Historical Resources (DHR) assists staff to ensure protection of archaeological and historical sites.

Public Participation

DRP provided an opportunity for public input by conducting a public workshop and an Advisory Group meeting to present the draft management plan to the public. These meetings were held on July 19, 2022 and August 9, 2022, respectively. Meeting notices were published in the Florida Administrative Register, 7/7/22 Vol 48/131 and 8/1/22 Vol 48/148, included on the Department Internet Calendar, posted in clear view at the park, and promoted locally. The purpose of the Advisory Group meeting is to provide the Advisory Group members an opportunity to discuss the draft management plan (see Addendum 2).

Other Designations

Wakulla Springs State Park is not within an Area of Critical State Concern as defined in Section 380.05, Florida Statutes, and it is not presently under study for such designation. The park is a component of the Florida Greenways and Trails System, administered by the Department's Office of Greenways and Trails.
All waters within the park have been designated as Outstanding Florida Waters, pursuant to Chapter 62-302, Florida Administrative Code. Surface waters in this park are also classified as Class III waters by the Department. This park is not within or adjacent to an aquatic preserve as designated under the Florida Aquatic Preserve Act of 1975 (Section 258.35, Florida Statutes).

The Wakulla Spring and Wakulla River are designated as National Natural Landmarks pursuant to 16 U.S. Code 461. The National Park Service maintains the Registry of Natural Landmarks that identifies and recognizes natural areas of ecological and geological significance. A portion of the park is also listed on the National Register of Historic Places as the Wakulla Springs Archaeological and Historic District (see Reference Map). This register is also maintained by the National Park Service. The Wakulla Springs Lodge was certified under the DEP Green Lodge program in December 2005.

The park is also designated as a Legacy Property by the Old Growth Forest Network. The initial 2,860 acres of the park was purchased in 1986 in order to preserve several outstanding natural and cultural features. In addition to surrounding one of the world's largest and deepest springs, the forest holds a number of old growth trees, including virgin bald cypress, some ranging from 400-600 years old, as well as more than a dozen past and current state and national champion trees. The park contains distinct natural communities within the Gulf Coastal Lowlands. Approximately 42% of this area is Upland Hardwood Forest with some of the oldest and most beautiful American beech-southern magnolia climax forest to be found in the South. Approximately 43% of this area is Upland Pine Forest which has previously seen disturbance in the way of fire exclusion, turpentining, logging and agricultural practices. Since 1986, however, park staff have promoted natural growth, prescribed fire, and some planting of longleaf pine seedlings. The remaining area is comprised of springs, sinks, river, sloughs, floodplain swamps, and floodplain forests.

RESOURCE MANAGEMENT COMPONENT

The DRP has implemented resource management programs for the perpetual preservation of representative examples of the state's significant natural and cultural resources. This component of the plan describes the natural and cultural resources of the park and identifies the methods that will be used to manage them.

The DRP's resource management philosophy is guided by the principles of natural systems management. Primary emphasis is placed on restoring and maintaining the natural processes that shaped the structure, function, and species composition of Florida's diverse natural communities as they occurred in the original domain. Single species management for imperiled species can be accommodated on a case-by-case basis and should be compatible with the maintenance of natural processes.

The DRP's management goal for cultural resources is to preserve sites and objects that represent Florida's cultural periods, significant historic events, or persons contributing to the history of Florida. This goal often entails active measures to stabilize, reconstruct, restore, or rehabilitate cultural resources. Appropriate public use of cultural resources will be considered according to the sensitivity of the resources.

Park units are often components of larger ecosystems, and their proper management can be affected by conditions that occur beyond park boundaries. Ecosystem management is implemented through an evaluation program that assesses resource conditions, refines management activities, and reviews development permit applications.

The entire park is divided into management zones that delineate areas on the ground that are used to coordinate management activities. The shape and size of each zone may be based on natural community type, burn zone, and existing roads or fire breaks.

Measurable objectives and actions have been identified for each of the DRP's management goals for Edward Ball Wakulla Springs State Park. The goals, objectives, and actions identified in this management plan will serve as the basis for developing annual work plans for the park. The ten-year management plan is based on conditions that exist at the time the plan is developed. The annual work plans provide the flexibility needed to adapt to future conditions as they change during the ten-year planning cycle.

Table 1. Wakulla Springs State Park Management Zones

Management Zone	**Acreage**	**Managed with Prescribed Fire**	**Contains Known Cultural Resources**
WK-01	20	No	No
WK-02	21	No	No
WK-03	49	No	Yes
WK-04	23	No	No
WK-05	6	No	No
WK-06	25	No	No
WK-07	17	No	No
WK-08	5	No	No
WK-09	93	No	No
WK-10	243	No	No
WK-11	160	No	No
WK-12	404	No	No

Table 1. Wakulla Springs State Park Management Zones			
Management Zone	**Acreage**	**Managed with Prescribed Fire**	**Contains Known Cultural Resources**
WK-13	3	No	No
WK-14	38	No	Yes
WK-15	131	No	Yes
WK-16	214	No	Yes
WK-17	229	No	Yes
WK-18	6	No	Yes
WK-19	130	No	Yes
WK-20	465	No	Yes
WK-A	154	Yes	Yes
WK-AA	12	Yes	No
WK-B	81	Yes	Yes
WK-BB	42	Yes	No
WK-C	249	Yes	Yes
WK-CC	52	Yes	Yes
WK-D	182	Yes	Yes
WK-DD	48	Yes	No
WK-E	606	Yes	Yes
WK-EE	45	Yes	No
WK-F	258	Yes	Yes
WK-F1	18	Yes	No
WK-F2	76	Yes	No
WK-F3	122	Yes	No
WK-F4	73	Yes	No
WK-F5	15	Yes	No
WK-F6	100	Yes	No
WK-F7	118	Yes	No
WK-F8	196	Yes	No
WK-FF	63	Yes	Yes
WK-G	21	Yes	Yes
WK-H	35	Yes	Yes
WK-HH	7	Yes	No
WK-I	74	Yes	Yes
WK-II	78	Yes	No
WK-J	80	Yes	Yes
WK-K	22	Yes	No
WK-KK	13	Yes	Yes
WK-LL	12	Yes	Yes
WK-M	3	Yes	Yes
WK-N	6	Yes	Yes
WK-NN	27	Yes	No
WK-O	249	Yes	Yes
WK-OO	67	Yes	No
WK-P	145	Yes	No
WK-PP	31	Yes	No
WK-Q	75	Yes	No
WK-QQ	74	Yes	No
WK-R	23	Yes	No

Table 1. Wakulla Springs State Park Management Zones			
Management Zone	**Acreage**	**Managed with Prescribed Fire**	**Contains Known Cultural Resources**
WK-RR	40	Yes	No
WK-S	357	Yes	No
WK-SS	40	Yes	No
WK-T	73	Yes	No
WK-TT	31	Yes	No
WK-U	93	Yes	No
WK-UU	165	Yes	Yes
WK-V	25	Yes	No
WK-VV	40	No	No
WK-W	12	Yes	No
WK-WW	13	No	No
WK-X	65	Yes	Yes

Topography

The park occurs in the physiographic province known as the Gulf Coastal Lowlands, which covers most of the southern half of the panhandle of Florida. The topography of the lowlands is generally flat with occasional ancient dune fields of higher elevation.

The highest elevation at the park is about 30 feet above mean sea level. The majority, however, is below 20 feet, with the north side of the river being lower in elevation than the south side. The river, sloughs, floodplain swamps and floodplain forests make up about one-tenth of the acreage and these areas are generally below 10 feet in elevation (see Topographic Map). The major topographic feature is the main spring and its wide-reaching system of aquatic caves. Wakulla Spring is a first magnitude spring. With a mean flow of over 252 million gallons of water a day, the spring is classified, in average discharge, as one of the seven largest in Florida. Optimal water visibility, when not colored by tannins and chlorophyll or clouded by turbidity, enables the park visitor to see to a depth of about 125 feet where the bottom slopes under a limestone edge. The actual depth of the spring at the entrance to the cave system is about 185 feet.

At least three Pleistocene mammal bone deposits are noted in the cave system, the largest of which lies within 200-600 feet of the cave entrance. Living animals are represented by troglobitic amphipods, isopods and crayfish, as well as American eels and catfish, which were seen as far back into the cave system as 3,000 feet and at depths of 300 feet.

From November 15, 1955, through June 1, 1957, approximately 100 documented cave penetrations by groups of two to six SCUBA divers took place. During this time, at least 10 different divers, making 450 dives, were involved in horizontal cave penetrations ranging from 200 to 1,100 feet, which was the maximum extent of the mapping effort. No availability of mixed gas and other technological limitations severely restricted bottom time on any given dive and limited maximum depths to about 250 feet.

Since these initial dives, there have been three major dive efforts conducted at Wakulla Springs. The Wakulla Project occurred in October to December of 1987. The Wakulla II Project was done from November 1998 to February 1999. The Woodville Karst Plain Project (WKPP) has been conducting cave diving research since the 1980s to present day. The WKPP has explored and mapped a large portion of the Leon Sinks, River Sinks and Wakulla Springs cave system (see Cave System Map). Many of the caves of these systems have been physically connected by divers swimming from one sinkhole to another sinkhole, while additional connections have been verified through dye trace studies. On July 28, 2007, cave divers with the WKPP made the first ever physical connection of the Leon Sinks cave system and the Wakulla Springs cave system. The connection was made from Turner Sink at the southern end of the Leon Sinks system, to the Wakulla Springs cave. Currently, the aquatic cave exploration and mapping remains an ongoing project. The exploration, mapping and research work projects will be further described in this plan. Additional exploration and mapping are proposed for the Wakulla Springs cave system.

A smaller spring, named Sally Ward Spring, is 0.7 miles northwest of the main spring. The Sally Ward Spring run joins the Wakulla River downstream from the Wakulla Spring. The Sally Ward Spring cave is a meandering six to 8-foot-wide tube, with a 30-foot vertical chimney at one point. It is suspected but not verified that the Sally Ward tunnel system connects with the Wakulla Spring system. McBride Slough and its associated floodplain swamp also joins the Wakulla River within the park. In addition to these major topographic features, several smaller springs and solution depressions occur in the park. Some of these smaller springs have been explored by cave divers from the WKPP. The explorations of these smaller springs have concluded at this time that there are no entrances into the conduit systems that can be further explored by cave divers. Only Wakulla Spring, Sally Ward, Turner Sink, Ferrell tract, and the River Sinks property sinkholes are currently being explored and mapped.

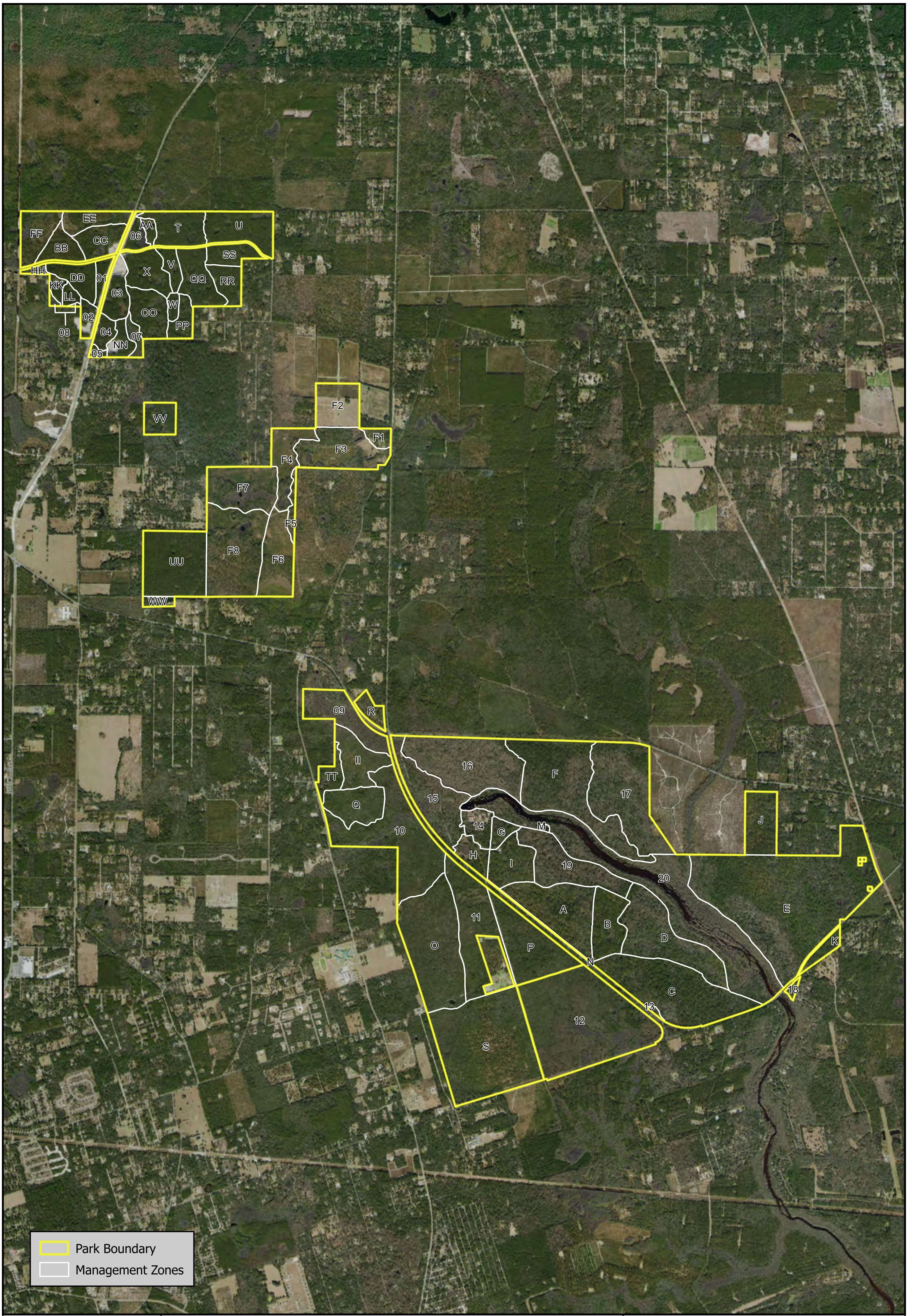
Cherokee Sink is a large sinkhole lake located in the western portion of the park. This sink was formed by the collapse of the limestone bedrock. The collapse was sufficiently deep to intercept the water table forming a water-filled sinkhole. The St. Marks Formation and overlying clays are exposed around the perimeter of Cherokee Sink.

The River Sinks property has several large sinkhole lakes and sinkholes located throughout the site. Many of these karst features are connected by their underground cave system. The River Sinks system of karst features has recently been proven a part of the Wakulla Spring system and contributes water flow to the spring and river. There are several other smaller sinkhole lakes and sinkholes located within the park.

The Ferrell tract, acquired in 2018, connects with the Turner Sink tract. Like the Turner and River Sinks tracts, this area of the park has several sinkhole lakes and sinkholes.

Flood prone areas include most areas below 12 feet elevation within the park. Normal vertical Wakulla River water level fluctuations within the park do not exceed three feet annually with lowest levels reported in the winter and associated with periods of reduced rainfall.

Man-induced topographic alterations to the park include signs of past forestry activities, patrol or access road construction, dredging and blasting river channels, and excavation of borrow pit/dump sites. Old fire plow lines and remnant roads associated with agricultural logging and turpentine operations exist throughout the former longleaf pinelands. The upland areas of the Cherokee Sink property were clear-cut of most merchantable timber in 1987 and 1988. The upland portions of the River Sinks property were planted in loblolly pine and altered for this silvicultural use.



EDWARD BALL WAKULLA SPRINGS STATE PARK
Management Zones

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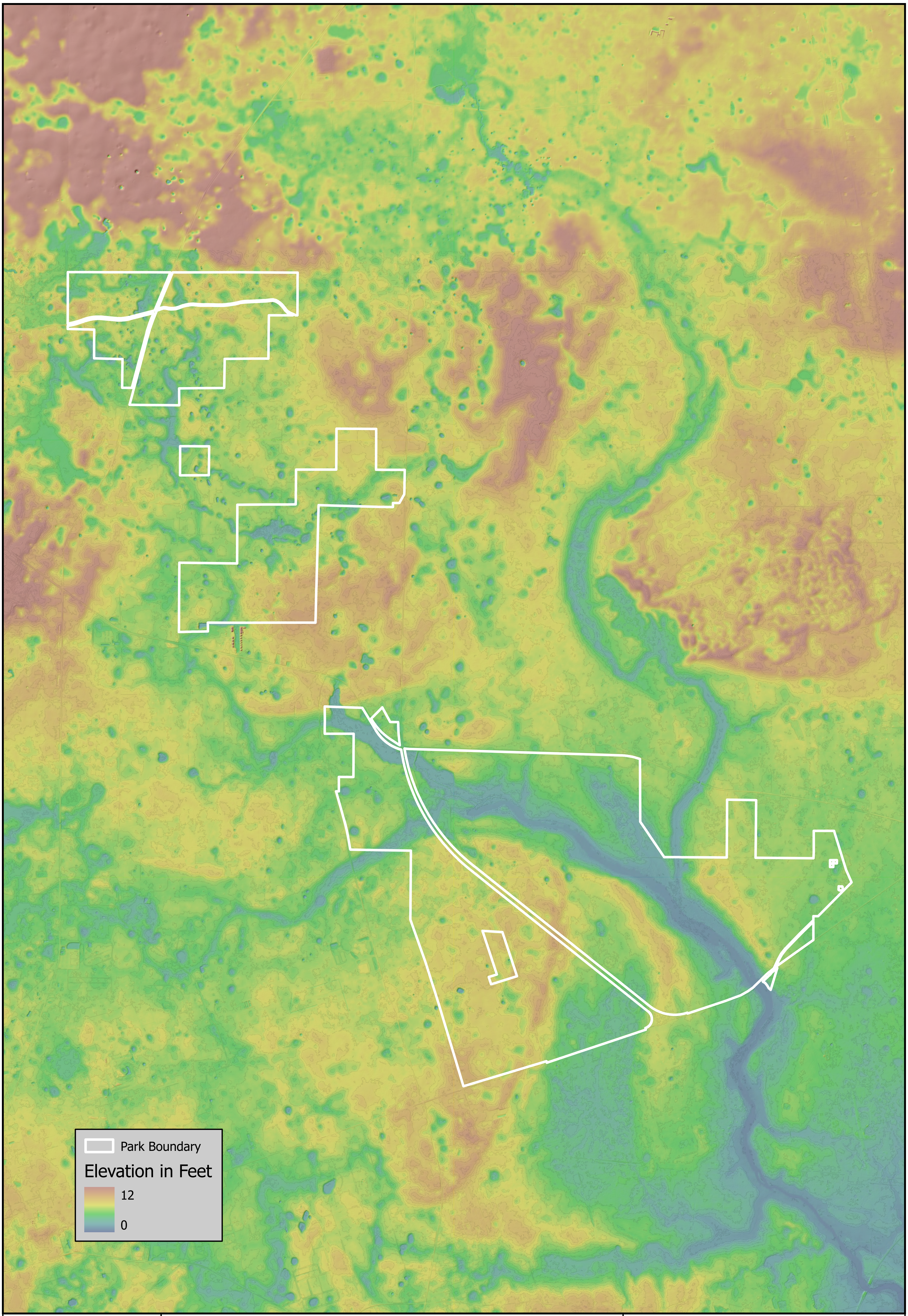

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Topography

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Boundary road construction along State Road 267 and State Road 61, as well as road development paralleling the Wakulla River along the southern edge of the floodplain forest, occurred after 1952 and before 1972 based upon DOT aerial photos.

Construction of these roads resulted in formation of low swales adjacent to the roads; irregular piling of low mounds of unused fill along the road shoulders at the forest edge, and in some places borrows of fill to level low areas while at the same time reducing elevations in some uplands areas. River channel modifications to the river tour route and all of Sally Ward Slough also occurred before 1972, probably in the late 1960s. Spoil banks deposited by dredging operations have since been colonized by native pioneer vegetation normally growing on slightly higher sites than would be expected at the river's edge.

Two extensive borrow pits existing before 1937 aerial photos occur on the park. They received limited use as dumpsites, primarily of lodge construction materials and kitchen refuse. These pits, up to 30 feet in length, 4-7 feet deep and of variable width are designated 8Wa3S1 and 8Wa371 in the 1988 Archaeological Survey of Wakulla Springs conducted by the Department of the State (Bryne, 1988). Additional smaller excavated trash pits still exist near the shop complex. Other trash pits near the shop have been filled in. At least one borrow pit near the old shop was created in 1969 when sand was removed to replace that lost from the beach during a high water episode.

Geology

The lower Miocene St. Marks Formation is at or within 25 feet of the surface throughout the park. In some areas there is a thin layer of quartz sand or clayey sand that overlies this formation. The St. Marks Formation is comprised of pale orange to light gray to white, moderately indurated, chalky, fossiliferous limestone. The fossils include mollusks, foraminifera, bryozoans, and echinoids. The St. Marks Formation was deposited during the early Miocene approximately 20 million years ago.

The St. Marks Formation ranges from 50 to 100 feet thick. The lower Oligocene Suwannee Limestone underlies the St. Marks Formation. This formation is approximately 300 feet thick and is where most of the conduits that are connected to Wakulla Spring occur. The upper Eocene Ocala Limestone underlies the Suwannee Limestone.

The St. Marks Formation is part of the Upper Floridan aquifer, and it is in this unit at depths of 25-150 feet that most Wakulla County water is drawn. The Suwannee Limestone and Ocala Limestone comprise the lower units of the Upper Floridan aquifer.

Within the park are two marine terraces associated with sea-level high stands that occurred during the Pleistocene epoch. These terraces are called the Pamlico and Silver Bluff Terraces and occur at elevations ranging from 10-25 feet and 1-10 feet respectively. The Pamlico Terrace was formed during the mid-Wisconsin interglacial stage, and it represents the largest area of the park. The more recent Silver Bluff Terrace formed when sea levels were as much as 10 feet higher than they are now.

The park resides within the Woodville Karst Plain geomorphic province. This area is characterized by numerous karst features on a flat to gently rolling landscape with sands and clays overlying limestone. Surface elevation ranges from sea level to 30 feet above mean sea level and slopes southward at an average of four feet per mile. Karst topography is a term applied to land where near-surface carbonate rock has been dissolved by water forming features such as sinkholes, caves, springs, and depression lakes.

Minerals

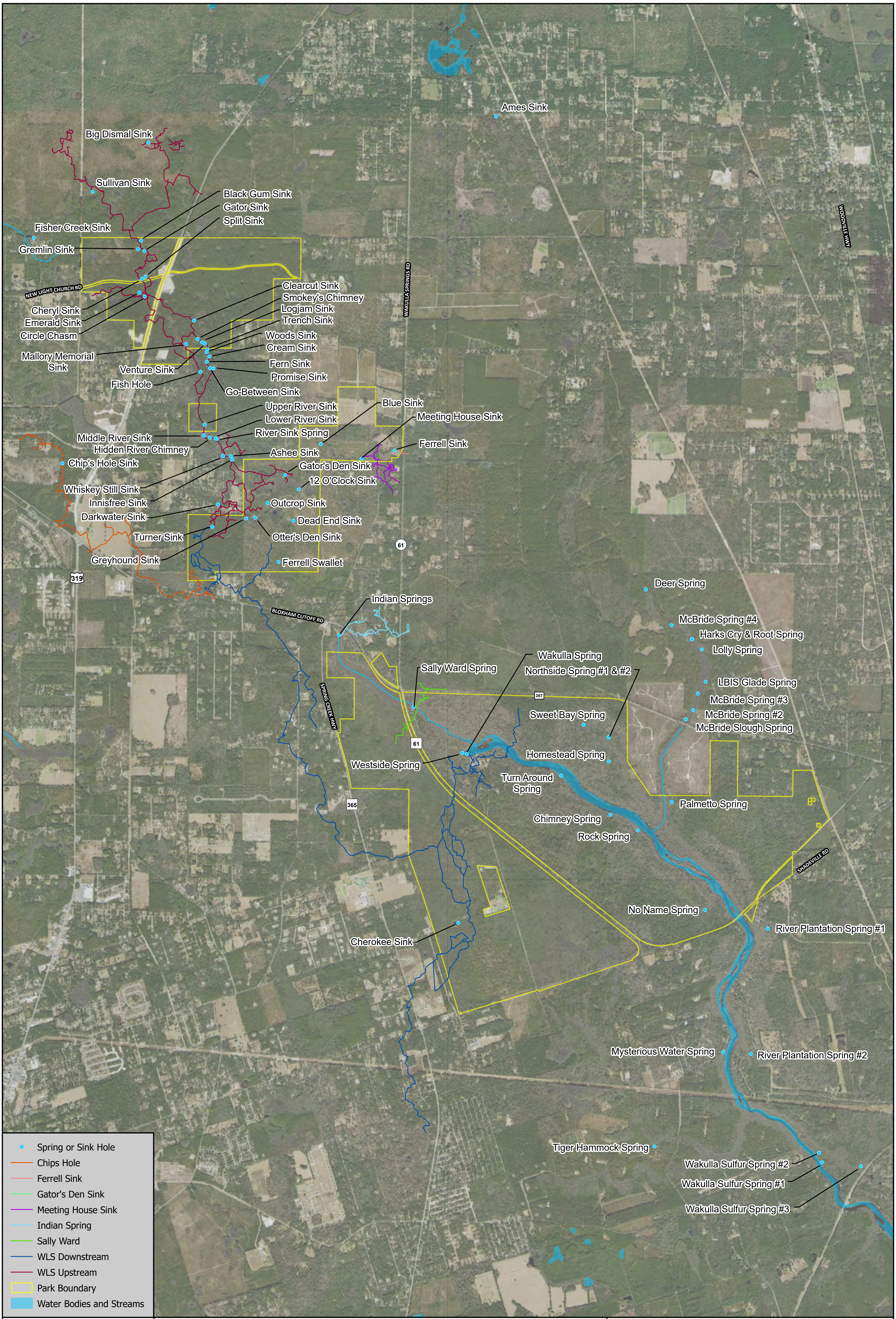
While several minerals occur in the park and are described below, there are no known deposits of commercial value. In the park, the St. Marks Formation limestone is composed principally of the mineral calcite, a crystalline form of calcium carbonate ($CaCO3$). Dolomite, which is calcium-magnesium carbonate, is associated with some of the limestone formations in Wakulla County.

Clay and quartz sand are also found in the park. Clay minerals were transported by rivers and streams and were deposited in estuaries that once covered the area. Quartz sand, or silica, was derived from the erosion of rocks in the ancient Appalachian Mountains and the fragmentation and transport southward of the harder quartz components.

Chert, also comprised of silica, occurs as weathered nodules and coral heads. Silica is leached by groundwater from clay minerals and can replace or fill void spaces in the underlying limestone. Although no prehistoric quarry sites are known within the park, Native Americans almost certainly obtained chert for their stone tools within the park. Bryne (1988) reported ten different occurrences of primary and secondary decortication chert flakes as well as non-decortication chert flakes, all probably from the Archaic Period. In addition, chert scrapers, hammer stones, and Newnan, Wacissa, Putnam, Bradford, Hernando, and Lafayette projectile points have been found. In 1995, B. Calvin Jones, DHR staff archaeologist, conducted extensive archaeological investigations to mitigate ground-disturbing impacts during construction of a new sewage collection system around the Lodge and recovered Paleo-Indian tools.

Soils

Most of the soil types at Edward Ball Wakulla Springs State Park have developed from the sandy marine terrace deposits (see Soils Map). They are comprised primarily of unconsolidated quartz sand with minor amounts of clay. Other soils in the park are comprised of alluvial sediment deposited in the floodplains of watercourses, sandy peat that was deposited in the more permanent pond basins, and loose quartz sand that washed into various depressions. The thin cover of quartz sand over the limestone substrate, and the porosity and permeability of the sands themselves, contributed to the formation of the upland, xeric, pine community that dominated the area prior to human disturbance. The soil resources of the park are protected by natural ground cover in most areas. In areas used by visitors, access is controlled and limited using paths and trails. Along some parts of these paths and trails elevated boardwalks are used to prevent soil erosion and compaction where slopes are steep or soils are wet. There are 26 soil types at Wakulla Springs and a complete soil type description for each is contained in Addendum 3.



EDWARD BALL WAKULLA SPRINGS STATE PARK
Cave System Map

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Miles

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ESRI, Florida Department of Environmental Protection, Woodville Karst Plain Project (Permit #03012022011)
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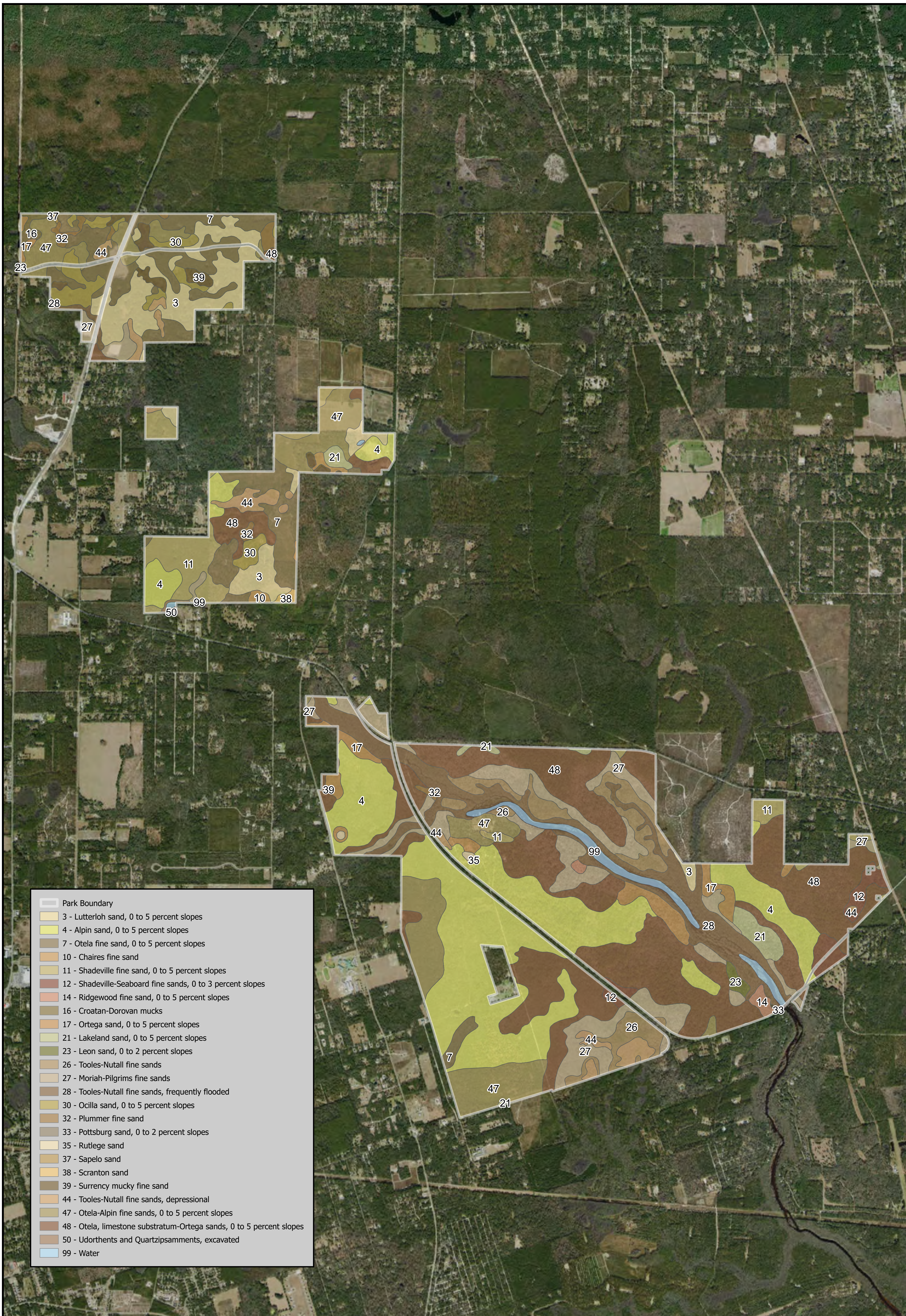

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Soils

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ESRI; Florida Department of Environmental Protection
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Hydrology

The principal hydrological feature in the park is the Wakulla River, supplied by one major and several minor springs. The river is a clear, calcareous spring run. Water temperature averages 69 degrees Fahrenheit, and the pH is 7.3 (slightly alkaline). The water is hard, averaging 153 mg/L-dissolved solids. The sediment load from land runoff into the river is minimal because of the low topography and the well-vegetated riverbanks. In the first mile of the river along the tour boat route, where the river bottom does not consist of exposed limestone, dense growths of rooted submerged aquatic vegetation (SAV) formerly stabilized the sandy and silty soils. Invasion of the upper river by hydrilla in the late 1990s and subsequent treatment with herbicides reduced SAV coverage substantially and initiated stream channel erosion which has continued since that time (Van Dyke, 2019).

River stage data indicate that the water elevation at the spring has been declining over the period of record since 1987 resulting in an increasing head gradient between the spring and the aquifer to the north (Northwest Florida Water Management District, 2021). Additionally, there is a decreasing head gradient between the spring and the Floridan aquifer to the south based on Wakulla Spring pool stage and Spring Creek Group equivalent freshwater head (Sutton, 2020). The decreasing stage, coupled with accelerating sea level rise, have likely resulted in more frequent inflows of groundwater from the Spring Creek Springs Group at the coast contributing to episodes of increased salinity. These challenges are described further below.

The Wakulla River has a total surface watershed area of approximately 1,170 square miles (748,800 acres) in Wakulla and Leon Counties and includes a substantial portion of the City of Tallahassee and unincorporated lands to the south and west of the city (NWFWMD, 2021). The Floridan aquifer is the primary source of the spring water at the park. The Wakulla Springs complex is of the calcium-bicarbonate type. The groundwater contribution area for Wakulla and Sally Ward springs comprises 1,325 square miles (848,445 acres) including portions of Wakulla, Leon, and Gadsden counties and southern Georgia (FDEP, 2018).

Wakulla Spring and Sally Ward Spring are unique among Florida springs in that discharge has increased significantly during recent years. Wakulla Spring is classified as a first magnitude spring. First magnitude springs are classified as the largest springs and have a flow of at least 100 cubic feet per second (cfs) or 64.6 million gallons of water per day (mgd). As of 2007, Wakulla Spring had the greatest recorded range of flow of the major Florida springs. That range, measured between 1907 and 1974, extended from a low of 25 cfs (16 mgd) in June 1931, to a high of 1,910 cfs (1,234 mgd) in April 1973. The average flow calculated for that period of 67 years of records was 390 cfs (252 mgd). More recently the average discharge between October 23, 2004, and December 31, 2019, was 575 cfs (372 mgd) (NWFWMD, 2021).

Cherokee Sink is a large sinkhole lake located in the southwest portion of the park. The collapse of this sinkhole when formed was sufficiently deep to intersect the water table allowing it to become water filled. Dive exploration has shown the sink to be about 60 feet deep with a silt, sandy bottom. This silt and sand had eroded into the sinkhole at a great rate prior to state ownership. It is believed that Cherokee Sink had a much greater depth than 60 feet and was most likely connected to the Wakulla Springs conduit system before the erosion occurred.

The River Sinks property has several large sinkhole lakes that are connected by their subterranean cave system (see Cave System Map). These River Sinks sinkholes are part of the Leon Sinks cave system which continues to the north. A hydrological connection between the River Sinks karst system and Wakulla Spring has been confirmed through dye trace studies. A physical connection was established by WKPP cave divers on July 28, 2007, when they connected Turner Sink at the south end of the River Sinks cave system, to a tunnel from the Wakulla Springs cave system. This was the final piece to complete the puzzle connecting Wakulla Springs with the Leon Sinks cave system.

The Ferrell tract has a variety of natural wetlands including several sinkhole lakes, swamp lakes, basin marshes, smaller depression marshes, and dome swamps.

Two offsite springs flow onto the park and discharge into the Wakulla River. Indian Spring (now referred to as Sherlock Spring) begins off park property, then flows through Indian Spring Slough onto the northwest portion of the park where it merges with the Sally Ward Spring run and flows into the Wakulla River. Unlike Sally Ward Spring, Indian Spring Slough does not have a permanent flow and may stop flowing during dry periods. The McBride Spring Group is a third magnitude spring group (<10 cfs) comprised of three small springs that flows into McBride Slough. McBride #1 is located on private property north of Highway 267 and McBride #2 and McBride #3 are located within Wakulla State Forest. McBride Slough flows due south onto park property and into the Wakulla River. Flow appears to be continuous. Northside Spring Group, Sweetbay Spring, Homestead Spring, and Palmetto Spring are within the boundary of the park and form spring runs that flow into the Wakulla River. These springs are in the northern portion of the park. An additional spring, "No-name Spring," is located in the southern end of the park, west of the river. Several additional small springs are located along the Wakulla River within the park (Westside Spring, Turnaround Spring, Chimney Spring, and Rock Spring).

Other smaller sinkholes, small basin swamps, shallow ephemeral ponds and permanent cypress domes occur on the park. Seasonal ponds are not mapped as distinct natural communities because of their small size. Nevertheless, they serve as important water resources and breeding areas for some of the wildlife of the park.

The Wakulla Springs Basin Working Group was established by Jim Stevenson at FDEP in 1992 to encourage the sharing of information and data between agencies, organizations, groups, and individuals in order to protect the water quality of Wakulla Spring and the Wakulla River. The working group produced reports on the history of water quality data collection and recommendations for future data collection. Some of the recommendations accomplished were: 1) a current meter installed at the mouth of the Wakulla cave, 2) the installation of a hydro-lab meter at the boat dock area, 3) collection and analysis of additional water samples obtained by cave divers, 4) installation of three monitoring wells in the subterranean conduits at conduit intersections, 5) installation of sampling tubes and data collection meters in each of the three conduit wells, 6) installation and periodic replacement of the water sampling tube at the spring that is now shared by several agencies, and 7) recommendations that have affected land use planning activities. The working group also had a management strategy prepared for Wakulla Spring. The strategy was prepared by the Howard T. Odum Florida Springs Institute and a final product, titled "Wakulla Spring Adaptive Management Strategy", was completed in August 2011. The Florida Springs Institute also produced another product for the Friends of Wakulla Springs. This product, titled "Wakulla Spring Restoration Plan", was completed in August of 2014. Both these papers produced by the Florida Springs

Institute are listed in Addendum 2 – References Cited. The Wakulla Springs Working Group lost state funding in 2011. In 2012, Jim Stevenson founded the Wakulla Springs Alliance from the remnants of the working group and the Hydrogeology Consortium.

In 2001, the Governor's Springs Initiative focused the attention of government and the private sector on the need to protect springs on a regional level. Before that time, monitoring of flow, water quality and biology at Wakulla Springs was sporadic and inconsistent. Funding from the 2001 initiative, and from the subsequent Springs Initiatives, has supported research and work to protect springs. Water quality and quantity monitoring at Wakulla Springs was greatly improved. Discharge is monitored continuously, and water quality is monitored monthly. In addition to water quality and quantity monitoring, projects funded the Springs Initiative also include: cleanup of sink holes on private lands, recharge basin delineation, baseline biological surveys of spring fauna, semi-annual stream condition index (SCI) monitoring of the spring runs, establishing best management practices for land use in springs recharge areas, and providing public forums for education and outreach to improve the understanding of springs management. Preservation of Florida's springs requires protection of spring flows and water quality. Protection of these relies on the continued scientific data collection by the monitoring programs and studies.

The Wakulla Springs Alliance, successor to the Wakulla Springs Basin Working Group, undertook a three-part, four and a half-year research project beginning in 2015 to identify the causes and sources of more frequent and prolonged low visibility conditions at the spring associated with dark water conditions when the water appears brown or green. Funded with grants from the Fish and Wildlife Foundation of Florida's Protect Florida Springs Tag Grant Program, WSA contracted with McGlynn Laboratories Inc. (MLI) to conduct weekly analyses of light transmission and water quality at the spring. MLI also conducted dye studies of suspected sources of chlorophyll, while researchers at Florida A&M University and Florida State University analyzed algal taxonomy and environmental DNA to identify possible chlorophyll sources. Findings are summarized in the discussion below of spring dark water conditions.

There have been three major dive exploration efforts since Wakulla Springs became a state park. The first was the Wakulla Project in 1987 that mapped a portion of the cave system, collected samples of water and fauna from the cave and explored a portion of the Sally Ward Cave. A twenty-man diving team from the U. S., Mexico, and Great Britain extended exploration and mapping efforts during the October-December 1987 Wakulla Dive Project. The team discovered four major conduits that converge into a main tunnel leading into the Wakulla Springs cavern entrance. None of the four tunnels was traced to their origin, despite penetrations of 4,176 feet, 3,600 feet, and 2,684 feet in tunnels B, D and C respectively. "A" Tunnel (which passes southward under State Road 61) pumped tannic water at the same time "D" tunnel (running northward), "B" tunnel (running northeast), and "C" tunnel (running southeast then south) were pumping clear water. The main tunnels are interspersed with unexplored side tunnels and rooms that ranged as large as "The Grand Canyon," a huge chamber 100 feet high and 150 feet across. Explorers reached a maximum vertical depth of 360 feet in B tunnel.

A second Wakulla Project was conducted in late 1998 and early 1999. This project, called "Wakulla II" conducted additional mapping of the cave system using a 3-D video mapper. Mapping of the cave system on the surface was also done for the first time ever. This surface mapping gives park staff a surface location that follows the path of the below ground conduit system.

A third exploration project has been ongoing at the park since 1991. This long-term project has been conducted by the Woodville Karst Plain Project (WKPP) group. This group has performed multiple dives at Wakulla Spring and most of the other caves within the Leon Sinks, River Sinks and Wakulla systems. They have also attempted to dive the smaller springs in the park as well as many of the sinks and springs of the cave system in the Woodville Karst area. The WKPP have discovered over 15 tunnels within these systems and have mapped more than 34 miles of cave system within the area (see Cave System Map). They have dived over five miles in length in one tunnel and have gone to depths of more than 300 feet. They have identified which conduits carry dark, tannic water, and which conduits are always filled with clear water. In addition to their dives, the WKPP has assisted the park, and several other agencies and individuals, by collecting water samples from individual conduits, the construction and placement of sampling equipment in the cave system, planting of native aquatic plants for restoration, providing interpretation of their dive experiences, and assistance in educating the public on the Woodville Karst system.

Other research divers have added to our knowledge of the cave system as well. During 2017-2019, Andreas Hagberg and Luke Alcorn discovered and mapped over 12,000 feet of cave passage at an average water depth of 270 feet, starting from Meetinghouse Sink on the old Ferrell property (which has since been added to the park). These beautiful cave passages are big and transport a significant amount of clear water straight toward Wakulla Spring. This is a different water source than the Leon Sinks cave system to the west and may be a source of the clear water most often seen emerging from Sally Ward Spring. These dives were made possible thanks to the Aquatic Science Association.

Since late 2020, another one mile of new cave passage has been discovered and mapped by Andreas Hagberg and Ben Martinez from a privately owned sinkhole less than one mile north-east of the Ferrell tract. Some conduits in this section of cave are immense and rarely have anything but clear water. Some unique cave features have been found in this cave, and rock samples have been captured and catalogued in the FGS rock archives. This water likely flows to the Meetinghouse cave and on to Wakulla Springs State Park, but future dye tracing will tell. Thanks to Cal Jamison for arranging access to this sinkhole.

The Wakulla Spring and River are experiencing three water quality challenges of concern: (1) continued high levels of nitrate nitrogen that exceed the total maximum daily load set by FDEP, (2) more frequent and prolonged periods of “dark water” conditions that limit visibility and have largely ended glass bottom boat tours of the spring, and (3) the advent and increasingly frequent occurrence of salinity spikes that may be stressing native plant and animal species.

In 2008, FDEP declared the Upper Wakulla River (upper 6.3 miles from the spring to US 98 bridge) to be impaired for nitrates because of excessive growth of hydrilla and algal mats. Levels of nitrates in the spring had increased from 0.1 mg/L in the late 1960s to 1.1 mg/L in the early 1990s. As a result, FDEP established a Total Maximum Daily Load (TMDL) of 0.35 mg/L for the Upper Wakulla River in 2012 (Gilbert, 2012). This in turn led to the development of a Basin Management Action Plan in 2015 (FDEP, 2015) which was revised in 2018 (FDEP, 2018).

The Northwest Florida Water Management District (Chelette et al., 2002) reported the following proportional estimated ten-year average (1990-1999) annual nitrogen loads to the Wakulla Springs contributory area from inventoried nitrogen sources:

- Wastewater treatment facilities effluent – 40%
- Atmospheric deposition – 26%
- Wastewater treatment facilities residuals – 15%
- Commercial fertilizer – 7%
- Septic systems – 6%
- Sinking streams – 4%
- Livestock waste – 2%

Following a citizen lawsuit and a dye study demonstrating a hydrological connection between the City of Tallahassee's spray field and Wakulla Spring (Kincaid et al., 2012), the city completed a $27 million overhaul of its T.P. Smith Water Reclamation Facility in 2012 culminating in a 73% reduction in the facility's total nitrogen discharge. These changes were reflected in a decline in nitrate levels at the spring in 2013 after which levels trended significantly, averaging about 0.37 mg/L during 2021 with several measurements below the 0.35 mg/L TMDL threshold.

The most recent assessment of nitrogen sources in the basin (Lyon and Katz, 2018) describes the following distribution:

- Septic systems – 34%
- Atmospheric depositions – 27%
- Farm fertilizer – 21%
- Urban fertilizer – 10%
- Wastewater treatment facilities – 3%
- Livestock waste – 3%
- Sports turf fertilizer – 2%

Wakulla Spring has likely experienced previous periods of "dark water" when the water turns tea-colored and visibility drops to a few feet, although reportedly those events were infrequent prior to 1957 (Wally Jenkins, personal communication). Historically, dark water events were associated with periods of prolonged rainfall. However, available data suggest that the frequency and duration of dark water episodes have increased in recent decades, and observers have noted that, at times, the low-visibility water in the spring appears green rather than brown.

When visibility is less than 75 feet, the park stops operating the popular glass bottom boat tours because the major features of interest can no longer be seen. In the late 1980s and early 1990s the park typically ran tours 125 or more days a year, but that number fell off dramatically in 1994. It recovered briefly in 2000 and 2001, then fell off sharply again and has trended downward since. In 2012 and 2013 the park conducted tours for only 15 days. There were none in 2014 or 2015, five each in 2016 and 2017, and none since 2017 through July 2022 with the exception of a few tours during a brief period of improved visibility in early summer 2021.

Weekly measurements of light transmission at the spring conducted for the Wakulla Springs Alliance by McGlynn Laboratories Inc. (MLI) showed an average visibility depth limit of 17 feet between December 24, 2015, and January 16, 2020, with a range of 4 to 70 feet (McGlynn, 2020).

MLI's data indicate that the reduced visibility is due to tannins and to a lesser extent chlorophyll and occasional periods of turbidity (McGlynn and Deyle, 2019; Deyle, 2020a).

Dye studies and an analysis of dissolved organic carbon by Luzius et al. (2018) have demonstrated that the principal source of tannins is several sinking streams. Fisher Creek, Jump Creek, and Black Creek originate in the Leon Sinks area of Apalachicola National Forest. They discharge into swallets that flow to the spring from the northwest. Lost Creek discharges to a swallet located southwest of the spring.

Episodes of low visibility when the water appears green are associated with chlorophyll and low concentrations of tannins (Deyle, 2020a). Dye studies, algal taxonomic analyses, and environmental DNA analyses suggest that chlorophyll might originate from surface waters such as several of the large sinking lakes located north of the spring including Lakes Munson, Jackson, Iamonia, and Upper Lake Lafayette (Deyle, 2020b).

The more frequent and prolonged periods of dark water may be related to changes in the relative head gradients among Wakulla Spring, aquifer levels near the sinking streams and within the conduit system, and the Spring Creek Springs Group to the south. Gradients have changed due to the combined effects of decreasing spring pool stage and accelerating sea level rise (Deyle, 2021a).

Salinity spikes pose a threat to the freshwater plants and animals in the upper river and spring. The Northwest Florida Water Management District's minimum flows and levels report (2021) attributes salinity increases at Wakulla Spring, measured as specific conductivity, to reversals of the flow at the Spring Creek Springs Group. The first recorded departures from the long-term average of 330 microsiemens occurred in 2007, one year after Spring Creek Springs Group reversals were first reported (Kincaid, 2011). Eleven spikes have occurred since then, most recently in January and June of 2020.

Salinity spikes may be as important as long-term trends in average or median salinity because many freshwater plants and animals are stenohaline with limited tolerances for higher salinity. The recent breakup of the so-called bulrush island at the downstream end of the river boat tour route may be the result of the intolerance of the California bulrush (*Schoenoplectus californicus*) to elevated salinity. Bulrush generally cannot tolerate chloride concentrations greater than 45 mg/L (Neubauer et al., 2012). FDEP water quality data shows that there were eight instances where chloride levels have exceeded that threshold between 2007 and 2021, including a very high spike of about 170 mg/L in January 2015. Loss of this habitat is concerning because it provides nesting habitat for several species including common gallinule, pied-billed grebe, and least bittern which is designated as a "species of greatest conservation need" by the Florida Fish and Wildlife Conservation Commission (2019). If the river stage continues to decline, coupled with accelerating sea level rise, salinity spikes may increase in frequency and duration.

In May of 1997, the Northwest Florida Water Management District with the assistance of the Florida State University Academic Dive Program installed an automatic current meter at the mouth of the spring. This meter was installed at a depth of 190 feet at the entrance of the main tunnel and measures spring discharge. The US. Geological Survey is monitoring stage and water quality in the Wakulla Spring pool. Flow and stage in the Sally Ward Spring run are also monitored by the Northwest Florida Water Management District.

Improvements to park roads have reduced surface runoff and now provide better protection of the water resources of the park. Improvements were made to the Park Drive near Sally Ward Spring, the Lodge Drive near two sinkholes, the parking lot of the lodge, and relocation of the picnic/swimming area parking lot. During the project to connect the lodge to central sewer the asphalt parking lot was removed and replaced with pervious concrete. Improvements were made from the funding of Federal/Florida Department of Environmental Protection grants under the 319 Non-Point Source Grant Program. These grants also provided funds for the park to develop additional public education materials on the water quality of the spring and river.

Cherokee Sink is now a resource of Edward Ball Wakulla Springs State Park. As stated earlier, Cherokee Sink had been disturbed by a history of unregulated use and access. As state park property, improvements have been implemented that address the need for restoration of this resource, its protection, and regulated use and access by the public. Actions taken by the park include: 1) Limiting vehicle access to the sink by closing all non-required roads. 2) Conducting periodic prescribed burning of the upland area adjacent to the south side of the sink. 3) Conducting extensive clean up and trash removal of the area, including in the waters of the sink. 4) Construction of over ground boardwalks for access to the sink that reduce soil compaction, soil erosion, and improve visitor safety. 5) Restoration of a heavily eroded shoreline and sloped area of the sink using large native limestone boulders and native fill dirt and revegetation of native plants. 6) Additional erosion control measures taken at several other, less severe erosion sites. 7) Closure and security of the site at night.

Erosion of the beach and lodge grounds at the Wakulla Spring swimming area continues to occur. The park was granted an extension to its five-year permit by the U. S. Army Corps of Engineers and the Florida Department of Environmental Protection to renourish the beach area by dredging the swimming and boat dock areas. A retaining wall was installed to reduce erosion and was a requirement of the permit. The Florida State University Anthropology Department has made two attempts at dredging this area. These two attempts met with minimal success and the effects of the erosion were still present. Park staff developed and implemented a more intense dredging operation relocating soils that had eroded into the river. The previous use of this area as an access point for vehicles removing collected hydrilla has been discontinued and all vehicle access is limited. Rainfall and the continued heavy visitor use of this area will require ongoing maintenance dredging and a permanent fix is not likely to occur. Park staff will continue to apply for a dredge permit as needed to improve the soil condition at the beach area.

The park became a member of the Florida Lakewatch Program in April of 1996. Edward Ball Wakulla Springs State Park was the first spring/river to become a member of this program. The Lakewatch Program analyses monthly water samples collected by park staff. The monthly samples are collected from three sites in the spring and river. The samples are analyzed for visibility, total phosphorus, total nitrogen, and chlorophyll. The database of over 25 years of samples is probably the longest term and most dependable sampling data that has been collected by Wakulla Springs park staff.

Hydrological Management

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

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

Objective A: Conduct/obtain an assessment of the park's hydrological restoration needs within its wetland and upper river spring run stream natural communities.

Action 1 Review all management zones in order to identify and prioritize any hydrological restoration needs. This review should be completed during the 10-year span of this approved unit management plan.

Action 2 Consult with the Northwest Florida Water Management District, FDEP, and other experts to assess the ongoing erosion in the upper river channel.

Objective B: Restore and protect natural hydrological conditions and functions within all 813 acres of the park's wetland and upper river natural communities.

Action 1 Implement restoration measures in any area identified in the comprehensive review described above under Objective A.

Action 2 If possible, renew and keep active the park's dredge permit for maintaining the beach/swimming area and the boat dock portion of the river.

Action 3 Consult with the Northwest Florida Water Management District, FDEP, the Florida Fish and Wildlife Conservation Commission, and other experts to assess possible intervention strategies, including submerged aquatic vegetation restoration, to slow the progress of stream channel erosion in the upper river so as to delay the salinization of the spring and river due to decreasing spring stage and accelerating sea level rise.

Action 4 Delineate all wetlands as protected areas and exclude any new park development that would degrade or impact natural hydrological conditions.

Objective C: Monitor water quality and quantity.

Action 1 Continue efforts to monitor the water quality of Wakulla Spring and the Wakulla River by continuing to collect monthly water samples for the Florida Lakewatch Program. Continue to work closely with FDEP, USGS, the Northwest Florida Water Management District, and other agencies to collect, analyze and share additional water quality data.

Action 2 Continue educational programs and community outreach relating to groundwater protection in an effort to implement scientifically based policy changes at the local government level that significantly reduce nutrient inputs into the groundwater.

Action 3 Continue to support research and efforts to reduce the impacts of septic tank use within the Wakulla Springs Basin on the nitrate nitrogen loading of Wakulla Spring. Encourage adherence to both Leon and Wakulla Counties' ongoing projects to connect existing septic systems to sewer where financially feasible. Wakulla County requires use of advanced nitrogen removal septic systems for new development within its Wakulla Springs Special Planning Area (aka Wakulla Springs Protection Zone). Wakulla County also requires development setbacks from sinkholes. Leon County is conducting a pilot project to test the efficacy of replacing existing septic systems with passive nitrogen removal systems. Both counties have public information programs to promote septic-to-sewer conversions and use of advanced nitrogen removal septic systems. Some private landowners in the basin are voluntarily using advanced treatment septic systems. These combined efforts, overtime, should lead to reduced nutrient loading from human caused sources.

Action 4 Continue to monitor water visibility of Wakulla Spring. Estimate or use a secchi disc to measure visibility of the spring daily. Rainfall is also recorded daily by an electronic rain gauge near the waterfront area. Both spring visibility and daily rainfall can be tracked and compared for any pattern or relationship that is observed.

Action 5 Continue to support efforts by other agencies, research and volunteer groups to explore, conduct dye traces, and map the cave system of Wakulla Spring. Continue to support efforts to locate, map and describe karst features to aid with exploration efforts and support land use decisions. Prior to approval, all research and exploration permit applications should be thoroughly reviewed and evaluated for their capacity, experience, credentials, and impacts to the resource and the park's visitor experience.

Natural Communities

This section of the management plan describes and assesses each of the natural communities found at the park. It also describes of the desired future condition (DFC) of each natural community and identifies the actions that will be required to bring the community to its desired future condition. The system of classifying natural communities employed in this plan was developed by the Florida Natural Areas Inventory (FNAI). The premise of this system is that physical factors such as climate, geology, soil, hydrology, and fire frequency generally determine the species composition of an area, and that areas that are similar with respect to those factors will tend to have natural communities with similar species compositions. Some physical influences may vary from FNAI's descriptions for certain natural communities in this plan.

Alluvial Forest

Desired future condition: Alluvial forests are hardwood forests found in river floodplains on ridges or slight elevations above floodplain swamp and are flooded for one to four months of the year during the growing season. Typical overstory trees may include swamp chestnut oak (*Q. michauxii*), swamp tupelo *(Nyssa biflora),* bald cypress *(Taxodium distichum),* American elm (*Ulmus americana*), and red maple (*Acer rubrum*). Understory species may include stiff cornel dogwood (*Cornus foemina*), Carolina willow (*Salix caroliniana)*, and ironwood (*Carpinus caroliniana*). Presence of groundcover will be variable. Species such as Virginia chain fern (*Woodwardia virginica*) and other shade tolerant herbaceous species may be present.

Description and assessment: The alluvial forest appears relatively undisturbed with large specimens of representative tree species such as swamp tupelo, bald cypress, red maple and American elm. Large cypress stumps occur both in the floodplain forest and floodplain swamp throughout the park. Cypress harvesting occurred in the past, possibly beginning as early as the 1890's, for both lumber and shingle production. However, numerous ancient cypresses were left uncut and are located along the 3 miles of the Wakulla River within the park. The alluvial forest areas have reached the desired future condition and are in a maintenance condition.

General management measures: Management measures for the park's alluvial forest will focus on habitat protection and maintaining the natural hydrology for this plant community.

Aquatic Cave

Desired future condition: Aquatic and terrestrial caves are characterized as cavities below the ground surface in karst areas. A cave system may contain portions classified as terrestrial caves and portions classified as aquatic caves. The latter will vary from shallow pools highly susceptible to disturbance, to more stable, totally submerged systems. Because all caves develop under aquatic conditions, terrestrial caves can be considered essentially dry aquatic caves. Near the cave entrance, the vegetation may be typical of the surrounding natural community. Within the cave, illumination levels and therefore vegetation densities will drop rapidly. Species of mosses, algae, liverworts, may be present. Plants may be absent or limited to a few inconspicuous species of fungi that grow on organic debris. Cave systems are extremely fragile. Desired future conditions include protecting against alterations that may affect light penetration, air circulation, microclimate, or increase pollution in aquatic systems.

Description and assessment: The aquatic caves at Wakulla Springs have had extensive exploration conducted in them in spite of their extreme depths and lack of entry points. These systems are massive, in both size and distance, and extend far beyond the park's boundary. Even though well explored, little is known about the biological community of this system. On-going studies and frequent biological sampling should assist to provide information on the health of this unique community. The aquatic caves at Wakulla Springs have reached their desired future condition and are in a maintenance condition.

General management measures: Management measures for the aquatic caves will consist of habitat protection, continued limited exploration, and associated monitoring of water chemistry and unique biota.

Basin Swamp

Desired future condition: Basin swamps are forested basin wetlands that are highly variable in size, shape and species composition, and will hold water most days of the year. While mixed species canopies are common, the dominant trees will be pond cypress (*Taxodium ascendens*) and swamp tupelo. Other canopy species can include slash pine (*Pinus elliottii*), red maple, dahoon holly (*Ilex cassine*), sweetbay (*Magnolia viginiana*), and sweetgum (*Liquidambar styraciflua*). Depending upon fire history and hydro period, the understory shrub component can be throughout or concentrated around the perimeter. Shrub species can include a variety of species including Virginia willow (*Itea virginica*), swamp dogwood, wax myrtle (*Myrica cerifera*), and titi (*Cyrilla racemiflora*). The herbaceous component will also be variable and may include species such as maidencane (*Panicum hemitomon*), ferns, arrowheads (*Sagittaria lancifolia*), lizard's tail (*Saururus cernuus*), and false nettle (*Boehmeria cylindrica*). Soils will be typically acidic, nutrient poor peat often overlying a clay lens or other impervious layer.

Description and assessment: The basin swamp soils are nearly level and very poorly drained. These isolated, forested wetlands are ponded for 200 to 300 days a year and have seasonal high water tables within a depth of 20 inches for most of the remainder of the year. The basin swamps are vegetated with hydrophytic trees and shrubs that can withstand the extended hydro period.

Some of the basin swamps at Edward Ball Wakulla Springs State Park are found in the southern portion of the Cherokee Sink property. A series of three basin swamps occur here. They are not connected, being separated by the higher elevations of the surrounding disturbed upland hardwood forest. The basin swamps appear relatively undisturbed, and are forested with large mature trees, including most of those species mentioned above. These areas were most likely too wet to be logged when this property was timber harvested in 1987/88. Other basin swamps are found on the River Sinks property surrounded by the planted loblolly pines. The swamps were too wet to have been site prepared and planted to pines, so they were left in their present state.

Several basin swamps also occur on the Ferrell tract, located north of State Road 267 and west of State Road 61. The Ferrell tract basin swamps are generally irregularly shaped, densely forested wetlands that hold some level of water throughout much of the year. The closed canopy of hydrophytic trees includes blackgum (*Nyssa biflora*), pond cypress, bald cypress, Ogeechee tupelo (*Nyssa ogeche*), water oak (*Quercus nigra*), and sweetgum. Any understory consists of patches of ferns, sedges and lizard's tail. The basin swamps have reached the DFC and are in a maintenance condition.

General management measures: Management measures will focus on habitat protection and a natural systems management approach within surrounding uplands in order to enhance and protect the local hydrology and associated water quality.

Depression Marsh

Desired Future Condition: Depression marsh is characterized as containing low emergent herbaceous and shrub species which will be dominant over most of the area and include open vistas. Trees will be few and if present, will occur primarily in the deeper portions of the community. There will be little accumulation of dead grassy fuels due to frequent burning; one can often see the soil surface through the vegetation when the community is not inundated. Dominant vegetation in basin marsh and depression marsh may include maidencane, panic grasses (*Panicum* spp.), cutgrass (*Leersia* sp.), common reed (*Phragmites australis*), pickerelweed (*Pontederia cordata*), arrowheads, buttonbush (*Cephalanthus occidentalis*), St. John's wort (*Hypericum fasciculatum*), and coastalplain willow (*Salix caroliniana*). The Optimal Fire Return Interval for this community is 2-10 years depending on fire frequency of adjacent communities.
Description and Assessment: There are two isolated areas best described as depression marsh located in zone WK-F3. The depression marsh is surrounded by pine plantation with a slight difference in elevation from the surrounding community. This area will normally burn with the surrounding community.

General Management Measures: Little is known about the optimum prescribed fire interval of depression marsh. As such, prescribed fire should be applied to this community following the recommended fire return interval of the surrounding natural community to prevent rapid growth of hardwood shrub species present in the area. Fire should be allowed to burn into this area and extinguish naturally. Care should be taken to prevent physical disturbance such as hog rooting or damage from vehicles. Efforts should also include rapid detection and treatment of invasive plant species so that these plants do not gain a foothold. Special consideration should be given when planning roads or footpaths near this area as it could alter the hydrology of the marsh area.

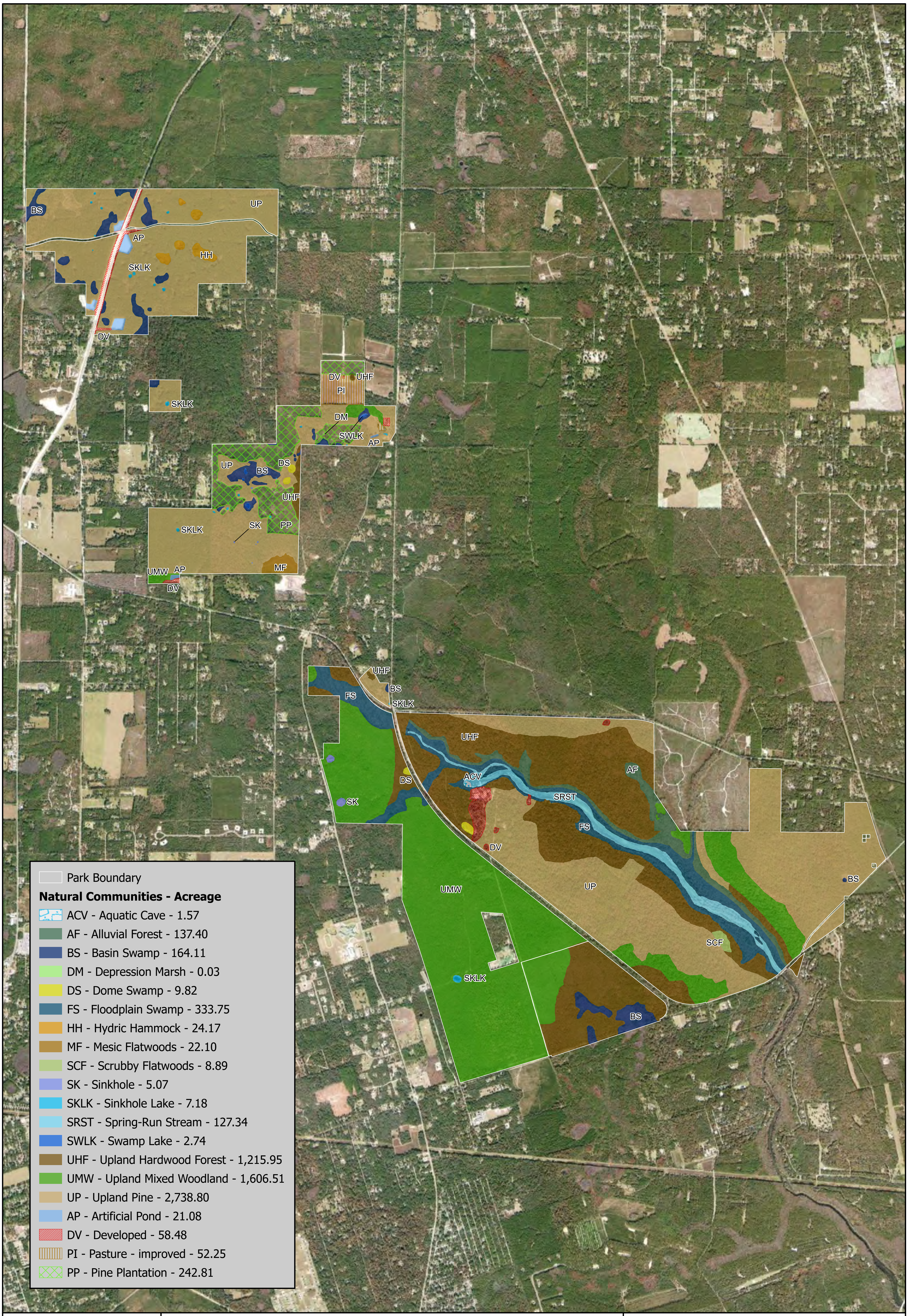
Dome Swamp

Desired future condition: Dome swamp is an isolated, forested, depression wetland occurring within a fire-maintained matrix such as mesic flatwoods. The characteristic dome appearance will be created by smaller trees that grow on the outer edge (shallower water and less peat) and larger trees that grow in the interior. Pond cypress will typically dominate, but swamp tupelo may also form a pure stand or occur as a co-dominant. Other subcanopy species may include red maple, dahoon holly, swamp bay (*Persea palustris*) and sweetbay. Shrubs may be absent to moderate (a function of fire frequency) and can include Virginia willow, gallberry (*Ilex glabra* and *Ilex coriacea),* buttonbush, wax myrtle, and titi. An herbaceous component may range from absent to dense and include ferns, maidencane, sedges (*Carex* spp.), and lizard's tail. Vines and epiphytes will be commonly found. Maintaining the appropriate hydrology and fire frequency is critical for preserving the structure and species composition of the community. Dome swamps should be allowed to burn on the same frequency as the adjacent fire type community, allowing fires to naturally burn across ecotones. Fires should be appropriately planned to avoid high severity fuel consumption within the dome swamp.

Description and assessment: Periodic fluctuations of hydro periods are essential for the maintenance of cypress dome communities. The normal hydro period for domes is 200 to 300 days per year. Extended hydro periods will limit tree growth and prevent reproduction, while shortened hydro periods will permit the invasion of mesophytic species, which will change the character of the understory and eventually allow hardwoods to replace cypress.

In the park, four of the several solution depressions that occur within the upland pine and hardwood forest communities contain water for enough of the year and are large enough to support a cypress dome community. Fortunately, one of these areas is along the park entrance drive and is frequently visited by lodge guests on evening walks. This cypress dome was excluded from large scale timbering, but selective cutting has occurred at the dome periphery. Individual trees toward the center of this dome are very old. Recent burning in the surrounding uplands has reduced and eliminated some of the pine and hardwood tree invasion around the dome's edge.

The second cypress dome is found on the Cherokee Sink property adjacent to State Road 61. Timbering and the past construction of State Road 61 have disturbed this area. Most of the cypress trees have been removed from the interior portions of the dome. Sweetgum and maple trees now dominate with smaller cypress trees at the edge. This dome is not as wet or large as the one on the park drive. This is mostly a result of the construction of State Road 61 that now bisects and alters hydrological connection along its eastern edge.



EDWARD BALL WAKULLA SPRINGS STATE PARK
Existing Conditions

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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.

Two other dome swamps consisting of a mix of cypress and blackgum occur on the Ferrell tract just to the east of Twelve O'clock Sink. These domes have reached their desired future condition and are in a maintenance condition.

General management measures: Management measures for the park's dome swamps will focus on habitat protection and prescribed burning in the surrounding uplands to improve and maintain natural community delineation.

Floodplain Swamp

Desired future condition: Floodplain swamp will be a frequently or permanently flooded community in low lying areas along streams and rivers. Soils will consist of a mixture of sand, organics, and alluvial materials. The closed canopy will typically be dominated by bald cypress but commonly includes swamp tupelo as well as red maple. Trees bases are typically buttressed. Understory and groundcover will typically be sparse.

Description and assessment: The park's pristine floodplain swamp is perhaps the most visible natural community to most visitors. Bald cypress grows on natural mid-channel islands of the Wakulla River, giving park visitors the feeling of being surrounded by primeval, towering trees.

Parts of this community were altered somewhat by channel dredging and spoil deposition activities in the late 1960s. While the spoil banks have made some wildlife such as the alligator more visible, they have also increased the densities of willows and wax myrtle along the edge of the river. The Sally Ward Spring Slough was also significantly widened by dredging at that time, and many cypress trees along the spring run and through the "back jungle" section of the tour boat route were impacted. While all these alterations are apparent in the upper river, conditions are pristine a short distance down river and below the tour boat section. The floodplain swamps of Indian Spring Slough and McBride Spring Slough have been left relatively undisturbed. The majority of the floodplain swamp have reached their desired future condition and are in a maintenance condition.

General management measures: Management measures for the park's floodplain swamp will focus on habitat protection and maintaining natural hydrology.

Hydric Hammock

Desired future condition: Hydric hammock is characterized with a closed canopy, evergreen hardwood and/or palm forest with a variable understory dominated by palms, with sparse to moderate ground cover of grasses and ferns. Typical canopy species will include live oak (*Quercus virginiana*), sweetbay, swamp tupelo, American elm, red maple and other hydrophytic tree species. Soils will be poorly drained but only occasionally flooded. Hydric hammock should occasionally burn by allowing fires to naturally burn across ecotones from fires originating in adjacent upland natural communities.
Description and assessment: Hydric hammock occurs on low, flat, wet sites where limestone may be near the surface. Soils are sands with considerable organic material that are generally saturated but are inundated only for short periods following heavy rains. The normal hydro period is seldom over 60 days per year.

Hydric hammock occurs on the River Sinks property as patches of lowlands in association with karst seepage. Most of the hydric hammock is surrounded by upland pine forest that has been site prepped and planted to loblolly pine (*Pinus taeda)*. The majority of the hydric hammocks have reached their desired future condition and are in a maintenance condition.

<u>General management measures:</u> Management measures for this natural community will focus on habitat protection. Prescribed burning of the surrounding upland pine community will improve habitat delineation.

Mesic Flatwoods

<u>Desired Future Condition:</u> Mesic flatwoods is characterized by an open canopy of tall pines [typically longleaf pine (*Pinus palustris*) and/or south Florida slash pine), depending on the region of the state] and a dense, low ground layer of low shrubs, grasses and forbes. Saw palmetto (*Serenoa repens*) will generally be present but not overly dominant. Other shrub species may include gallberry, fetterbush (*Lyonia lucida*), runner oak (*Quercus elliottii*), dwarf live oak (*Quercus minima*), shiny blueberry (*Vaccinium myrsinites*), and dwarf huckleberry (*Gaylussacia dumosa*). The herbaceous layer is primarily grasses, including wiregrass (*Aristida stricta* var. *beyrichiana*), dropseeds (*Sporobolus curtissii, S. floridanus*), panicgrasses (*Dicanthelium* spp.), and broomsedge (*Andropogon* spp.). This community has minimal topographic relief, and the soils contain a hardpan layer within a few feet of the surface which impedes percolation. Due to these factors, water can saturate the sandy surface soils for extended periods during the wet season, but lengthy droughts also commonly occur during the dry season. The Optimal Fire Return Interval for this community is 1-3 years.

<u>Description and Assessment:</u> The mesic flatwood communities are found in management zone WK-F6. A thick ground cover of shrubs is present, with dense clumps of Lyonia and white swamp azalea (*Rhododendron viscosum*) and saw palmetto spread throughout this area. Scattered pockets of wiregrass are also present across the area but do not make up a large ground cover component. The area shows signs of recent timber activity and was most likely clear cut a few years prior to state acquisition. It does not appear that the area was replanted after being cut. There is some evidence of pine regeneration most likely from the area of upland pine in the northern portion of the management zone. A very defined ecotonal boundary is present and divides this area from the upland pine north of it in the management zone.

<u>General Management Measures:</u> Prescribed fire should be applied to this community following the recommended fire return interval to prevent rapid growth of hardwood shrub species present in the area. Prescribed fire is effective at naturally thinning slash pine, gallberry, and wax myrtle, when possible, fire intensity should be heightened by switching burns to the growing season. The species found in mesic flatwoods all respond well to frequent fire. Shorter fire return intervals will result in a greater species diversity. Shortly after state acquisition, fire lines were installed on all boundaries, these lines should continue to be maintained.

Scrubby Flatwoods

<u>Desired future condition:</u> The dominant tree species of the park's scrubby flatwoods are longleaf pine. There is a diverse shrubby understory often with patches of bare white sand. A scrub-type oak "sub-canopy" may exist and contain a variety of age classes across the landscape. Dominant shrubs include, saw palmetto, laurel oak *(Quercus hemisphaerica),* diamond oak *(Quercus margaretta),* dwarf live oak and runner oak. Cover by herbaceous species will be low. The Optimal Fire Return Interval for this

community will be regionally variable; typically, 3-5 years when aiming to achieve a mosaic of burned and unburned areas.

Description and assessment: The park's scrubby flatwoods are an open canopy forest of widely scattered pine trees with a shrubby understory with barren areas of sand. The elevated, deeper sandy soils engender a drier environment than the surrounding upland pine and upland hardwood forest.

Scrubby flatwoods occur in one small area located just west of the River Road, in the southern portion of the park. The area is mostly contained within management zone WK-D. This site is dominated by scattered, mature longleaf pines with an understory of mostly dense saw palmetto and some scattered sand live oak. Frequent prescribed fire has maintained this community. The scrubby flatwoods area has reached its desired future condition and is in a maintenance condition.

General management measures: The primary management measure will be to continue with frequent prescribed burning in order to maintain natural community structure and species proportions.

Sinkhole

Desired future condition: Sinkholes are characterized by cylindrical or conical depressions with limestone or sand walls. Sinkholes do not contain standing water for long periods of time as do sinkhole lakes. Depending upon the age of the sinkhole, the vegetation of sandy sinkholes may represent a well-developed forest including southern magnolia (*Magnolia grandiflora*), sweetgum, wax myrtle, grape vines (*Vitis* spp.), Virginia creeper (*Parthenocissus quinquefolia*), water oak and pignut hickory (*Carya glabra*). Sinkholes with vertical limestone walls may be covered by a variety of mosses, liverworts, ferns and small herbs. Sinkholes will generally have a very moist microclimate due to seepage and being buffered by the lower elevation and a tree canopy. Desired future conditions include limiting unnatural erosion and protecting the microclimate from disturbance.

Description and assessment: Most of the sinkholes at Edward Ball Wakulla Springs State Park are surrounded by upland areas. They provide a damp microclimate compared to the dry uplands. Because of this, sinkholes provide habitat for salamanders and invertebrates that would be unable to survive in the drier uplands. The sinkholes also preserve pools of water and are important water stations for wildlife living in and using the drier upland areas that surround them.

Trees and other flora within and around the park's sinkholes are similar to the future desired conditions described above and thus the majority of sinkholes have reached their desired future condition and are in a maintenance condition.

General management measures: Management measures for the park's sinkholes will focus on habitat protection and monitoring for unauthorized uses that may deteriorate these natural features.

Sinkhole Lake

Desired future condition: Sinkhole lakes can be described as relatively permanent and typically deep lakes characterized by clear water with a high mineral content formed in depressions within a limestone base. Vegetative cover may range from being completely absent, consist of a fringe of emergent species, or be completely covered with floating plants.

Description and assessment: Cherokee Sink is considered a sinkhole lake and is located on the park property west of County Road 61. Cherokee Sink is quite large and has steep limestone walls on several sides. Its water depth is estimated to be about 60 feet. Vegetation in the sink is limited to some submerged and emergent aquatic vegetation. Fish, turtles, and snakes have been observed in the water. The area immediately surrounding the sink is vegetated by mostly upland species such as longleaf pine, bracken fern *(Pteridium aquilinum)*, wax myrtle, laurel oak and southern red oak (*Quercus falcata*).

Cherokee Sink has a long history of local use as a swimming area. Due to this use and unrestricted access, the sink has been heavily disturbed. Historically, numerous trails lead down to the sink and several dirt roads encircled the area. Because of these trails and roads, soil erosion in the past has been severe. Sedimentation of the sink from erosion had been occurring for several decades. This sedimentation slowly filled portions of the sink with a thick layer of sand and silt and has most likely affected its exchange of water with the associated karst environment. Over the years, trash dumping was also a problem at the sink. The bottom of the sink is covered in an array of human garbage including drink cans, glass, plastics and other objects. The land area surrounding the sink was also a collection of human refuse including mostly cans, glass and plastics. Since the property was acquired in 1999, much restoration work has been accomplished. Roads have been closed and access to the sink limited to three improved and protected entry points. The walkways for these access points are elevated boardwalks that improve safety and reduce soil erosion. Much of the trash in and around the sink has been removed including a car, boat, and other objects from its waters. Some badly eroded areas have been recontoured, filled and revegetated.

There are many sinkhole lakes on the River Sinks and Ferrell tracts. These are mostly smaller and less disturbed than Cherokee Sink. Most are named and are connected to the vast system of subterranean caves and tunnels. The sinkhole lakes on the River Sinks tract are surrounded by upland pine forest, most of which have been planted to loblolly pines. There are nine sinkhole lakes on the Ferrell tract. Ferrell Sink, Meetinghouse Sink, Blue Sink, Greyhound Sink, Outcrop Sink, and Otter's Den Sink all occur within upland pine forest. Dead End Sink occurs within a longleaf pine plantation. Gator's Den Sink and Twelve O'clock Sink are partially surrounded by upland pine but border adjacent basin swamp.

The majority of the sinkhole lakes at Wakulla Springs have reached their desired future condition and are in a maintenance condition.

General management measures: Management measures for the park's sinkhole lakes will include minimizing disturbances that cause unnatural erosion and minimizing pollution to the connected aquifer system.

Spring-run Stream

Desired future condition: The Wakulla River and the Sally Ward Spring run are perennial water courses which derive most, if not all, of their water from limestone artesian openings from the Floridan aquifer. The waters will be typically cool, clear, and circumneutral to slightly alkaline. These factors allow for optimal sunlight penetration and minimal environmental fluctuations which promote plant and algae growth. Areas of high flow will typically have sandy bottoms while organic materials concentrate around fallen trees and limbs and slow-moving pools. Typical vegetation will include eel grass (*Valisneria americana*), spring tape grass *(Sagittaria kurziana),* arrowheads, southern naiad (*Najas guadalupensis*), and pondweeds (*Potamogeton* spp.).

Description and assessment: The Wakulla River is approximately 450 feet wide along its 3-mile length within the park. The average surface area of the river is approximately 160 acres. Significant channel features are Sally Ward Spring, No Name Spring, McBride Slough, other unnamed springs and their respective spring runs. Other small springs contribute to the Wakulla River but not through well-defined channels.

The section of the Wakulla River within the park was renowned for its high density and variety of fish, aquatic reptiles and birds. The abundant submerged and emergent aquatic vegetation of the river, which once included eel grass, spring tape grass, southern naiad, chara (*Chara spp.)*, pickerelweed and smartweed *(Polygonum spp.)*, was the base of a complex food chain.

This system was radically disturbed by the invasion of the invasive submerged aquatic plant *(Hydrilla verticillata)* and subsequent perturbations from efforts to control it. Not present in the spring or river before 1997, hydrilla, fed by high levels of nitrates in the spring water, came to dominate the spring pool at all depths, and spread down river within the park. It shaded out native submerged aquatic vegetation (SAV) species and interfered with boat operations and use of the swimming area. Mechanical removal efforts proved ineffective and resulted in unacceptable levels of bycatch of crayfish, snails, and small fish. Large-scale liquid herbicide treatment initiated in 2002 accomplished substantial removal of the hydrilla standing crop, but the hydrilla recovered each year necessitating regular treatment. Collateral losses of native SAV also occurred and algal mats began to proliferate. The initial treatment and removal of hydrilla led to a large surge of impounded water downstream which eroded the stream bottom and uprooted native, beneficial SAV (Van Dyke, 2019). This created a positive feedback loop where continued erosion resulted in higher flows and more erosion. This is currently thought to have led to ongoing decline in the spring and river elevation (stage) (Northwest Florida Water Management District, 2021).

Manatee began to appear regularly in 2003, possibly as a result of the 2002 hydrilla surge opening access through river shallows at the Shadeville Road bridge (Van Dyke, 2019). Increasing manatee grazing of the hydrilla thereafter, coupled with decreasing nitrate loading to the spring resulting from improvements to the City of Tallahassee's T.P. Smith Water Reclamation Facility, brought the hydrilla under control. As a result, no herbicide treatments have been applied since May 2012.

The cumulative effects of these perturbations have dramatically altered the SAV community that is one of the foundations for the spring and river ecosystem. Low altitude aerial photography shows that the spring and upper river bottoms were densely populated by submerged aquatic grasses (eelgrass and spring tape grass) in 1967. Quarterly SAV surveys along the boat tour route were initiated in April 2013. At that time approximately 20 percent of the upper river bottom habitat was bare sediment, 45 percent was algal mats, and 35 percent SAV. Trend analysis of data collected during April through June of each year reveals a statistically significant increase in the percent of bare sediment accompanied by decreases in algal mats and an apparent shift from hydrilla to spring tape grass (Deyle, 2021b).

From 2004 to 2010, a habitat restoration project occurred in which an estimated 4,250 eel grass (*Vallisneria americana)* plants were relocated from a portion of the lower Wakulla River outside of park boundaries, to a portion of the upper Wakulla River near Wakulla Spring. This project was done in cooperation with the Florida Fish and Wildlife Conservation Commission. As part of this project, a Certificate of Nursery Registration was maintained yearly through the Florida Department of Agriculture and Consumer Services. It was hoped that the increase in native aquatic plant material would improve the habitat for both the apple snail and the limpkin. Eel grass plants are still observed growing near the boat dock where they were planted.

Trend analysis of monthly and weekly wildlife abundance survey data collected by park staff and volunteers since 1992 shows statistically significant long-term declines in total wildlife abundance along the riverboat tour route (Deyle, 2022). Park staff and volunteers also have conducted a semi-annual full river wildlife survey in the summer (July through early August) and winter (January through early February) starting in 1989. The approximate 9-mile river is divided into three segments: (1) the upper three miles within the park, (2) the reach between the Shadeville Road bridge and the US 98 bridge, and (3) the reach from the US 98 bridge to the river's confluence with the St. Mark's River. Trend analyses have not been conducted, but the presence of several rookeries within the lower two miles of the river within the park ("the sanctuary") is noteworthy. Large numbers of Double-crested Cormorants and Cattle Egrets nest here along with smaller numbers of Little Blue Herons and Great Egrets. These rookeries influence the abundance of these species observed along the weekly wildlife survey tour boat route.

Good water chemistry and some flow statistics have been recorded and maintained for Wakulla Springs over the years. In recent years, the park itself has taken on the task of collecting water samples, so a dependable, constant database is developed. This makes the spring and river an important location for both hydrological and biological research.

In May 2021, the Northwest Florida Water Management District adopted a minimum flow for the Wakulla and Sally Ward Spring system to protect the water resources and ecology from significant harm due to consumptive water withdrawals. The minimum flow is 539 cubic feet per second, based on the long-term average combined spring flows from October 23, 2004, through present. The District will continue monitoring spring flows and perform periodic evaluations to ensure that the minimum flow is being met.

<u>*General management measures:*</u> Management measures for the Wakulla Spring and spring-run streams will consist of habitat protection, public interpretation, routine invasive aquatic plant control, routine water quality and quantity monitoring, continued weekly wildlife surveys of the boat tour route, continued biannual wildlife surveys of the entire Wakulla River, continued quarterly surveys of submerged aquatic vegetation along the boat tour route, and continued summer surveys of apple snail eggs. The park will continue to restrict access to the lower two miles of the river within the park to minimize disturbance of the rookeries.

Swamp Lake

<u>*Desired future condition:*</u> Swamp lakes are shallow open water zones, with or without floating and submerged aquatic plants that are surrounded by Basin Swamp. They are

permanent water bodies, although water levels can fluctuate substantially depending on rainfall trends. Moving in from the surrounding basin swamp, the margins of the swamp lakes will be fringed by large hydrophytic trees and, in some area, woody shrubs. Due to their isolation, these wetlands will be favored habitats for a variety of fish, amphibians, reptiles, waterfowl, and wading birds.

Description and assessment: The park contains four swamp lakes, all of which occur on the Ferrell Tract. Cannon Pond and Gator Pond both occur within the tract's largest basin swamp. Both ponds are fringed by blackgum, cypress, red maple, Virginia willow, and water oak. Emergent vegetation includes pickerelweed, water pepper, and various sedges. Similar to many of the Ferrell tract sinkhole lakes, the most abundant submerged aquatic appears to be the macro algae, *Chara*, commonly known as musk grass.

Hourglass Pond occurs within a smaller closed canopy basin swamp south of the two aforementioned swamp lakes. This is the largest and most secluded of the tract's swamp lakes, attributing to its exceptional abundance of wildlife. Approaching the blackgum shaded pond margins, there are large numbers of frogs including bull frog, southern leopard frog, bronze frog, and cricket frog. The water is full of bluegill sunfish, mosquito fish, and presumably large-mouth bass. The pond is also home to alligators, several species of water snakes, ducks, and a small wading bird rookery.

The Ferrell tract's fourth swamp lake occurs in the northeast not far from the park staff residence. Similar to the other lakes, it is surrounded by heavily forested basin swamp.

General management measures: General management measures for the swamp lakes of the Ferrell tract will include habitat protection, erosion control, and inventory of biota.

Upland Hardwood Forest

Desired future condition: Mature, closed canopy hardwood forest typically occurring on slopes and rolling hills with generally mesic conditions. Overstory tree species may consist of southern magnolia, sweetgum, live oak, laurel oak, Florida maple (*Acer saccharum* subsp. *floridanum*), white oak (*Quercus alba*), swamp chestnut oak and American beech. Understory species will include trees and shrubs such as American holly (*Ilex opaca*), flowering dogwood (*Cornus florida*), eastern redbud (*Cercis canadensis*), red bay (*Persea borbonia*), horse sugar (*Symplocos tinctoria*), and beautyberry (*Callicarpa americana*). Ground cover will be comprised of shade tolerant herbaceous species, sedges and vines.

Description and assessment: The upland hardwood forest community at Wakulla Springs is of two distinct forms. The original park area contains some of the oldest and most beautiful American beech-southern magnolia climax forest to be found in the Southern United States. State champion size magnolia, beech, basswood and sassafras trees have been identified since the establishment of the park in October 1986. The large beech and magnolia trees occur in several portions of the park. A relatively small linear area of upland hardwood forest also occurs along the eastern edge of the Ferrell tract and is very close to the above description.

This upland hardwood forest community is not the classic rolling hill, clayey soil type, but more typical of that which would occur on the flat Gulf Coastal Plain where fire has been excluded. The sections with the oldest hardwoods may represent virgin tracts where the river, the numerous limestone outcroppings and the swampy terrain protected the community from lightning fires. Younger sections may have replaced either extensively cut hardwood forest or may be a successional stage following early removal of portions of the pine forest.

The second distinct form of upland hardwood forest is found on the property west of County Road 61. This area has an upland hardwood forest that has been most recently disturbed by a major timber-harvesting project. In 1987-88, this community was clear-cut of almost all-merchantable timber. Since the timber harvest, the area has been allowed to grow back naturally. This natural growth has resulted in a thicket of competing hardwoods including crabapple, hawthorns, plum, laurel oak, winged elm, basswood, black cherry and magnolia. The trees are mostly 4-6 inches in diameter and 25-40 feet tall. There is little to no herbaceous understory growth. Access to the area is by established roads and trails only.

The upland hardwood forest on the original park area has reached its desired future condition and is in a maintenance condition. The upland hardwood forest on the property west of County Road 61, due to the timber harvesting in 1987 and 1988, is young and has not yet reached maturity or its desired future condition.

General management measures: Resource management measures for this natural community will focus on habitat protection. Prescribed burning of any pine dominant areas within the forest as well as burning in adjacent areas will aid in natural community delineation.

Upland Mixed Woodland

Desired future condition: Dominant tree species will include longleaf pine, shortleaf pine (*Pinus echinata*), southern red oak, post oak (*Quercus stellata*), live oak, mockernut hickory (*Caraya tomentosa*) and white oak. Hardwood tree species are frequently dominant or co-dominant with pines (*Pinus* spp.). Flowering dogwoods may be present. Percent herbaceous cover will be highly variable and include wiregrass *(Aristida stricta)* and broomsedge. In old growth conditions, oaks and hickories will be commonly 150-200 years old. The Optimal Fire Return Interval for this community is 2-5 years, depending on adjacent natural communities.

Description and assessment: This forest type is similar to the upland hardwood forest but lacks the more mesic tree species such as American beech *(Fagus grandifolia)*, swamp chestnut oak and ironwood. This is because the upland mixed woodlands are located on sandier, drier soils and at slightly higher elevations.

The upland mixed woodlands at Edward Ball Wakulla Springs State Park are mostly located on the property west of County Road 61 where major timber-harvesting has disturbed this community. In 1987-88, this community was clear-cut of most merchantable timber. Since the timber harvest, the area has been allowed to grow back naturally. This regeneration has resulted in a thicket of young hardwoods and pines with a propensity towards early successional species.

There are some clumps of pine regeneration, mostly young slash occurring in areas that are more open with less hardwood growth and more herbaceous plant growth. Some smaller areas of longleaf pine regeneration have been discovered within this community as well, mostly adjacent to dirt roads. Some small patches of wiregrass have also been observed in these longleaf pine areas.

Less disturbed, higher quality upland mixed woodlands are located on the main park property east of County Road 61. Here they occur as transition communities in bands between drier upland pine and more mesic upland hardwood forest. Another relatively large area of upland mixed woodland occurs just north of the park residence at the Ferrell tract. This area has a mixed canopy of broadleaf hardwoods such as red oak, white oak, blackjack oak, and mockernut hickory, in addition to scattered, live oak, and longleaf pine. This area of upland mixed woodland has reached its desired future condition.

General management measures: Management measures for the park's upland mixed woodlands will include prescribed burning when there is sufficient fuel present. Where appropriate, measures such as hardwood controls to reduce undesired early successional species, and planting of longleaf pine seedlings in the more open areas will be conducted.

Upland Pine

Desired future condition: Dominant tree species will include longleaf pine, shortleaf pine, southern red oak, post oak, mockernut hickory, and white oak. Hardwood tree species are frequently dominant or co-dominant with pines. Turkey oak *(Quercus laevis),* bluejack oak *(Quercus incana)* and flowering dogwoods may be present. Percent herbaceous cover will be comparable to sandhill and will be dominated by wiregrass. In old growth conditions, oaks and hickories are commonly 150-200 years old. The Optimal Fire Return Interval for this community is 2-5 years, depending on adjacent natural communities.

Description and assessment: The upland pine forest community on the Wakulla Springs portion of the park has mostly longleaf, loblolly and slash pines remaining in the canopy. This upland pine forest is not in classic, clay soil, rolling hill habitat, but is in the flatlands of the Gulf Coastal Plain, where shallow sandy soils cap a limestone stratum. While the upland pine forest is quite extensive, hardwood succession has been occurring in varying degrees. This has occurred because fire had been excluded from the property for at least 60 years before state ownership.

The longleaf pinelands on this portion of park property have a history of a century or more of disturbance. A few living pines remain on the property which show evidence of turpentine industry "cat faces", angular gashes cut into the trees. These trees seem more common on the north side of the river but park-wide less than 1 percent of the remaining longleaf show the old catface turpentine scars. Many of the trees large enough to be turpentined 60 or more years ago were eventually logged. Most of the existing longleaf pines on the property today had diameters of six inches or less and were less than 30 years old when the last round of turpentine and subsequent logging occurred. The largest longleaf and loblolly pines on the property today (those over 15 inches in diameter at breast height) are only 60-100 years old.

Logging, turpentine, and agricultural practices occurring before 1935 and decades of fire suppression have resulted in the loss of pineland community keystone ground cover species and a reduction in natural pine regeneration. The only naturally occurring wiregrass of appreciable size is located on the north side of the river.

Reintroduction of routine fire has been an important pineland restoration tool. The burning in combination with individual removal of invading hardwood trees has improved the natural species composition within portions of this community.

Most of the upland pine forest community on the River Sinks property of the park has been altered by silvicultural practices and is now planted in loblolly pines. The loblolly pines are estimated to be 40 years old. The trees are planted in rows that have been "bedded." "Bedding" is a silviculture practice of gathering soil from the sides to make an elevated soil mound of one to two feet in height. Pine tree seedlings are planted on top of the mound or "bed." The pines are planted in rows on spacing of ten feet between the rows and 4 – 6 feet between the trees. Portions of these loblolly pine areas have been thinned with past logging operations. Over scattered areas of this forest, remnant populations of wiregrass have been discovered. The wiregrass had been suppressed, in poor health, and was in need of prescribed burning. For the last two decades, most of the planted pine on the River Sinks property has been prescribed burned several times. by park staff. The burning has reduced the hardwood tree density and improved the health condition of the remnant wiregrass areas. In the northwestern most portion of the River Sinks property is a small area where timber harvesting and silvicultural practices did not occur, most likely due to its remote location. This area contains mature longleaf pines and scattered hardwood trees. This small area has not been prescribed burned yet due to access and control lines concerns. There are also other areas where strips of intact upland pine forest occur along the public roads. This vegetation includes longleaf pine, hardwoods and wiregrass. These natural areas are very narrow and small and are burned as part of the larger management zone that they are within. There is no record or evidence that the River Sinks upland pine forests were prescribed burned prior to state ownership.

The upland pine forest on the Ferrell tract is in very good condition. The overstory consists almost entirely of longleaf pine, with varying age/size trees, including grass stage and sapling. Broadleaf hardwoods including southern red oak, blackjack oak, and hickories also occur as canopy and/or mid canopy trees. Understory conditions are generally dominated by small trees and woody shrubs attributed to the low frequency or lack of prescribed burning. However, native grasses, forbs, and other herbaceous plants are plentiful at ground level, and will respond well to the reintroduction of fire.

The upland pine forest communities that are located on the Wakulla Springs portion of the park and the Ferrell tract have reached their desired future condition and are in a maintenance condition. The upland pine forest community located on the River Sinks property has not yet reached its desired future condition.

General management measures: Management measures for the park's upland pine forests will include routine prescribed burning, invasive plant removals and hardwood tree reduction. For the upland pine forest areas on the River Sinks and Ferrell tracts, routine prescribed burning and invasive plant controls will continue. Other actions required for the River Sinks & Turner Sink tracts to reach their desired future condition will include timber harvests to remove off-site pines, native groundcover restoration and reforestation of longleaf pine.

Artificial Pond

Description and assessment: Six artificial ponds are found throughout the park. Four of them were constructed on the River Sinks property to serve as stormwater retention ponds during the widening of US 319 which began in 2019. They are surrounded by raised berms, and water is transported into them via culvert pipes. The ponds may be dry or wet depending on recent rainfall. When holding water, they get some use by wading birds and shorebirds.

One artificial pond lies in WK-F3, a short distance south of the residence on the Ferrell tract. It is adjacent to Ferrell Sink. It appears that the Ferrell family dug out what was formerly a swamp lake to serve as a fishing hole. There was a fishing dock at this spot when the park acquired the land.

Another artificial pond is in WK-WW, known as the Quarry parcel. Based on historic aerial imagery, it was created between 1967 and 1972. This appears to have been due to mining on the site, prior to its being added to the park. The pond extends off park property onto adjacent private lands to the east. Tall spoil piles of limestone surround most sides of the pond, with hardwood trees, shrubs and grasses now established on them.

General management measures: Management measures for the artificial ponds will include water quality protection, invasive plant removals, and monitoring for unauthorized uses that may deteriorate these features.

Developed

Description and assessment: The developed areas make up a small portion of the park. These areas include the lodge complex and associated buildings, the formal grounds around these buildings, the ranger station and associated park entrance area, three mobile home residences, a warehouse/dry dock area, the park manager's residence, the assistant park manager's residence on the Ferrell tract, a fenced shop complex, the picnic area, parking lots, the park's administrative offices, a mowed wildlife observation area, and a small vegetation disposal site.

General management measures: The developed areas within the park will be managed to minimize the effect of the developed areas on adjacent natural areas.

Pasture-Improved

Description and assessment: Dominated by planted non-native or domesticated native forage species and evidence of current or recent pasture activity and/or cultural treatments (mowing, grazing, burning, fertilizing; Agro-Ecology Grazing Issues Working Group 2009). Improved pastures have been cleared of their native vegetation. Most improved pastures in Florida are planted with bahiagrass (Paspalum notatum) and to a lesser extent with Bermudagrass (Cynodon dactylon) or pangolagrass (Digitaria eriantha). Weedy native species are often common in improved pastures in Florida and include dogfennel (Eupatorium capillifolium), many species of flatsedge (Cyperus spp.), carpetgrasses (Axonopus spp.), crabgrasses (Digitaria spp.), and rustweed (Polypremum procumbens) among many others. The pasture area at Wakulla Springs consists of bahiagrass (Paspalum notatum) as the primary groundcover with scattered volunteer longleaf (Pinus palustris) making up the midstory.
General management measures: Management activities for this area will include prescribed fire and the development of a restoration plan to return pasture areas within the park to a condition identical to that found on adjacent natural areas. Surrounding Natural Communities include Upland Mixed Woodland and Upland Pine.

Pine Plantation

Description and assessment: These include lands where either planted pines are having or will have an ongoing detrimental effect on native groundcover, the history of planted pines has damaged ground cover to the point where further restoration beyond thinning and burning is required, and/or the method of planting (e.g. bedding) has severely impacted groundcover. Pine plantations in Florida are often dominated by even-aged loblolly, sand, or slash pine (Pinus taeda, P. clausa, or P. elliottii, respectively). Dense pine plantations typically have sparse to absent herbaceous vegetation as a result of shading or a cover of deep pine needle duff. These plantations may be very shrubby or vine-dominated or open at ground level. The groundcover in most cases has been severely impacted by mechanical site preparation, such as roller chopping and bedding. However, while perennial grasses such as wiregrass (Aristida stricta var. beyrichiana) may be greatly reduced, many components of the native groundcover persist even though the relative abundance is altered. Groundcover can be partially restored by thinning and/or frequent burning, although some planting of perennial grasses such as wiregrass may be required. With activities such as thinning and burning, plantations with intact native groundcover can be restored to the former natural community.

The pine plantation is limited to the Ferrell Tract at Wakulla Springs. These tracts of pine plantation consist of longleaf pine planted in dense rows. The tract shows an extensive history of silvicultural activity in these pine plantation areas; however, some elements of the original natural community remain intact.

General management measures: Management measures for this land type will include regular prescribed burning and required timber thinning and harvest with a goal to work towards restoring these areas to match the surrounding intact natural community.

Natural Communities Management

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

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

Prescribed Fire Management

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

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

Objective A: Within 10 years, have 3,500 acres of the park maintained within the optimum fire return interval.

Action 1 Develop/update annual burn plan

Action 2 Manage fire dependent communities by burning between 875-1920 acres annually.

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

Table 2: Prescribed Fire Management		
Natural Community	**Acres**	**Optimal Fire Return Interval (Years)**
Upland Pine	2,739	2-5
Upland Mixed Woodland	1,607	3-5
Scubby Flatwoods	9	3-5
Mesic Flatwoods	22	1-3
Annual Target Acreage	875-1920	

Prescribed fire is planned for each burn zone within the appropriate interval. The park's burn plan is updated annually because fire management is a dynamic process. To provide adaptive responses to changing conditions, fire management requires careful planning based on annual and very specific burn objectives. Each annual burn plan is developed to support and implement the broader objectives and actions outlined in this ten-year management plan.

The goal of the Wakulla Springs burn program is to expand all burn zones to their maximum area of fire-type community. New interior fire lines are discouraged, and fires are allowed to burn naturally into surrounding areas in an effort to increase the size of the burned areas. Much of the characteristics of these fire-type communities had been lost over a time of 60-80 years because of fire exclusion. Early successional hardwood trees such as laurel oak, sweet gum and dogwoods had invaded these sites due to this lack of fire. This hardwood invasion changed the makeup of these fire-type communities and put them well on their way to succession from an upland pine community to an upland mixed/hardwood community. With succession, the characteristics of the open, pine-dominated community with an herbaceous dominated understory was lost or degraded as the invading hardwoods began shading out the grasses. This shift in understory proportions from herbaceous towards woody species made these areas less attractive to the wildlife of the upland pine community. Deer, turkey, quail and gopher tortoises had less foraging habitat. Additionally, gopher tortoises and Southeastern fox squirrels had fewer open areas to move from site to site. The loss of herbaceous groundcover forced the gopher tortoise to move to the sunny edges near roadsides in order to find its food source of grasses, flowers and berries.

The burn program at Edward Ball Wakulla Springs State Park has been in progress since the late 1980s. Since the first six test burns of a total of 12 acres in March of 1988, the burn program has expanded to 48 burn zones covering approximately 4,053 acres. The results of this burning have been excellent. Burning of zones on 2-5 year rotations has provided positive impacts to the upland community. Off-site hardwood intrusion has been reduced, herbaceous plant growth has increased, and desired wildlife species have increased and moved into new areas. The prescribed burning in combination with other restoration efforts has halted the previous hardwood succession in many of the pinelands.

The burn program of the park originally concentrated on late spring and summer burning after an initial winter burn to reduce the 60-year-old fuel load. Prescribed burning in the late summer has been difficult in some zones. High concentrations of hardwoods, lack of native grasses, and high humidity levels has limited the effectiveness of burns done at those times. These conditions have forced park staff to conduct burns in the late winter and early spring for some zones and parts of other zones. The weather conditions for these late winter, early spring burns have been good with low humidities, higher winds and drier fuels. The results of these burns have been excellent. Burn zones have been expanded and the goals of burning are being met. These goals include: 1) fuel load reduction which, if left to accumulate, might cause a destructive wildfire, 2) exposure of bare mineral soil which has allowed for the successful germination of herbaceous vegetation and pine seeds, 3) reduction of invading hardwood trees, and 4) maintenance of planted pine areas as the first step in the restoration process of disturbed sites.

The burn program has been expanded into selected areas of the Cherokee Sink, River Sinks, and Ferrell tracts. These areas are burned based on the condition of the plant community and the probability that the community can be restored successfully. These areas include sites with intact upland pine communities, or significant elements such as wiregrass growth or the presence of longleaf pines. Other open upland areas with a fair amount of herbaceous vegetation and planted pine stands may also benefit from prescribed burning. These types of sites are more likely to carry a fire through the zone and respond positively to the effects of burning. New burn zones are created when it is determined that there is suitable vegetation that will carry an effective fire through the zone. The new zone must also have clear access and control lines or barriers that will allow for the safe containment of fire within the zone.

All burn zones have been reviewed for existence of cultural resources. Burn zones that have cultural resources are then evaluated for degree of threat that burning may have to the integrity of the resource. If there is a threat, then methods for minimizing or eliminating the threats are accounted for in the burn plan for that zone. Interpretation of prescribed burning has helped park visitors and neighbors understand the principles and use of this resource management tool.

The park’s fire dependent natural communities include upland pine, upland mixed woodland, mesic flatwoods, and scrubby flatwoods. Prescribed burning is the primary tool to manage for fire adapted wildlife species such as gopher tortoises, fox squirrels, turkey, and quail. All the park’s management zones containing fire dependent communities are delineated by perimeter fire lines or natural breaks. While not all portions of every fire-maintained management zone may carry fire, the entire zone is usually included in the burn prescription and functionally treated as the “burn zone.” All fire lines are inspected annually, and perimeter vegetation mowed as necessary in order to maintain proper width. Fire lines for zones scheduled to be burned in a given year may be lightly disked wherever a mineral soil component is deemed necessary.

The park maintains an excellent working relationship with the local and regional Florida Forest Service staff. Acceptable wind directions for each of the fire-maintained management zones are determined based on proximity to nearby roads and development.

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

Natural Community Restoration

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

Examples that would qualify as natural community restoration, requiring annual restoration plans, include large mitigation projects, large-scale hardwood removal and timbering activities, roller-chopping and other large-scale vegetative modifications. The key concept is that restoration projects go beyond management activities routinely done as standard operating procedures such as routine mowing, the reintroduction of fire, spot treatments of invasive plants, and small-scale vegetation management.

Objective A: Conduct habitat/natural community restoration activities on 890 acres of upland pine natural community.

Action 1 Develop/update site specific timber management/restoration plan for portions of the River Sinks property. This plan will include measures and timeframes for thinning up to 703 acres and clearcutting 187 acres of off-site loblolly pine as well as measures to reintroduce native groundcover and longleaf pine seedlings. Project shall be monitored via photo points.

Action 2 Implement the approved River Sinks timber management/restoration plan.

Action 3 Develop/update site specific timber management/restoration plan for the longleaf pine plantations on the Ferrell tract.

Action 4 Implement the approved Ferrell tract timber management/restoration plan.

Objective B: Conduct a pilot SAV restoration project in the upper river spring run stream habitat.

Action 1 Identify a formal monitoring program with support from other agencies and research and volunteer groups to assess the spread or lack thereof of selected patches of eelgrass and spring tape grass including areas restored previously.

Action 2 In consultation with FDEP, the Florida Fish and Wildlife Conservation Commission, and the Northwest Florida Water Management District, initiate a pilot project to assess the feasibility of restoring eelgrass and or spring tape grass in low-velocity sections of the river where adequate sediment remains. Include manatee exclusion devices as needed and test plots at different depths around the spring bowl margins.

Natural Community Improvement

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

Objective A: Conduct natural community/habitat improvement activities on 250 acres of Upland Pine or Upland Mixed Woodland Natural Communities.

Action 1 Conduct hardwood tree reduction on 250 acres. This action will target primarily Management Zones S, R, II, TT and EE. Hardwood trees targeted will be laurel oak, live oak and sweetgum. All herbicide treatments should be stem specific.

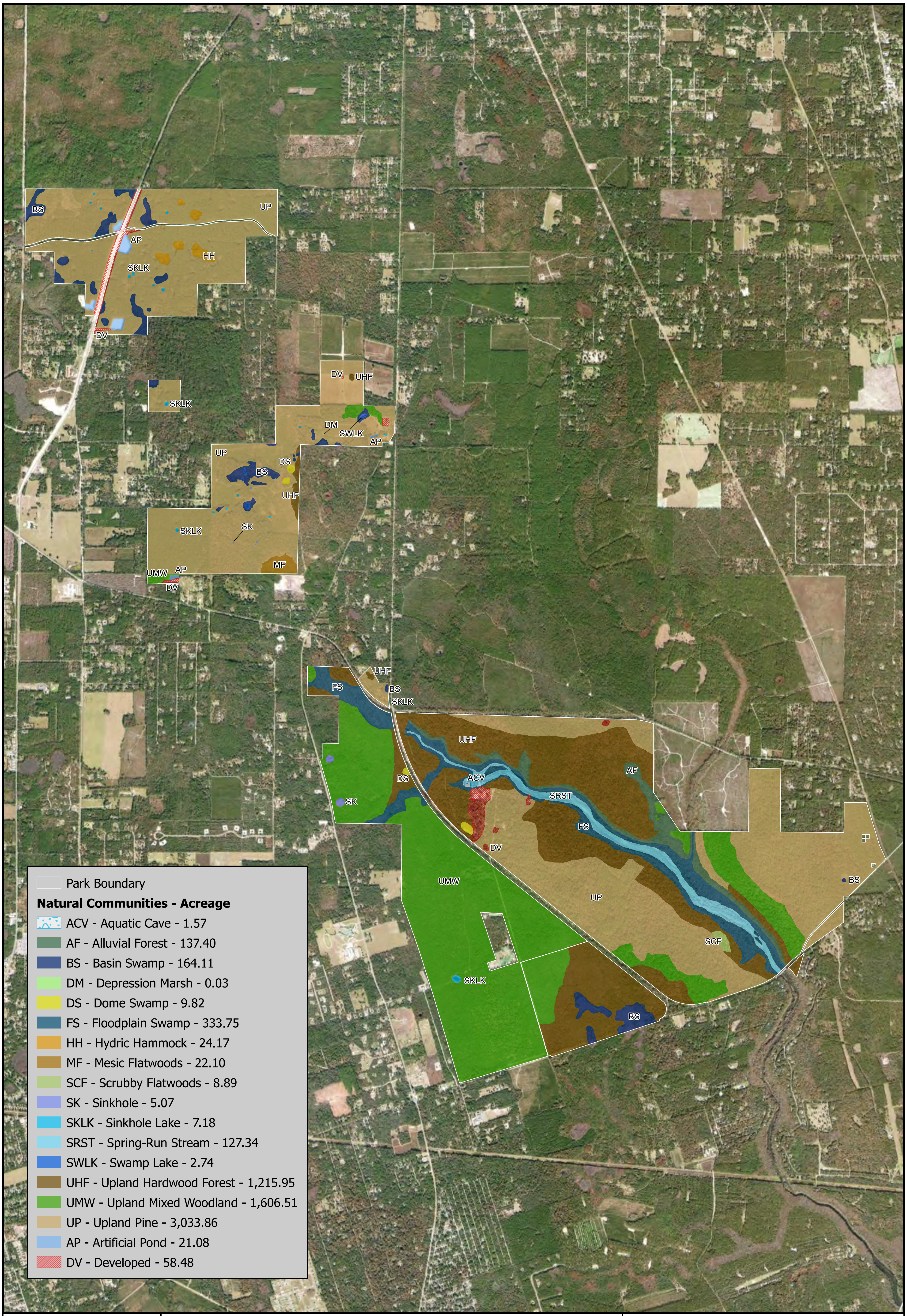
Action 2 Continue to frequently prescribe burn these management zones to aid in the progression of desired vegetative growth and species stocking.

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.

The park provides refuge for thirty imperiled species. These include four plants, three arthropods, five reptiles, fifteen birds, and three mammals. Most of the animals are associated with the Wakulla River and are safe as long as the habitat remains undisturbed and in good condition.

The Limpkin population has disappeared from the Wakulla River and this bird is now only an occasional visitor to the park. Whenever a limpkin is seen on the river, the sighting is recorded on the daily limpkin observation report which is generated only when Limpkins are seen. In an effort to increase limpkin populations at the park, park staff with assistance from staff of the Florida Fish and Wildlife Conservation Commission, have conducted a restocking of the native apple snail (*Pomacea paludosa)*, a favorite food source of the Limpkin. During the 2000 to 2011 time span, over 4,000 raised apple snails were released into the river. Park staff began conducting monthly summer surveys of apple snail egg clusters in 2005 to determine the snail's activity in park waters. While the surveys showed a marked increase in apple snail activity through 2011, egg counts decreased thereafter, exhibiting an apparent rebound beginning in 2019. Meanwhile, the Limpkin population has not re-established, with only the occasional visitor to the park's waters. These visitors have been observed to feed largely on mussels. Predation



EDWARD BALL WAKULLA SPRINGS STATE PARK
Desired Future Conditions

N

Miles
0 1 2

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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.

pressure from juvenile alligators and other species, along with periodic storm-induced high flow events, may be preventing the apple snails from proliferating (Dana Bryan, personal communication).

It should be noted that the Snail Kite is only a transient in this region and is recorded from a single four-month visit in the late 1950s. The Wood Stork is an occasional visitor to the park although it is a year-round resident in the region.

The gopher tortoise range in the park has been expanding due to the increased application of prescribed fire by park staff. Recruitment of gopher tortoises is evident from burrow surveys done in selected burn zones after each prescribed burn. Recorded observations of gopher tortoises have been more frequent and from new areas. Expansion of populations should continue due to habitat improvements attributed to prescribe burning. In 2014, the Florida Fish and Wildlife Conservation Commission contracted with the Jones Ecological Research Center to conduct gopher tortoise surveys and population evaluations at several Florida State Parks including Wakulla Springs State Park. The field work for the gopher tortoise research was completed in July of 2015, and a report followed in 2016. The Jones report was the most detailed gopher tortoise survey ever conducted at Wakulla Springs State Park. They surveyed approximately 1,111 acres of habitat and estimated the tortoise population at 73 tortoises. This makes the population at the park a primary support population for gopher tortoise in this portion of their range.

Fox squirrels have been seen in several management zones on the River Sinks property in areas adjacent to the Apalachicola National Forest. They have also been seen in WK-E and the upland restoration portion of WK-S. They are observed frequently in several areas of the Ferrell tract.

The Suwannee cooter also appears to be benefiting from prescribed burning. Several new turtle nesting locations have been discovered in upland locations near the river where burning has allowed more sun light to reach the ground. This may become crucial to the Suwannee cooter population if it ever becomes threatened due to the heavy predation by raccoons and crows in its traditional nesting areas.

Manatees were first observed on August 8, 1997, when four appeared at the spring. They stayed in the area for three days before returning to the lower part of the Wakulla River. The next sighting of a manatee was on November 25, 2000, when one was seen for 5 days. Then again, on December 21, 2002, three manatees were seen. Since that time, the manatee has used the spring and park portion of the river as its habitat.

A daily manatee count estimate by the tour boat drivers was begun in 2003 and is recorded on the waterfront monthly report. Peak winter counts increased steadily from 2007 until December 2012. The record high count for one day was 46 manatees seen on December 8, 2012. It was common for 25 to 35 manatees to be seen each day from November to February that winter. During this time, the park recorded 62 different individual manatees using park waters. The increased use of the upper portion of the river is attributed to improved access as a result of targeted invasive aquatic plant removal efforts.

A decline in manatee numbers at the park began in winter 2013 coincident with the decrease in hydrilla following the completion of improvements to the City of Tallahassee's T.P. Smith Water Reclamation Facility which substantially reduced nitrate loading to the spring. Manatee count data collected during the weekly wildlife surveys exhibit similar trends. Monthly means of daily manatee counts dropped from a high of 24 in December of 2012 to a low of 4 in December of 2018. These have since trended upward to monthly means of 14 in December 2020 and 12 in December 2021. Manatee sightings are common in the park and on the lower portion of the river during the non-winter months as well.

In January of 1999, during a full river wildlife survey, a roosting colony of Southeastern bats *(Myotis austroriparious)* was discovered in a cypress tree in the middle of the river. This is the only documented case of this species roosting in a tree surrounded by water in the state of Florida. At the present time, the bats are still roosting in the same tree.

Four of the imperiled species listed in Table 3 are included in the park's weekly wildlife survey. Summaries of the status of each of these species follows from Deyle (2022).

The Little Blue Heron exhibits no significant long-term abundance trend from 1992 through May 2022. It is often a solitary feeder with a diverse diet including insects, shrimp, amphibians, and fish. It has bred in nesting colonies along the second mile of the upper Wakulla River periodically since 1989, as documented by the park's summer full-river wildlife surveys, most recently nesting there since 2016. Annual means peaked in 2000 and 2001 followed by declines from 2002 through 2004. It is possible that the Little Blue benefited from the expansion of the hydrilla and then experienced a setback after the initial intensive mechanical and chemical control efforts greatly reduced the hydrilla cover as well as the animals that inhabited it. Annual means peaked again in 2007 and 2011, but returned to pre-2000 levels in 2012.

Snowy Egret counts are generally low throughout the period of record with annual means ranging from zero to four between 1994 and 2020. It has exhibited a significant long-term decrease in counts per survey as well as a significant decreasing trend during the hydrilla management period when mechanical harvesting and herbicides were used. The decline began in 2005, midway through that period. The Snowy eats mostly small fish as well as some macroinvertebrates, amphibians, reptiles, and small mammals. The by-catch of juvenile fish and invertebrates from the mechanical harvesting and/or the dramatic fluxes in the SAV community may have been accompanied by other changes throughout the food web that contributed to the observed decline in this species. The Snowy Egret levelled off at an annual mean of one in 2009 with dips to zero in 2014, 2015, 2019, and 2020.

The Tricolored Heron also is present in small numbers with annual means ranging from one to four, peaking in 2000 and stable at one since 2010. This species, which has experienced a significant long-term trend of decreasing abundance, exhibited a significant decreasing trend during the hydrilla management period and then a modest rebound in the post-hydrilla management period raised up by higher counts per survey in 2018 through 2021. Its rise and fall in abundance may reflect increased food availability associated with the expanding hydrilla mats and a subsequent decline resulting from the mechanical harvesting by-catch of juvenile fish and, perhaps, reduced fish habitat associated with decreases in the overall SAV community following herbicide treatment. However, Florida breeding populations of tricolored herons have exhibited a declining trend of -1.27 percent per year during much of the period of record from 1993-2019 (Sauer et al., 2020) as well as during the most recent 10-year period analyzed, 2005-2015 (-1.73 percent per year as reported by Sauer et al., 2017). Thus, the Wakulla declines may be associated, at least in part, with a larger-scale shift in the regional metapopulation.

Based on year-round counts per survey, the white ibis has experienced a long-term increasing trend in abundance spurred by a significant increase during the hydrilla invasion period. However, no significant trends in counts per survey are exhibited during the hydrilla management period or the post-management period. Ibis migrate regionally and their site allegiance can be low for both breeding and roosting habitat. During summer months (April – June), counts are low on the upper Wakulla River, often comprising mostly immature birds, while adults are presumably nesting in colonies elsewhere. Adults and immatures congregate in much larger numbers during the non-breeding season starting in July and peaking from October through February. There is no significant long-term trend for summer season abundance, but winter abundance does exhibit a significant long-term positive trend.

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

Table 3: Imperiled Species Inventory

Common and Scientific Name	**Imperiled Species Status**				**Management Actions**	**Monitoring Level**
	FWC	**USFWS**	**FDACS**	**FNAI**		
PLANTS						
Sweet-shrub *Calycanthus floridus*			E	G5,S2	10	Tier 2
Eastern purple cone flower *Echinacea purpurea*			E	G4,S1	10	Tier 2
Green adder's mouth orchid *Malaxis unifolia*			E	G5,S3	10	Tier 2
Little club-spur orchid *Platanthera clavellata*			E	G5,S1	10	Tier 2
BUTTERFLIES						
King hairstreak *Satyrium kingi*				G3,G4,S2	1,10	Tier 1
Coral hairstreak *Satyrium titus*				G2,S1	1,10	Tier 1
Appalachian brown *Satyrodes Appalachia*				G4,S2,S3	1,10	Tier 1

Table 3: Imperiled Species Inventory						
Common and Scientific Name	**Imperiled Species Status**				**Management Actions**	**Monitoring Level**
	FWC	**USFWS**	**FDACS**	**FNAI**		
REPTILES						
American alligator *Alligator mississippiensis*	SAT	FT(S/A)		G5,S4	4,10	Tier 1
Gopher tortoise *Gopherus polyphemus*	ST	C		G3,S3	1,6,7,10,13	Tier 3
Alligator snapping turtle *Macroclemys temminchii*	SSC			G3,G4,S2	10	Tier 1
Florida pine snake *Pituophis melanoleucus*	SSC			G4,T3,S3	1,10	Tier 1
Suwannee cooter *Pseudemys concinna suwanniensis*	SSC			G5,T3,S3	1,10	Tier 1
BIRDS						
Roseate Spoonbill *Platalea ajaja*	SSC			G5,S2	10	Tier 1
Limpkin *Aramus guarauna*	SSC			G5,S3	2,3,10,12	Tier 2
Little Blue Heron *Egretta caerulea*	SSC			G5,S4	10	Tier 1
Snowy Egret *Egretta thula*	SSC			G5,S3	10	Tier 1
Tricolored Heron *Egretta tricolor*	SSC			G5,S4	10	Tier 1
Swallow-tailed Kite *Elanoides forficatus*				G5,S2	10	Tier 1
White Ibis *Eudocimus albus*	SSC			G5,S4	10	Tier 1
Merlin *Falco columbarius*				G5,S2	10	Tier 1
Peregrine falcon *Falco peregrinus*				G4,S2	10	Tier 1
Southeastern American Kestrel *Falco sparverius Paulus*	ST			G5,T4,S3	10	Tier 1

Table 3: Imperiled Species Inventory						
Common and Scientific Name	**Imperiled Species Status**				**Management Actions**	**Monitoring Level**
	FWC	**USFWS**	**FDACS**	**FNAI**		
American Oystercatcher *Haematopus palliates*	SSC			G5,S2	10	Tier 1
Worm-eating Warbler *Helmitheros vermivorus*				G5,S1	10	Tier 1
Wood Stork *Mycteria americana*	FT	T		G4,S2	10	Tier 1
Snail Kite *Rostrhamus sociabilis plumbeus*	FE	E		G4,G5,T2,S2	10	Tier 1
Louisiana Waterthrush *Parkesia motacilla*				G5,S2	10	Tier 1
MAMMALS						
Manatee *Trichechus manatus*	FE	E		G2,S2	2,4,10,12	Tier 3
Sherman's fox squirrel *Sciurus niger shermani*	SSC			G5,T3,S3	1,10	Tier 1
Florida black bear *Ursus americanus floridanus*				G5,T2,S2	1,4,10,13	Tier 1

Management Actions:

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

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.

Imperiled Species Management

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

The DRP strives to maintain and restore viable populations of imperiled plant and animal species primarily by implementing effective management of natural systems. Single species management is appropriate in state parks when the maintenance, recovery or restoration of a species or population is complicated due to constraints associated with long-term restoration efforts, unnaturally high mortality or insufficient habitat. Single species management should be compatible with the maintenance and restoration of natural processes and should not imperil other native species or seriously compromise park values.

In the preparation of this management plan, DRP staff consulted with staff of the FWC's Imperiled Species Management or that agency's Regional Biologist and other appropriate federal, state and local agencies for assistance in developing imperiled animal species management objectives and actions. Likewise, for imperiled plant species, DRP staff consulted with FDACS. Data collected by the USFWS, FWC, FDACS and FNAI as part of their ongoing research and monitoring programs will be reviewed by park staff periodically to inform management of decisions that may have an impact on imperiled species at the park.

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

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

Action 1 Continue efforts to track any plant and animal observations and update imperiled species inventories accordingly.

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

Action 1 Continue to follow established monitoring protocols for gopher tortoise, Limpkin and manatee.
Action 2 Implement monitoring protocols for the 3 species identified above.
Action 3 Continue to coordinate monitoring efforts with FWC and USFWS.

Objective C: Monitor and document 4 selected imperiled plant species in the park.

Action 1 Develop monitoring protocols for the park's 4 imperiled plant species which are sweet-shrub, Eastern purple cone flower, green adder's mouth orchid and little club-spur orchid. Monitoring protocol should include occurrence maps and monitoring schedule.

Action 2 Implement monitoring protocols for the 4 species listed above and include photo documentation

Action 3 If necessary, take actions to improve habitat conditions for the imperiled species. This may include managing competing vegetation and limiting access to the sites. The park should pursue active partnerships with local botanists to assist in this endeavor.

Invasive Species

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

Invasive animal species include non-native wildlife species, free ranging domesticated pets or livestock, and feral animals. Because of the negative impacts to natural systems attributed to invasive animals, the DRP actively removes invasive animals from state parks, with priority being given to those species causing the greatest ecological damage.

In some cases, native wildlife may also pose management problems or nuisances within state parks. A nuisance animal is an individual native animal whose presence or activities create special management problems. Examples of animal species from which nuisance cases may arise include venomous snakes, raccoons and alligators that are in public areas. Nuisance animals are dealt with on a case-by-case basis in accordance with the DRP's Nuisance and Invasive Animal Removal Standard.

The hydrilla presence in the Wakulla River and spring was the most threatening invasive plant in the park prior to its decline following the advent of heavy manatee grazing in the mid-2000s and the substantial reduction in nitrate loading from the City of Tallahassee T.P. Smith Water Reclamation Plant in 2012. The impact of this plant to the park has been so dramatic and widespread that it requires special consideration. Hydrilla has the potential for causing serious, permanent deterioration of the river system.

No one knows exactly how this invasive was introduced. Hydrilla was first observed in the spring run area of the Wakulla River in April of 1997. Its spread had increased at an alarming rate, out competing and displacing large amounts of eelgrass and other submerged vegetation in the upper two miles of the river and spring.

The control of hydrilla began with initial hand removal in 1997 and 1998, both from the surface and by SCUBA divers. Some control of the invasive plant was gained in the spring bowl and swimming area, but hydrilla continued to spread rapidly down river throughout the boat tour route. Starting in 1999 mechanical harvesting of hydrilla was contracted to a private vendor and a much larger area of the river was being controlled. Large amounts of hydrilla were removed but its spread marched down river outside the collection area and the boat tour route. Also, in 1999 an attempt at biological control was made in conjunction with Florida A & M University when 20,000 flies (*Hydrellia pakistane*) were released on a small portion of the river. No evidence of any negative impacts to the hydrilla from fly activity was ever observed and the control attempt was deemed a failure.

Removal efforts by hand, SCUBA diving, and mechanical harvesting continued with minimal success until 2002, when park and DEP staff determined another control option must be attempted. Previous suggestions to use herbicides had been rejected until park staff witnessed first-hand the successful treatment and control of hydrilla at Merritt's Mill Pond in Jackson County. Based on this review of an active project similar to the Wakulla system, the decision was made to proceed with the use of herbicide. The first step was to release rodamine dye and monitor its dispersion throughout the river. The study was funded by Bureau of Invasive Plant Management and conducted by the U.S. Corps of Engineers and a private contractor. Evidence showed that adequate mixing occurred, and the use of herbicide could proceed. To obtain proper concentrations of herbicide reliable flow data was essential. The Northwest Florida Water Management District took surface measurements at all the discharge points, provided the flow data and continued to provide this essential data for each subsequent treatment.

All reviews had been accomplished and it was determined that an application of the herbicide Aquathol K would be applied to the river in April of 2002. Notice was given to area residents regarding the use of the herbicide. On April 16, 2002, the herbicide treatment of the Wakulla River began. The treatment lasted 52 hours and an estimated rate of 4.25 ppm of Aquathol K was applied. The results of the first treatment were amazing but also concerning. Control of hydrilla was excellent with approximately 70- 80 percent of the hydrilla removed from the river. This included areas outside the park boundary over 3 miles away. However, concerns were also raised when several native plants were also impacted by the treatment and a minor die-off of river crayfish was observed soon after the treatment. Turbidity downstream was also high and lasted for more than a month. The massive biomass of dead plant material disintegrated quickly. Additionally, sediments that had built up on the river bottom from the hydrilla infestation were discharging due to the increase in water flow that occurred after the plants died off. These two factors were the cause of the excessive turbidity. Follow up treatments resulted in much less turbidity. Excellent control of the hydrilla lasted for about 6 months.

After research had been done on the impacts to native plants and the river crayfish, a reduced herbicide treatment was proposed for November 2002. The second treatment using Aquathol K was done at a rate of almost 2.0 ppm. Control of hydrilla was again attained to a satisfactory level with less impact to native plant species and no negative impacts on the river crayfish. After the successful second herbicide application, it was determined by Division and DEP staff that herbicide treatments would be the primary tool used in the control of hydrilla in the Wakulla Spring and river.

Since April of 2002, there have been eleven herbicide treatments completed with excellent desired results. The focus of the treatments has been to use the lowest concentration of herbicide and still get excellent control of the hydrilla. This has been accomplished with concentration of the herbicide being reduced from a high of 4.24 ppm to a low of 1.41 ppm and still getting excellent kill on the hydrilla. During the April 2005 treatment, crayfish (*Procambarus peninsulanus*) were monitored to determine if the herbicide was toxic to them. The investigation determined there were no toxic signs from the crayfish after the treatment.

Since May 4, 2012, no additional full river hydrilla herbicide treatments have been required or completed for hydrilla control. The lack of a need for herbicide controls of the hydrilla has been due to the unexpected and effective establishment of a biological control – the manatee, coupled with reduced nitrate loading to the spring from the Tallahassee wastewater treatment facility. The manatees fed on most of the aquatic vegetation found in the spring and river, but their most desired plants were southern naiad and hydrilla. By the spring of 2013, the biomass of southern naiad and hydrilla in the river had been greatly reduced. (Southern naiad is now only occasionally observed during the quarterly SAV surveys.) It was estimated that the hydrilla infestation had been reduced from its peak dominant state of 80% of all plant biomass, to less than 20% of the plant biomass in April of 2013. Based on this dramatic decrease, a full river herbicide treatment for 2013 could not be justified and no treatment was done. This trend of manatee use has continued, and the result has been low hydrilla infestation and no need for herbicide treatments in recent years. It now comprises 10% or less of the SAV biomass. Park staff hopes this trend of hydrilla control by manatees continues into the future.

Park staff feel that the management of hydrilla at Wakulla Springs State Park is at a controlled level that can be maintained by similar future management actions. Park staff continue to remove hydrilla from public use areas by hand when needed, but this removal is minimal compared to past levels of activity. As always, park staff will continue to seek assistance and research from additional sources in dealing with hydrilla control and manatee management.

Over the last ten years, a substantial effort has been made to remove a second aquatic invasive, parrot's feather. This invasive has been eradicated from the west end of the swimming area and an area just below the boat dock. Parrot's feather is now only present along the shore of the meadow area and a short distance down river. Several non-herbicide control efforts by park staff have been conducted on this remaining infestation site. Limited herbicide spot treatments have also been used in order to prevent fragmentation caused by hand-pulling of plants. With continued removal efforts, this invasive plant should soon be eradicated from park waters.

Brazilian elodea is now present in only small amounts in Sally Ward Spring, its creek run and the Wakulla River. The elodea has been removed in small amounts and its impacts to the park resources have been greatly overshadowed by the infestation of hydrilla. Elodea has been displaced by hydrilla in the most portions of the Wakulla River. Impacts from elodea have been much less severe than those presented by hydrilla.

An infestation of water lettuce was discovered at Turner Sink that completely covered this waterbody. A hand removal effort was initiated and competed. Now this area is monitored for reinfestation by this invasive plant and removed by hand when it is observed.

Upland invasive plants at Edward Ball Wakulla Springs State Park are present but for the most part their impacts are minor and are dealt with on a routine basis. When invasive plants are observed they are removed and treated. The site is monitored for reinfestation and additional treatment is applied if necessary. All invasive plant infestation sites are surveyed at least once every two years.

Table 4 contains a list of the Florida Invasive Species Council (FLISC) Category I and II invasive plant species found within the park (FLISC, 2011). The table also identifies relative distribution for each species and the management zones in which they are known to occur. An explanation of the codes is provided following the table. For an inventory of all invasive species found within the park, see Addendum 5.

Table 4: Inventory of FLISC Category I and II Invasive Plant Species			
Common and Scientific Name	**FLISC Category**	**Distribution**	**Management Zone (s)**
PLANTS			
Mimosa *Albizia julibrissin*	I	1	WK-12, WK-18, WK-U
		2	WK-01, WK-03, WK-06, WK-BB, WK-C, WK-CC, WK-DD, WK-EE, WK-FF, WK-H, WK-HH, WK-I, WK-K, WK-KK, WK-SS, WK-UU, WK-X
Coral ardisia *Ardisia crenata*	I	1 2 3	WK-02, WK-E, WK-PP, WK-RR, WK-QQ
Camphor tree *Cinnamomum camphora*	I	1	WK-15
Air potato *Dioscorea bulbifera*	I	2	WK-S
Hydrilla *Hydrilla verticillata*	I	3	WK-20
Cogongrass *Imperata cylindrical*	I	1	WK-F, WK-UU, WK-V
		2	WK-A
Chinese privet *Ligustrum sinese*	I	1 2	WK-UU WK-UU, WK-WW
Japanese climbing fern *Lygodium japonicum*	I	1	WK-1, WK-2, WK-4, WK-5, WK-7, WK-9, WK-14, WK-QQ, WK-R, WK-UU
		2	WK-2, WK-3, WK-7, WK-DD, WK-E, WK-G, WK-H, WK-LL, WK-NN, WK-OO, WK-PP, WK-QQ, WK-T, WK-U, WK-V, WK-W, WK-X
		3	WK-UU
		4	WK-UU, WK-V
		6	WK-15, WK-PP, WK-QQ, WK-SS
Chinaberry *Melia azedarach*	II	1	WK-R
		2	WK-12, WK-19
Nandina *Nandina domestica*	I	2	WK-5, WK-6, WK-HH
Golden bamboo *Phyllostachys aurea*	II	2	WK-TT
Water lettuce *Pistia stratiotes*	I	2	WK-UU
Chinese tallow	I	1	WK-2

Sapium sebiferum		2	WK-SS
Tropical soda apple *Solanium viarum*	I	1 2 3 6	WK-F7, WK-T WK-10, WK-20 WK-F8 WK-C, WK-UU
Chinese wisteria *Wisteria sinensis*	II	2	WK-6, WK-14, WK-15, WK-19, WK-E, WK-HH, WK-J, WK-S
		3	WK-I, WK-J, WK-S
Elephant ear *Xanthosoma sagittifolium*	II	2	WK-14

Distribution Categories:

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

Invasive Species Management

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

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

Objective A: Annually treat 5 acres of invasive plant species in the park.

Action 1 Annually develop/update invasive plant management work plan.
Action 2 Implement annual work plan by treating a minimum of 5 acres of invasive plant infestation annually with continuing maintenance and follow-up treatments, as needed.
Action 3 Continue to survey all known infestation sites at least once every two years.
Action 4 Record any new infestation sites as discovered and schedule control treatment.

Objective B: Monitor presence of hydrilla in the park.

Action 1 Continue to seek assistance and research from additional sources in dealing with hydrilla control and manatee management.

Objective C: Implement control measures on invasive animal species in the park.

Action 1 Continue to monitor for feral hog activity and implement established control measures as necessary. Past control efforts have proven successful at this park, and feral hogs are not a significant problem at this time.

Action 2 Continue to trap and remove free-ranging domesticated animals from the park.

<u>Cultural Resources</u>

This section addresses the cultural resources present in the park that may include archaeological sites, historic buildings and structures, cultural landscapes, and collections. The Florida Department of State (FDOS) maintains the master inventory of such resources through the Florida Master Site File (FMSF). State law requires that all state agencies locate, inventory, and evaluate cultural resources that appear to be eligible for listing in the National Register of Historic Places. Addendum 7 contains the FDOS, Division of Historical Resources (DHR) management procedures for archaeological and historical sites and properties on state-owned or controlled properties; the criteria used for evaluating eligibility for listing in the National Register of Historic Places, and the Secretary of Interior's definitions for the various preservation treatments (restoration, rehabilitation, stabilization, and preservation). For the purposes of this plan, significant archaeological site, significant structure, and significant landscape means those cultural resources listed or eligible for listing in the National Register of Historic Places. The terms archaeological site, historic structure or historic landscape refer to all resources that will become 50 years old during the term of this plan.

Condition Assessment

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

Good describes a condition of structural stability and physical wholeness, where no obvious deterioration other than normal occurs.

Fair describes a condition in which there is a discernible decline in condition between inspections, and the wholeness or physical integrity is and continues to be threatened by factors other than normal wear. A fair assessment is usually a cause for concern.

Poor describes an unstable condition where there is palpable, accelerating decline, and physical integrity is being compromised quickly. A resource in poor condition suffers obvious declines in physical integrity from year to year. A poor condition suggests immediate action is needed to reestablish physical stability.

Level of Significance

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

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

Prehistoric and Historic Archaeological Sites

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

Humans have occupied and used Wakulla Springs for more than 12,000 years. Archaeological evidence shows intermittent habitation from Paleo-Indian through European contact (1513), with significant Paleo-Indian, Archaic, Deptford, Swift Creek, Weeden Island and Fort Walton period sites. Later periods are also represented, particularly Spanish mission (Wa321), Creek and Seminole (Wa312). Late Nineteenth and early Twentieth century use included heavy timbering, farming and naval stores activities during the Nineteenth century and the development of tourism during the Twentieth century. The Florida Master Site File (FMSF) lists 70 sites within the unit.

The acquisition of the area by Edward Ball in 1934 resulted in its development as an attraction that focused on the preservation of wildlife and the conservation of natural features. The Wakulla Springs Lodge, designed by the firm of Marsh and Saxelbye of Jacksonville, is an excellent example of the use of Mediterranean Revival architecture. Edward Ball Wakulla Springs State Park was nominated to the National Register of Historic Places as an archaeological and historic district in 1992. It has since won those designations.

Wakulla Springs has been studied since the nineteenth century. The spring was well known to paleontologists since approximately 1850, when "Professor King" of Newport, Florida, recovered skeletal materials of a mastodon. Other mastodon remains were found during the late nineteenth and early twentieth century. Following the report of some 600-bone points found in general association with extinct Pleistocene elephant remains from the underwater cave area of the springs (Olsen 1958), attention turned to Paleo-Indian remains: Suwannee projectile points, bone points, and the remains of sloth and deer, in addition to megafauna. The archaeologist Wilfred Neill described what he saw as Paleo-Indian kill sites similar to Clovis sites reported in the American southwest (Neill 1964), making 8Wa24A one of the type sites cited to support the concept of Paleo-Indian big game hunters in Florida. In 1988, staff of the Department of State, Division of Historical Resources, Bureau of Archaeological Resources, conducted a limited archaeological survey. State Archaeologist B. Calvin Jones uncovered impressive Paleo-Indian tools (Suwannee Simpson biface; Suwannee fluted points) during testing in advance of construction for an advanced sewage collection system in 1995. More recently, several archaeological investigations have been conducted by the Aucillla Research Institute (ARI) that are revealing new information about the property. This new information allows park staff to better protect the cultural resources and to interpret the park's history.

Wa305, the Wakulla Springs Lodge complex features the most publicly visible cultural resources. Wa305A-F are the six structures associated with the lodge. Wa329, is the upland area surrounding the lodge building, while Wa24A encompasses the submerged area in and around the spring.

Briefly, the Wakulla Springs spring boil, Wa24A, was the site where mastodon skeletal materials and worked stone and bone artifacts were recovered. The lodge complex holds evidence about Twentieth century development in the area, while the upland area on which the lodge complex sits contains evidence for intermittent aboriginal habitation over several thousand years.

Most visible elements of these resources are in fair to good condition, although each has been disturbed or modified. Because the spring and lodge complex are the focus of most visitation, they are subject to daily wear and tear.

Description & Condition Assessment

Wa17 – Wakulla Bridge: The site consists of Weeden Island and Ft. Walton lithic scatter as well as historic refuse. The site is in good condition.

Wa24A – Wakulla Springs (underwater): This site consists of Paleoindian through Archaic period lithic scatter, tools and associated Pleistocene faunal remains found within the Wakulla Spring basin and extensive aquatic cave system. All cultural materials are well protected, and the site is in good condition.

Wa25 – This is an undetermined aboriginal habitation site consisting primarily of lithic scatter and chert flakes. The site is in good condition.

Wa180 – Material evidence from this large site suggest extensive occupation from possibly the Early Archaic through Ft. Walton times. In addition, the types of lithic materials suggest that the area also functioned as a major quarry for extracting raw materials for tool making. The site is in good condition.

Wa309 – Weeden Island Mound Complex: The site consists of two mounds and their respective borrow pits. Possible burial mounds with Weeden Island ceramics and lithic scatter. Currently, no artifacts are visible on the surface. There are signs of past looting, evidenced by "potholes." Some small tree encroachment on the large mound has occurred and some tree controls have been practiced by park staff. The Aucilla Research Institute conducted an archaeological investigation on site due to ground disturbances caused by trees that fell in 2018 during Hurricane Michael. Despite the disturbances, the mounds are in good condition.

Wa310 – No Name Spring: The site consists of Early Archaic lithics as well as historic ceramics, brick and iron fragments. A woods road to the site was blocked by park staff making the site more isolated. The site is well preserved and in good condition.

Wa311 – Turpentine Camp: Archaeological features consist of a pile of lime rocks with several red bricks and a coffee pot. The site is minimally disturbed and in good condition.

Wa312 – Ways Site: This site consists of archaeological remains associated with Late Archaic, Weeden Island and Seminole occupation. The site was described by Dr. Calvin

Jones as a “rare Seminole Site.” It is determined to be a multi-component habitation site where Creek Indians lived as well. The Seminole component is believed to be the site of Francis’ Town, the Nineteenth Century Indian settlement of the Creek Chief Hillis Hadjo, a.k.a., Francis the Prophet. The site is well protected and in good condition.

Wa313 – This site consists of Late Archaic lithic scatter and is in good condition.

Wa314 – This site consists of Late Archaic lithic scatter and is in good condition.

Wa315 – This site consists of Late Archaic lithic scatter and is in good condition.

Wa316 – This site consists of Ft. Walton period ceramics and lithic scatter. The site is minimally disturbed and is in good condition.

Wa317 – Bottle Dump: This site consists of Twentieth Century refuse associated with the early days of the lodge. The site is minimally disturbed and is in good condition.

Wa319 – Turpentine Camp: This site consists of turpentine pots, liquor bottles and bits of bricks, metal and glass. The site is undisturbed and in good condition.

Wa320 – This site consists of undetermined prehistoric lithic scatter. The site is undisturbed and in good condition.

Wa321/322 – Bear Site: This site consists of Deptford and Ft. Walton period archaeological materials including ceramics, lithics, animal bones and shell. The site is in good condition.

Wa323 – Chimney Spring: This site consists of undetermined prehistoric lithic scatter and Weeden Island ceramic fragments. The site is undisturbed and in good condition.

Wa324 – The site consists of undetermined prehistoric lithic scatter and is in good condition.

Wa325 – The site consists of undetermined prehistoric lithic scatter and is in good condition.

Wa326 – This is an historic home site. Archaeological materials include ironstone, whiteware, stoneware, crockery, red brick, liquor bottles, pharmaceutical bottles and iron stove parts. The site is minimally disturbed and in good condition.

Wa327 – This site consists of undetermined prehistoric lithic scatter. It is undisturbed and in good condition.

Wa328 – This site is an historic earthwork associated with a bridge crossing and associated highway construction in the early Twentieth Century. The site is in good condition.

Wa329 – Wakulla Springs (terrestrial): This is a large multi-component site consisting of archaeological evidence from Paleoindian, Early Archaic, Middle Archaic, Late Archaic, Deptford, Weeden Island, Ft. Walton, Seminole and American Twentieth Century periods. It appears to be a site of continuous occupation through these cultural/time periods. This site has been altered in historic times by development of the lodge and associated recreational and support facilities. Despite these modern features, the overall site is well protected, minimally disturbed and in good condition.

Wa330 – This site consists of Weeden Island ceramics and lithics. The artifacts are possible evidence of a village site associated with the Wa309 mound complex. The site has been slightly disturbed by minor looting but remains in good condition.

Wa331 – This site consists of undetermined prehistoric lithic scatter. The site is undisturbed and in good condition.

Wa332 - This site consists of undetermined prehistoric lithic scatter. The site is undisturbed and in good condition.

Wa333 – This site consists of Ft. Walton ceramic sherds and lithic scatter. The site is in good condition.

Wa334 – This site consists of undetermined prehistoric lithic scatter. The site is undisturbed and in good condition.

Wa335 – This is a Middle Archaic site as determined by the recovery of a Levy Point. The site is undisturbed and in good condition.

Wa336 – This is a Weeden Island site consisting of Weeden Plain, Wakulla Check Stamped and Swift Creek Complicated Stamped ceramic sherds. The site is well protected, relatively undisturbed and in good condition.

Wa337 – This site consists of Weeden Island ceramic sherds and is in good condition.

Wa338 - This site consists of undetermined prehistoric lithic scatter. The site is undisturbed and in good condition.

Wa339 – This site consists of Weeden Island ceramic sherds and lithic scatter. The site is in good condition.

Wa340 – This site consists of prehistoric lithic scatter and is in good condition.

Wa341 – This site consists of prehistoric lithic scatter and is in good condition.

Wa342 – This site consists of Weeden Island ceramic sherds and lithic scatter. The site is in good condition.

Wa343 – This is a Middle Archaic site as determined by the recovery of a re-sharpened stemmed point. The site is in good condition.

Wa344 – This is a Weeden Island site consisting of ceramic sherds, lithics, shell food remains and crystalline quartz. The site is in good condition.

Wa345 – This site consists of undetermined prehistoric lithics and lithic scatter. The site is in good condition.

Wa346 – This site consists of undetermined prehistoric lithic scatter and is in good condition.

Wa347 – The site consists of undetermined prehistoric lithics and lithic scatter. The site is in good condition.

Wa348 – This site consists of undetermined prehistoric lithic scatter and is in good condition.

Wa349 – This site consists of Weeden Island ceramic sherds and lithic scatter. The site is in good condition.

Wa350 – This site consists of undetermined prehistoric lithic scatter and is in good condition.

Wa351 – This is a historic dumpsite consisting of soda bottles and tableware. The site is relatively undisturbed and in good condition.

Wa352 – This site consists of Ft. Walton ceramic sherds and lithic scatter. The site is in good condition.

Wa353 – This site consists of Swift Creek and Weeden Island ceramics as well as historic ceramics. Diagnostic materials recovered from the site consist of Norwood Fiber Tempered ceramics and a Bradford Point. The site is in good condition.

Wa354 – This site consists of undetermined prehistoric lithic scatter and is in good condition.

Wa355 – This site consists of undetermined prehistoric lithic scatter and is in good condition.

Wa356 – This site consists of undetermined prehistoric lithic scatter and is in good condition.

Wa357 – This site consists of Weeden Island and Ft. Walton ceramic sherds. Diagnostic materials recovered from the site include Weeden Plain and Lake Jackson Plain pottery sherds. The site is in good condition.

Wa358 – This site consists of Deptford and Ft. Walton ceramic sherds. The site is in good condition.

Wa359 – This site consists of Weeden Island lithics as determined by the recovery of a Hernando Point. The site is in good condition.

Wa360 – This site consists of undetermined prehistoric lithic scatter and is in good condition.

Wa361 – This site consists of Swift Creek Fiber Tempered Norwood ceramic sherds. The site is in good condition.

Wa362 – This site consists of Early Archaic and Weeden Island ceramics and lithic tools. The site is in good condition.

Wa481 – Wakulla Springs Lodge West Site: This site consists of Ft. Walton ceramic sherds and possibly Seminole ceramic sherds. This site is in good condition.

Wa513 – This is the Nationally Registered Historic District that includes all recorded sites within the Wakulla Springs property. The district contains 55 recorded archaeological sites dating from the Paleoindian period into the Twentieth Century, and 23 buildings and structures associated with the architecturally significant Wakulla Springs Lodge which was built in the 1930s.

Wa539 – Apple Snail: This is believed to be a Weeden Island shell mound. The site is undisturbed and in good condition.

Wa635 – Cherokee Sink: This is a multi-component site that includes archaeological and historic materials related to Weeden Island and historic Twentieth Century occupation. The site is in good condition.

Wa710 – Causseaux Cemetery: Believed site of an early Twentieth Century family cemetery. The site is in fair condition.
Wa752 – Wakulla 2003 ARM: This is a multi-component site including archaeological materials associated with Paleoindian, Early Archaic and Creek/Seminole cultural periods.

Wa842 – This is an underwater site consisting of bricks from multiple historic periods ranging from Colonial to modern. The site has eroded into the river and is considered to be in fair condition.

Wa1205 – This is a terrestrial historic 20th century sand pit and trash dump along with a prehistoric campsite component. The sand pit and historic trash dump appear to be c. 1930s – 1950s, while the prehistoric campsite is expressed as a lithic scatter with no identified culture period. 8WA1205 is within the boundary of National Register district 8WA315 – 8WA321 and is a potential contributor to that district. The creation of the sand pit appears to have substantially disturbed the historic trash dump and prehistoric campsite.

Wa1221 – This is a terrestrial habitation site with evidence of occupation from the Paleoindian, Early and Middle Archaic, Fort Walton, and Leon-Jefferson Periods including a potential early contact component. The site is considered potentially eligible for listing on the National Register of Historic Places under Criterion D. Erosion and looting are the major threats to this site.

Wa1222 – This is a terrestrial habitation site dating to the late Fort Walton Period and early contact period (1513 – 1600). This site is potentially eligible for listing on the National Register of Historic Places under Criterion D either individually or as a contributor to a district. Overall site integrity is good, with some minor damage from animal burrowing and tree falls which are the major threats.

Wa1223 – This is a terrestrial historic homestead site with evidence of occupation during the Second Spanish and American Territorial Periods that may be associated with the Kinnaird era occupation. No prehistoric component was identified. The site is potentially eligible for listing on the National Register of Historic Places as a contributor to a district.

Wa1263 – This is a segment of a historic plank/corduroy road, or a structure similar in design constructed of logs split in the middle, placed with their flat side facing up, then smoothed with metal hand tools. Preservation of this wood feature was believed to have been achieved due to its location in saturated ground. The exact date of construction of this feature is unknown but plank roads were common in Florida the early to mid-19th century. The feature is located within National Register District 8WA315 and may be eligible to contribute to that district. Overall integrity is good with only minor disturbances noted and no significant threats are noted.

Wa1264 – This is a terrestrial historic road segment that may be part of a road that led to Fort San Marcos de Apalachee that is depicted on the 1815 Pintado map. The date of construction is unknown. Unlike WA1263 no logs or planks were noted in association with this site. 8WA1264 is located within the boundary of National Register district 8WA315 and may qualify to contribute to that district. It is reported as only having a minor degree of disturbance and no significant threats are noted. This feature may be associated with WA1265, but disturbance in the vicinity of the Wakulla Springs lodge has obliterated parts of the trail in that location.

Wa1265 – This is a terrestrial historic road segment. The date of construction is unknown. Unlike WA1263 no logs or planks were noted in association with this site. WA1265 is located within the boundary of National Register district 8WA315 and may qualify to contribute to that district. It is reported as only having a minor degree of disturbance and no significant threats are noted. This feature's relationship to 8WA1264 is uncertain, but the two may have joined in the vicinity of the Wakulla Spring headspring; however modern development has obscured the trail in that area.

Wa1269 – This is a small lithic scatter consisting of 9 lithic artifacts recovered from a single STP. The lack of diagnostic artifacts and the small size of 8WA01269 suggests that this site has low potential to yield significant information about history or prehistory.

Wa1270 – This is a large, multi-component Archaic and Middle Woodland site located south of a slough. Due to the site's large size, dense concentrations of artifacts, presence of diagnostics, and faunal preservation, PaleoWest recommends its status as Potentially Eligible for listing in the NRHP.

Wa1271 – This is a low to medium density artifact scatter located on the same water feature as 8WA01270. It is comparatively small, lacks faunal preservation, lacks features, and has a low likelihood for human remains.

Wa1272 – This is a precontact scatter containing lithics, ceramics, and one Herty cup fragment. The low density, small size, and lack of diagnostic artifacts limits 8WA01272's potential to yield information under Criterion D of the National Register for Historic Places.

Wa1273 – This is a low-density lithic scatter consisting of eight flakes. The lack of diagnostic artifacts, small size, and low density of 8WA01273 limits its potential to yield information under Criterion D of the NRHP.

Wa1275 – This is an Early Archaic through Woodland site located adjacent to a large water feature. There may be a separation of components stratigraphically. Diagnostic artifacts, intact stratigraphy, separation of components, size, and location near an interconnected slough suggests the site may have the potential to yield information under Criterion D of the NRHP.

Wa1276 – This is a small lithic scatter located on the western boundary of the River Sinks parcel. The low density, small size, disturbance by transmission line, and lack of diagnostic artifacts limits 8WA01276's potential to yield information under Criterion D of the NRHP.

Wa1277 – This is a small scatter consisting of four lithic artifacts. The low density, small size, and lack of diagnostic artifacts and features limits 8WA01277's potential to yield information under Criterion D of the NRHP.

Wa1293 – This is a very small site consisting of two flakes and one piece of pottery in a single STP. The low density, small size, and lack of diagnostic artifacts and features limits 8WA01293's potential to yield information under Criterion D of the NRHP.

Wa1294 – This is a low-density multi-component site consisting of 13 artifacts. The low density, small size, disturbance, lack of diagnostic artifacts, and lack of features limits 8WA01294's potential to yield information under Criterion D of the NRHP.

General Management Measures: Continue support of archaeological researchers to further knowledge of the park's cultural history. No immediate management actions are deemed necessary for the park's recorded archaeological sites, other than periodic monitoring and preservation. Preservation includes protection from damage from resource management, natural causes, construction or human damage including looting. If stabilization measures are deemed necessary at some point during this planning cycle, then these techniques may include the use of protective vegetation, use of filter cloth or other methods to prevent erosion or burial of the site. A current recommended treatment will be indicated in the table for each site listed as NRL, NR or NE.

Historic Structures

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

Description & Condition Assessment: The park contains seven historic structures recorded in the Florida Master Site File. The following is a discussion of each:

Wa305 – Wakulla Springs Lodge - The Wakulla Springs Lodge is a two-story Mediterranean Revival building, shaped like the Greek letter pi. It has textured stucco exterior, arched entries, and low pitched, side gabled roof. The roof surface of the main block and wings of the building was asbestos shingles and the attached hipped roof on the north elevation was covered with metal bright orange baked enamel flat shingles. All portions of the roof were reconstructed in 2001 and replaced with a metal barrel material similar to that found on the original roof. Fenestration includes arched, 4-light casement windows on the first story, and rectangular, 3-light casement windows on the second story.

Due to a buildup of many layers of old paint, the exterior coating over the stucco walls was no longer an effective moisture barrier. In 2004, with the approval of the Division of Historical Resources, the walls had the old layers of paint removed down to the original primer layer by wet sandblasting and were repainted with a special two-part epoxy-based finish that has an extended life expectancy. The paint color is "Warm Sun" that was matched to one of the initial layers of old paint that was removed. Three exterior stucco chimneys are located on the elevations of the courtyard located on the south side of the building. The main fireplace and chimney continue to function with the lobby fireplace; however, the damper mechanism and firebrick must be repaired to ensure good draft and fire control. The chimney to the west, on the kitchen side, is no longer used and was capped in 2004. The chimney on the east side of the courtyard once served the boiler room. It now serves as the exhaust for the gas water heater. A colony of chimney swifts return every summer and roosts for the evening in either this chimney or the fireplace chimney.

In 1997, $320,000 was spent renovating the lodge guest rooms. Furnishings in the rooms were re-finished or replaced with appropriate period replacement pieces. Included in the project was the restoration of all guest room windows. The windows in rooms 24 and 40 were replaced with new vinyl clad windows that should be replaced with historically appropriate window frames and sash. All other windows were removed of all paint down to the bare wood. Window hardware was refurbished and restored to full working condition. In 2001, $290,000 was spent to remove the asbestos shingles from the lodge roof and reroof the building using metal barrel tiles. The project was funded by a DHR grant received by the Friends of Wakulla Springs.

Within the structures, the lobby is the most heavily used area of the lodge and is the only surviving significant interior space used for congregation of visitors and guests. It has marble tile floors, wainscoted and plastered walls. It is generally in fair condition. The kitchen area was gutted and completely renovated. In 1995-96, additional walk-in cooler space was added to the building. In 2002, well-known art conservator Rustin Levenson was contracted to clean and restore the elaborately painted ceiling in the lobby. Funding for the $98,000 project was provided by the Friends of Wakulla Springs and matched with a Division of Historical Resources historic preservation grant.

The overall current condition of the lodge building is good.

Wa305A – Bath house – Designed by the architectural firm Marsh & Saxelbye, this building was constructed in 1935. It was designed to serve as both men's and women's dressing rooms and concession building. The bath house is composed of two simple, brick, masonry vernacular buildings, joined in the center by a service counter/concession area, and unified by a gable roof covered with asphalt shingles. The concession area, as well as portions of the bath house floors and baseboards, are marble. A frame vernacular ell was originally attached to the end of each bath house. These have been detached, and one has been removed. The remaining bath house ell, now converted for use as a conference Room (Wa305B), stands just north of the west end of the bath house. The roof of the conference room is covered with asphalt shingles.

The bathhouse was completely renovated in the 1990's. The wooden floor and lower section of the walls were in poor condition, but the roof and upper section of the walls were in good condition. The project consisted of suspending the building with large timbers and removing and replacing the lower section. The restroom portion of the building is in good condition.

Wa305B – Meeting house/conference room (Dogwood Pavilion) – Designed by the architectural firm Marsh & Saxelbye, this building was constructed in 1935. This is the remaining frame vernacular ell associated with the historic bath house building. This structure has been detached from the bath house and is now a separate building. Its current condition is good.

Wa305C – Wakulla Springs engine house – Designed by the architectural firm Marsh & Saxelbye, this building was constructed in 1937. It provided power and boiler steam to the lodge. The engine room is a rectangular, gable roofed, vernacular structure constructed of load bearing masonry on a concrete slab foundation. Fenestration is regular with 16-light, metal casement windows with center panel openings, located on the sides in groups of three. A double door is located in the center of each gable end; there is also a circular vent in each gable. Exterior fabric is stucco on plaster, painted white. The roof is covered with metal, simulated, red Spanish barrel tile. The interior is divided into two spaces by a fire wall. The boilers and generators have been removed and the building now serves as a laundry and storage area. The current condition of the building is good.

Wa305D – The staff house – This building was designed by the architectural firm of Marsh & Saxelbye. It is a gable roofed, two story, frame vernacular building completed in 1942 for use as a staff dormitory and office space. The foundation is masonry piers, exterior fabric is weatherboard, and the roof is finished in three tab fiberglass shingle. Fenestration is regularly placed sash window. The first story takes the form of a traditional double house, with the halves separated by a fire wall; the second story is divided into individual rooms which open on a central hall. Access to the second story hall is through gable end door and a set of wood stairs.

The staff house was constructed to house managerial and other permanent staff of the hotel. A portion of the first floor continues to be used as temporary lodging for DEP and cooperator staff assisting with resource management activities at the park. The remainder of the first floor and all of the second floor is now used as office space for park management and supporting administrative staff.

The only major alterations have been the addition of a fire escape stairway on the east elevation and an ADA ramp also on the east side of the building. The electrical wiring for the building was upgraded in the 2010’s. The current condition of the staff house is good.

Wa305E – Pump house – This building was designed by the architectural firm of Marsh & Saxelbye. It is located at the edge of the spring, west of the dive tower. Constructed in 1935, it is a small, vernacular building with a gabled roof covered with metal, simulated Spanish barrel tiles. It has 3 – light casement windows. The pumps originally extracted water from the spring and forced it to a water tower (Wa305F) located south of the lodge. In the 1980s, the pumps were rerouted to supply the lodge air conditioning system, and the water tower was connected to the municipal water main. The current condition of the pump house is good.

Wa305F – Water tower – This structure was designed and constructed in 1936 by the architectural firm of Marsh & Saxelbye. When constructed, water was pumped from the spring to the tower to insure adequate water pressure to the lodge and associated buildings. Spring water is no longer used for drinking water and the tower is connected to the Talquin Water supply. However, Talquin cannot provide adequate water pressure so the tower is still required. This structure is in fair to good condition.

General Management Measures: No restoration actions are deemed necessary for the park’s historic structures at this time. Any construction related to the maintenance of the park’s historic structures must be approved by the Division of Historical Resources. Appropriate materials and techniques utilized in performing routine maintenance functions should be periodically reviewed and updated. The exterior surfaces should be kept free of vegetation and leaf litter. A current recommended treatment will be indicated in the table for each of the park's historic structures listed as NRL, NR or NE.

Collections

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

Description: The park does not maintain an active collection of artifacts or other cultural materials. When the property was acquired, there was a substantial number of records relating to the Edward Ball era stored in the laundry building. To preserve the records, they were moved to the FPS Historic Collections Facility & Archives. Efforts to inventory these records and make them accessible for research should be supported.

Table 5 contains the name, reference number, culture or period, and brief description of all the cultural sites within the park that are listed in the Florida Master Site File. The table also summarizes each site's level of significance, existing condition, and recommended management treatment. An explanation of the codes is provided following the table.

Table 5. Cultural Sites Listed in the Florida Master Site File

Site Name and FMSF #	Culture / Period	Description	Significance	Condition	Treatment
Wakulla Bridge Wa17	Weeden Island & Ft. Walton	Archaeological Site	NE	G	P
Wakulla Springs Wa24	Deptford and Archaic	Archaeological Site	NE	G	P
Wakulla Springs (underwater) Wa24A	Paleoindian and Archaic	Archaeological Site	NRL	G	P
Wa25	Undetermined prehistoric	Archaeological Site	NE	G	P
USFS 80-10 Wa180	Prehistoric	Archaeological Site	NS	G	P
Mound Complex Wa309	Weeden Island	Archaeological Site	NE	G	P
No Name Spring Wa310	Early Archaic & Historic	Archaeological Site	NE	G	P
Turpentine Camp Wa311	Historic	Archaeological Site	NE	G	P

Ways Site Wa312	Late Archaic, Weeden Island & Seminole	Archaeological Site	NE	G	P
Wa313	Late Archaic	Archaeological Site	NE	G	P
Wa314	Late Archaic	Archaeological Site	NE	G	P
Wa315	Late Archaic	Archaeological Site	NE	G	P
Wa316	Ft. Walton	Archaeological Site	NE	G	P
Wa317	Historic Twentieth Century	Archaeological Site	NE	G	P
Wa319	Historic Turpentine Camp	Archaeological Site	NE	G	P
Wa320	Undetermined Prehistoric	Archaeological Site	NE	G	P
Bear Site Wa321/322	Deptford, Ft. Walton	Archaeological Site	NE	G	P
Chimney Spring Wa323	Undetermined Prehistoric	Archaeological Site	NE	G	P
Wa324	Undetermined Prehistoric	Archaeological Site	NE	G	P
Wa325	Undetermined Prehistoric	Archaeological Site	NE	G	P
Wa326	Historic Home site, Late Nineteenth – Early Twentieth Century	Archaeological Site	NE	G	P
Wa327	Undetermined Prehistoric	Archaeological Site	NE	G	P
Wa328	Historic, Twentieth Century	Archaeological Site	NE	G	P
Wa329	Paleoindian, Early – Middle – Late Archaic, Deptford, Weeden Island, Ft. Walton, Seminole & American Twentieth Century	Archaeological Site	NE	G	P
Wa330	Weeden Island	Archaeological Site	NE	G	P
Wa331	Undetermined Prehistoric	Archaeological Site	NE	G	P
Wa332	Undetermined Prehistoric	Archaeological Site	NE	G	P

Wa333	Ft. Walton	Archaeological Site	NE	G	P
Wa334	Undetermined Prehistoric	Archaeological Site	NE	G	P
Wa335	Middle Archaic	Archaeological Site	NE	G	P
Wa336	Weeden Island	Archaeological Site	NE	G	P
Wa337	Weeden Island	Archaeological Site	NE	G	P
Wa338	Undetermined Prehistoric	Archaeological Site	NE	G	P
Wa339	Weeden Island	Archaeological Site	NE	G	P
Wa340	Undetermined Prehistoric	Archaeological Site	NE	G	P
Wa341	Undetermined Prehistoric	Archaeological Site	NE	G	P
Wa342	Weeden Island	Archaeological Site	NE	G	P
Wa343	Middle Archaic	Archaeological Site	NE	G	P
Wa344	Weeden Island	Archaeological Site	NE	G	P
Wa345	Undetermined Prehistoric	Archaeological Site	NE	G	P
Wa346	Undetermined Prehistoric	Archaeological Site	NE	G	P
Wa347	Undetermined Prehistoric	Archaeological Site	NE	G	P
Wa348	Undetermined Prehistoric	Archaeological Site	NE	G	P
Wa349	Weeden Island	Archaeological Site	NE	G	P
Wa350	Undetermined Prehistoric	Archaeological Site	NE	G	P
Wa351	Historic, Early Twentieth Century	Archaeological Site	NE	G	P
Wa352	Ft. Walton	Archaeological Site	NE	G	P
Wa353	Swift Creek, Weeden Island	Archaeological Site	NE	G	P
Wa354	Undetermined Prehistoric	Archaeological Site	NE	G	P

Wa355	Undetermined Prehistoric	Archaeological Site	NE	G	P
Wa356	Undetermined Prehistoric	Archaeological Site	NE	G	P
Wa357	Weeden Island, Ft. Walton	Archaeological Site	NE	G	P
Wa358	Deptford, Ft. Walton	Archaeological Site	NE	G	P
Wa359	Weeden Island	Archaeological Site	NE	G	P
Wa360	Undetermined Prehistoric	Archaeological Site	NE	G	P
Wa361	Swift Creek	Archaeological Site	NE	G	P
Wa362	Early Archaic, Weeden Island	Archaeological Site	NE	G	P
Wakulla Springs Lodge West Site Wa481	Ft. Walton, Seminole	Archaeological Site	NE	G	P
Wakulla NRL Historic District Wa513 *(includes site Wa24a – Wa362)*	Paleoindian through Historic	Resource Group (Historic District)	NR	G	P
Apple Snail Wa539	Weeden Island	Archaeological Site (shell mound)	NE	G	P
Cherokee Sink Wa635	Weeden Island, Historic (Early Twentieth Century)	Archaeological Site	NE	G	P
Causseaux Cemetery Wa710	Historic, Early Twentieth Century	Cemetery	NE	G	P
Wakulla 2003 ARM Wa752	Paleoindian, Early Archaic, Creek/Seminole	Archaeological Site	NE	G	P
Spring Run Wa842	Historic (Colonial – Early Twentieth Century)	Archaeological Site	NE	F	P
Wakulla Springs Lodge Wa305	Historic Early Twentieth Century	Historic Structure	NE	G	P
Bath House Wa305A	Historic Early Twentieth Century	Historic Structure	NE	G	P
Meeting House Wa305B	Historic Early Twentieth Century	Historic Structure	NE	G	P
Wakulla Springs Engine House Wa305C	Historic Early Twentieth Century	Historic Structure	NE	G	P

The Staff House Wa305D	Historic Early Twentieth Century	Historic Structure	NE	G	P
Pump House Wa305E	Historic Early Twentieth Century	Historic Structure	NE	G	P
Water Tower Wa305F	Historic Early Twentieth Century	Historic Structure	NE	G	P
Sand Pit Wa1205	Prehistoric	Archaeological Site	NE	G	P
Watters Hill Wa1221	Archaic and Fort Walton	Archaeological Site	NE	G	P
Moai Rock Wa1222	Fort Walton	Archaeological Site	NE	G	P
Apthorp Pile O Rock Wa1223	1783-1821	Archaeological Site	NE	G	P
Sally Ward Old Plank Road Wa1263	Undetermined	Archaeological Site	NE	G	P
East Side Old Trail Wa1264	Historic	Archaeological Site	NE	G	P
West Side Old Trail Wa1265	Historic	Archaeological Site	NE	G	P
WSSP 1 Wa1269	Prehistoric	Archaeological Site	NS	G	P
WSSP 2 Wa1270	Archaic	Archaeological Site	NR	G	P
WSSP 3 Wa1271	Early Archaic	Archaeological Site	NS	G	P
WSSP 4 Wa1272	Prehistoric 20th Century	Archaeological Site	NS	G	P
WSSP 5 Wa1273	Prehistoric	Archaeological Site	NS	G	P
Barnes Cemetery Wa1274	Historic	Historic Cemetery	NS	G	P
WSSP 6 Wa1275	Archaic and Deptford	Archaeological Site	NR	G	P
WSSP 7 Wa1276	Prehistoric	Archaeological Site	NS	G	P
WSSP 10 Wa1277	Prehistoric	Archaeological Site	NS	G	P
WSSP8 Wa1293	Prehistoric	Archaeological Site	NS	G	P
WSSP9 Wa1294	Prehistoric 19th Century 20th Century	Archaeological Site	NS	G	P

Significance		Condition		Recommended Treatment	
NRL	National Register listed	G	Good	RS	Restoration
NR	National Register eligible	F	Fair	RH	Rehabilitation
NE	not evaluated	P	Poor	ST	Stabilization
		NA	Not accessible	P	Preservation
NS	not significant	NE	Not evaluated	R	Removal
				N/A	Not applicable

Cultural Resource Management

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

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

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

Objective A: Annually monitor 89 of 89 recorded cultural resources in the park.

Action 1	Conduct FMSF records review to determine which sites are in need of additional assessments/evaluation.
Action 2	Continue to manage cultural sites as protected areas, with restricted access and activities.
Action 2	Monitor impacts to historic structures from daily park operations.

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

Action 1	Ensure all known sites are recorded and updated in the Florida Master Site File.
Action 2	Utilize the predictive model for high, medium and low probability of locating archaeological sites, which was developed by University of South Florida in 2014, as a guide for management actions.
Action 3	Continue to support actions to document site Wa710 Causseaux Cemetery.

Action 4 Maintain records of oral history interviews.

Objective C: Maintain 89 of 89 recorded cultural resources in good condition.

Action 1 Continue regular monitoring programs for 89 cultural sites.
Action 2 Maintain protocols for protection of each cultural resource, including measures such as vegetation control and routine site visits to identify and deter negative impacts.

Special Management Considerations

Multiple Uses

For this park, it was determined that timber management could be accommodated in a manner that would be compatible and not interfere with the primary purpose of resource-based outdoor recreation and conservation. This compatible secondary management purpose is addressed in the Resource Management Component of the plan. Uses such as water resource development projects, water supply projects, stormwater management projects, linear facilities and sustainable agriculture and forestry (other than those forest management activities specifically identified in this plan) are not consistent with this plan or the management purposes of the park.

Timber Management Analysis

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

Edward Ball Wakulla Springs State Park (Wakulla Springs) is designated as a single-use park. As such, timber management is only permitted as a method of natural community restoration and maintenance rather than as an ongoing extractive activity. The feasibility of managing/harvesting timber at Wakulla Springs during the period covered by the Unit Management Plan was considered pursuant to the DRP statutory responsibilities to analyze the park's resource needs and values. The long-term management goal for forest communities in the state park system is to maintain or re-establish natural characteristics to the degree practicable, except in those natural communities specifically managed for a structure that differs from that described in the timber assessment found at reference sites for those communities established by the FNAI. In the case of imperiled species, the management of certain natural communities may differ from standard treatments to provide optimum habitat conditions within the park.

Most natural communities evaluated at Wakulla Springs had overstory pine stocking levels generally within the range identified for corresponding FNAI Reference Sites. Conversely, non-pine (hardwood) overstory stocking levels were generally above the upper limits identified for corresponding FNAI Reference Sites. The Timber Management Analysis found in Addendum 8 provides additional details. Overstory thinning is a management tool that may be utilized in areas which have overstocked conditions. Activities related to stand improvement, including palmetto and midstory reduction, are ongoing in many areas, as well.

Arthropod Control Plan

All DRP lands are designated as “environmentally sensitive and biologically highly productive” in accordance with Ch. 388 and Ch. 388.4111 Florida Statutes. If a local mosquito control district proposes a treatment plan, the DRP works with the local mosquito control district to achieve consensus. By policy of DEP since 1987, aerial is not allowed, but larviciding and ground adulticiding (truck spraying in public use areas) is typically allowed. The DRP does not authorize new physical alterations of marshes through ditching or water control structures. Mosquito control plans temporarily may be set aside under declared threats to public or animal health, or during a Governor’s Emergency Proclamation.

A general protocol for arthropod control has been developed for the park. The Park Manager can coordinate site specific ground adulticiding in visitor use areas if necessary.

Land Management Review

Section 259.036, Florida Statutes, established land management review teams to determine whether conservation, preservation and recreation lands titled in the name of the Board of Trustees are being managed for the purposes for which they were acquired and in accordance with their approved land management plans. The DRP considered recommendations of the land management review team and updated this plan accordingly. Wakulla Springs State Park was subject to a land management review on January 12, 2022. The review team determined the land is being managed for the purpose for which it was acquired, and the actual management practices, including public access, complied with the management plan for this site.

Sea Level Rise

Potential sea level rise is now under study and will be addressed by Florida’s residents and governments in the future. The DRP will stay current on existing research and predictive models, in coordination with other DEP programs and federal, state, and local agencies. The DRP will continue to observe and document the changes that occur to the park’s shoreline, natural features, imperiled species populations, and cultural resources. This ongoing data collection and analysis will inform the Division’s adaptive management response to future conditions, including the effects of sea level rise, as they develop.

LAND USE COMPONENT

Land use planning and park development decisions for the state park system are based on the dual responsibilities of the DRP. These responsibilities are to preserve representative examples of original natural Florida and its cultural resources, and to provide outdoor recreation opportunities for Florida's citizens and visitors. These dual responsibilities inform all recreational and infrastructure development considerations. Balancing equitable access to recreational facilities and preservation of Florida’s resources is the main priority when developing recreation and land use proposals.

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

This component of the management plan includes an inventory and brief description of the existing recreational uses, facilities, and special conditions on use. Specific areas within the park that will be given special protection are also identified. The Land Use Component then summarizes the Conceptual Land Use Plan (CLUP) for the park and identifies large-scale repair and renovation projects, new building and infrastructure projects, and new recreational amenities that are recommended to be implemented over the next ten-year planning period. Any adjacent lands that should be pursued for acquisition are identified as a part of the park’s Optimum Boundary.

Existing Use of Adjacent Lands

Wakulla County maintains a high percentage of open space and conservation lands, with roughly sixty percent of the county in public ownership. The park is in an area with a significant concentration of resource-based recreation opportunities provided by surrounding public lands that makes this region attractive to outdoor recreation enthusiasts. The Apalachicola National Forest protects over a half million acres north and west of the park. St. Marks National Wildlife Refuge is also within short distance of the park and is a source of 68,000 acres for outdoor activities and exceptional Florida panhandle scenery along the coastline of Apalachee Bay. San Marco de Apalachee is situated a short drive south at the confluence of the Wakulla and St. Marks Rivers. The Wakulla State Forest includes over 4,000 acres adjacent to the park on the north side of highway 267. The Tallahassee-St. Marks Historic Railroad State Trail is less than five miles from the main entrance to the park. Towards Tallahassee are also Miccosukee Canopy Road Greenway, Lafayette Heritage Trail Park and San Luis Mission Park which provide exquisite North Florida outdoor recreation and cultural resources. Privately owned lands adjacent to the park include a mix of undeveloped woodlands, open fields, pine plantations, and low-density single-family housing. Private lands surrounding the park maintain a rural, agricultural character.

Planned Use of Adjacent Lands

The park is located within the Wakulla Springs Special Planning Area designated in the Wakulla County Land Development Code, Ordinance #94-28. The planning area is governed by land use restrictions regulating the use, handling, production, storage, and disposal of toxic or hazardous substances. Proper enforcement of this ordinance will help avoid the future development of incompatible land uses within the spring basin and serve to protect the water quality of Wakulla Springs. The Wakulla County Comprehensive Plan's Future Land Use Map designates adjacent lands a mix of Agricultural and Rural Residential (R1/R2). Agricultural lands primarily support timber and/or farming activities and allow for very low residential densities. Lands designated R1/R2 provide for a range of agricultural, residential, and limited commercial activities at low densities. While these land use designations are compatible with the park, they are open to amendment, which could lead to higher density development and potentially incompatible uses on adjacent lands. As adjacent lands are converted to more intensive uses additional resource and visitor management challenges will face the park. Increased development adjacent to the park may detract from the wilderness feel of the park and impact the visitor experience through increased noise and light pollution. In addition, as park boundaries become more populated incidents of unauthorized access, illegal uses and encroachments onto park lands may increase. Park staff will continue to monitor land use changes adjacent to the park.

Assessment of Use

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

Past Uses

The Wakulla Springs area was used extensively by aboriginal inhabitants of the area. In earlier years, the park was used as a World War II training facility, movie filming location and training site for the Florida State College for Women (now FSU) Tarpon Club. A variety of uses have altered the landscape over time including farming, logging, and naval stores operations. From 1937 until acquisition by the state, the spring basin was operated as a resort while the lands south of the river were preserved as a wildlife sanctuary. Recreation activities included guided boat tours, glass bottom boat rides, and swimming while the Wakulla Restaurant and Lodge provided food and accommodations. The woodlands were protected from hunting and fishing during this period and fire suppression contributed to successional changes in the forest communities. The river channel and Sally Ward Creek were modified in the late 1960s. The Cherokee Sink parcel was logged prior to state ownership. The River Sinks and Turner Sink parcels were managed for silviculture before they were added to the park.

Future Land Use and Zoning

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

The Future Land Use Designations outlined by Wakulla County provide parcel designations for properties that are adjacent to Edward Ball Wakulla Springs State Park as well as a designation for the park property. All of the park property has a Future Land Use designation of Conservation. The lands adjacent to the park are designated as Agriculture, Rural 1, Rural 2, Rural 3, Public, and Conservation (Wakulla County, 2021). More information on these Future Land Use designations can be found in the Wakulla County 2040 Comprehensive Plan.

Current Recreational Use and Visitor Programs

The heart of the park is the world-famous Wakulla Spring. Its 69-degree Fahrenheit water flows from the majestic spring to create the Wakulla River. Tickets for the world-class wildlife viewing tours can be purchased at the lodge's front desk and online. The 45- to 55-minute cruise opens a window into the lives of alligators, native birds, turtles and often, manatees. The tour concludes by drifting over the bowl of Wakulla Spring, one of the world's largest and deepest freshwater springs. The jump from the dive/observation tower into the refreshing water of Wakulla Spring is an exhilarating rush. The nature trails, which lead through southern hardwood forests and maple-cypress habitats, provide easy to moderate hiking along a 0.9 mile loop trail or 6 mile linear trail. Several state and national champion trees mingle with other forest giants. A bridge over the Sally Ward Spring Run provides access to the upland hardwood forest on the north side of the Wakulla River. The elegant, two-story Lodge at Wakulla Springs was created by Florida business tycoon Edward Ball and opened in 1937. The spacious lobby with large fireplace and marble-topped checker tables leads out to a glass-enclosed terrace with splendid views of the spring. Most impressive, though, is the ceiling stenciled and painted with local wildlife scenes and European folk art designs. The dining room, overlooking the spring, provides elegantly prepared food for breakfast, lunch, and dinner. Gift items, light lunches and ice cream treats can be purchased in the gift shop at one of the world's longest marble counters.

Edward Ball Wakulla Springs State Park recorded 139,397 visitors in fiscal year (FY) 2020/2021 and contributed $21.9 million in direct economic impact, which is estimated as the equivalent of adding 307 jobs to the local economy (FDEP 2022).

Other Uses

Scientific research of the aquatic cave system occurs on park grounds. Wakulla Springs is considered one of the most studied karst systems in the world. Data gathered as a result of this research will be used to gain a better understanding of the springshed's hydrogeology, make better land use decisions, and improve environmental education activities.

Protected Zones

A protected zone is an area of high sensitivity or outstanding character from which most types of development are excluded as a protective measure. Generally, facilities requiring extensive land alteration or resulting in intensive resource use, such as parking lots, camping areas, shops, or maintenance areas, are not permitted in protected zones. Facilities with minimal resource impacts, such as

trails, interpretive signs and boardwalks are generally allowed. All decisions involving the use of protected zones are made on a case-by-case basis.
At Edward Ball Wakulla Springs State Park all wetlands and floodplain as well as known imperiled species habitat have been designated as protected zones. The park's current protected zone is delineated on the Conceptual Land Use Plan.

Existing Facilities

The existing park facilities support a variety of recreational activities with the focus on the main springhead and the historic buildings from the Edward Ball era. The support facilities are appropriate for the activities offered at the park.

Springhead and Lodge Use Area
Swimming Area
Floating Docks (2)
Platform
Tour Boat Dock
Ticket Office
Restrooms
Gazebo
Lodge and Restaurant
Picnic Pavilions (2)
Picnic Tables (30)
Shower Station
Hiking Trails (1 mile)
Hiking/Biking Trails (2 miles)
Multi-use/Equestrian Trails (5.22 miles)
Conference Room
Playground
Parking Area

Cherokee Sinks
Parking Area
Honor Box

River Sinks Use Area
Parking Area
Hiking/Biking Trails (2 miles)
Honor Box

Emerald Sink
Parking Area
Sink Access Steps
Honor Box

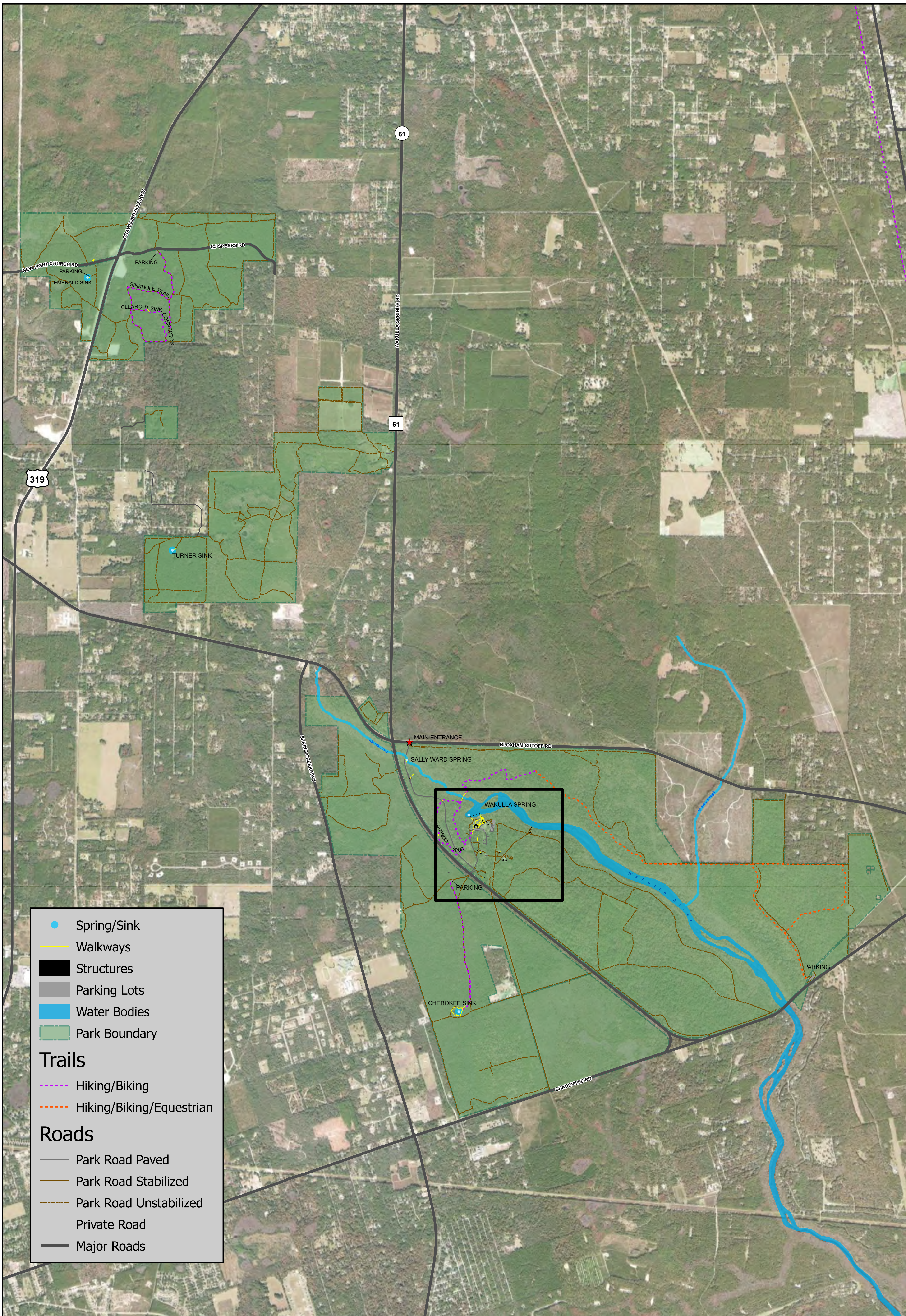
Rock Road Trailhead
Parking Area

Support Facilities
Dry Dock

Conceptual Land Use Plan

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

During the development of the conceptual land use plan, the DRP assessed the potential impact of proposed uses or development on the park resources to determine the future plan of the park as well as the scale and character of proposed development. Potential resource impacts are also identified and assessed as part of the site planning process once funding is available for facility development. At that stage, design elements and design constraints are investigated in greater detail including sewage and wastewater.



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Existing Facilities Page 1

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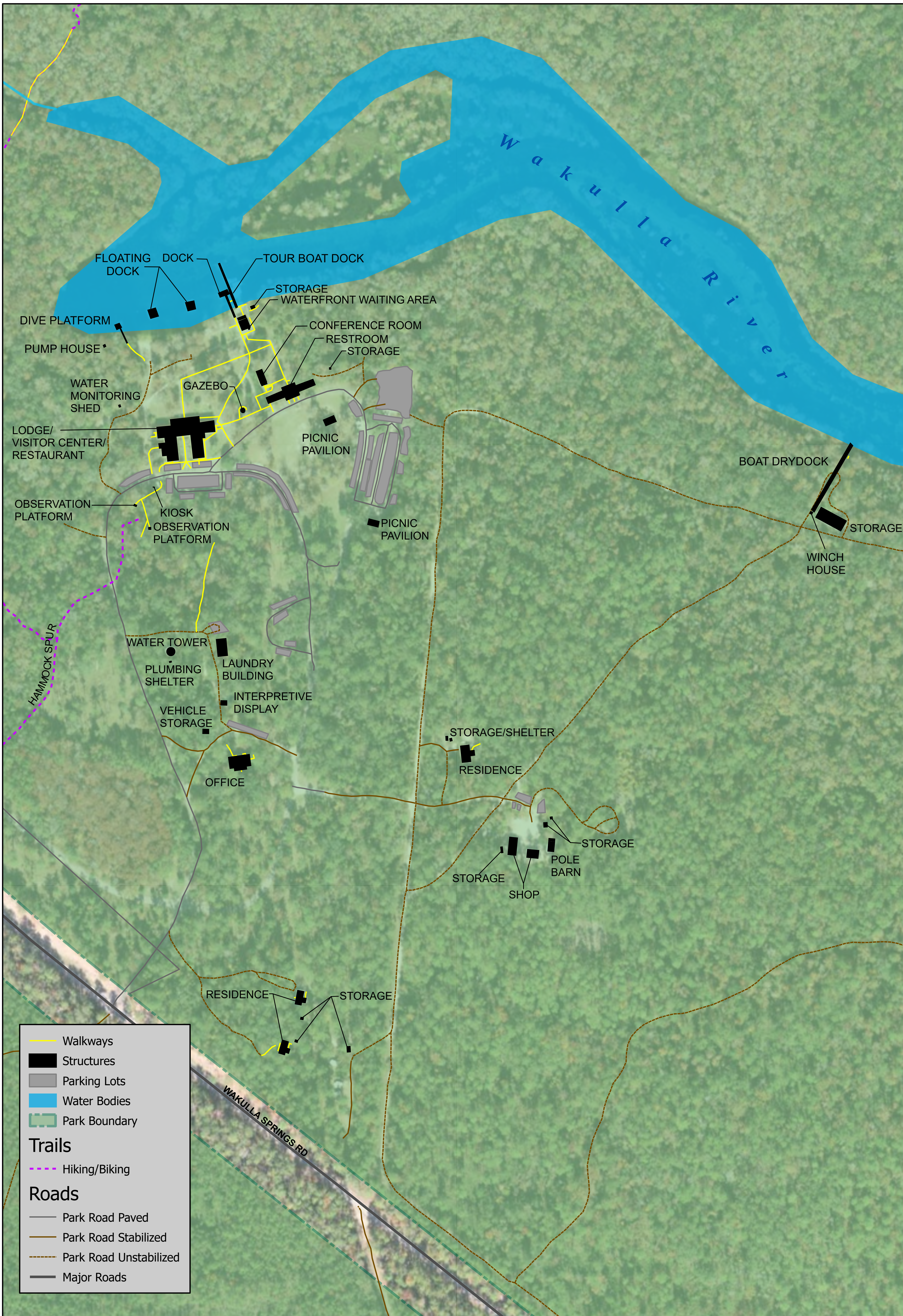

EDWARD BALL WAKULLA SPRINGS STATE PARK
Existing Facilities Page 2

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Creation of impervious surfaces is minimized to the greatest extent feasible in order to limit the need for stormwater management systems, and all facilities are designed and constructed using best management practices to limit and avoid resource impacts. Federal, state, and local permit and regulatory requirements are addressed during facility development. This includes the design of all new park facilities consistent with the universal access requirements of the Americans with Disabilities Act (ADA). After new facilities are constructed, park staff monitors conditions to ensure that impacts remain within acceptable levels.

<u>Public Access and Recreational Opportunities</u>

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

The existing recreational activities at this state park are appropriate to the natural and cultural resources contained in the park and should be continued.

Objective: Maintain the park's current recreational use.

The park is heavily visited throughout the year due to the draw of the Wakulla Spring. Water-based activities include swimming and boat tours. The park offers the Lodge with various food options while overlooking the spring to enhance the visitor experience. Trails accommodate bicyclists, hikers, and equestrian use.

Objective: Expand the park's recreational use.

Proposed activities such as adding recreational opportunities to the new Ferrell Tract, connecting with existing trails on Wakulla State Forest and St. Marks Trail, additional swimming opportunities at Cherokee Sinks, and adding cycling opportunities and improvements will increase the recreational use of the park.

Additionally, the current laundry building could be repurposed from its current use by the concessionaire as a laundry facility for the lodge and for the concessionaires shop area. If the building is repurposed from its current use there will be a need to relocate these concession services elsewhere in the park.

Objective: Continue to provide interpretive programs.

Wakulla Springs offers a variety of programs throughout the year. Each ranger hosts programs based on their interests and specialties. Examples of programs offered include campfire programs, monthly hikes, hikes with focuses such as wildflowers, birds, plants, and animals. Additionally, boat tours run throughout the day for interpretation of the Wakulla River. Other programs frequently held at the park focus on the rich history of Wakulla Springs and the area of Wakulla.

Objective: Develop new interpretive programs.

Potential program options at the park may include but are not limited to, Lunch with Archeologist, which would be with scientists that conducted the studies at the park and sharing that information and history with park visitors. Additional options include expanding the boat tours to include a Historic Boat Tour, a bike tour to Hidden Springs, a Photo Tour, various programs or tours of the Ferrell Tract, interpretive signs, and kiosks on important topics, and a Songbird Walk.

Capital Facilities and Infrastructure

Goal: Develop and maintain use areas and support infrastructure.

The existing facilities at the park are appropriate to the natural and cultural resources contained in the park and should be maintained. New construction, as discussed further below, is recommended to improve the quality and safety of the recreational opportunities, to improve the protection of park resources, and to streamline the efficiency of park operations.

Objective: Maintain all use area and support facilities in the park.

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

Objective: Improve 9 use areas.

Major repair projects for park facilities may be accomplished within the ten-year term of this management plan if funding is made available. These include the modification of existing park facilities to bring them into compliance with the Americans with Disabilities Act (a top priority for all facilities maintained by DRP).

Main Day Use Area
An interpretive center is proposed near the current bathhouse and main picnic area. This center will provide further opportunities for visitor interpretation of the unique and rich history of Wakulla Springs as well as conference space for meetings. The visitor center should provide interpretative amenities, restrooms, and conference space. To facilitate enhanced visitor flow and viewshed over the spring, the wing additions to the existing brick bathhouse could be removed. To supplement the proposed interpretive center, a master plan could provide additional guidance on placement of paths and pavilions for optimal visitor experience.

The parking area should be reconfigured to utilize the space more efficiently while maintaining its pervious nature. Reconfigured flow through the parking area and into the main use areas should be improved to maximize visitor experiences.

The dogwood pavilion should be removed and could be replaced with a restroom facility to serve the needs of guests using the waterfront for swimming and boat tours if other restroom facilities are not adequate.

Improvements are proposed to replace or renovate the playground structures as well as adding a small restroom and picnic pavilion. These improvements would improve the experience of children and provide a closer and safer option for restroom use without walking to the main restroom at the springhead.

Two additional trails, a small pervious parking area for 4-5 cars, and an observation deck in the cypress dome are proposed near the park admin office to provide additional recreational and interpretive opportunities. One trail is proposed to circle the cypress dome and connect to the existing trail in the area. This trail along with the observation deck in the cypress dome will provide additional recreation opportunities as well as controlled access to this scenic area. The second trail is proposed as an interpretive trail that utilizes existing service roads and trails to interpret the historical and cultural significance of numerous buildings and artifacts from the park's past. A more permanent structure is proposed on the existing concrete slab behind the admin building to house numerous props and tools that were used on the property for more interpretative opportunities.

Lodge

The windows, doors, and elevator are original to the lodge and are in need of replacement. Repairs to the original elevator are needed to address issues with unlevel landings as this elevator is the only ADA access for the lodge.

Water Structures

Improvements are also proposed for numerous water structures at the park. The water tower at the park needs to be inspected for safety concerns and improvements made as they are deemed necessary. The tour boat dock and observation t-dock are both in need of repairs as they are aging and beginning to show wear and cracks. Both floating docks should also be replaced as well as improvements made to the dive tower to ensure visitor safety in this area.

The tour boats should be repaired, renovated, or replaced to ensure their continued use and visitor satisfaction. The area of the river bottom directly behind the tour boat dock should be dredged to allow deeper water for boat operations. This has been done previously and the dredged sand replaced on the beach area where it eroded from. Improvements are needed to allow for enhanced park boat activities as well as improvements to the boundary fence that stretches across the Wakulla River.

River Sinks Day Use Area

The trailhead at River Sinks along CJ Spears Road has been relocated to accommodate the widening of U.S. 319. The relocation of the trailhead and parking area will also include perimeter fencing and reconfiguring of the trail system as needed while also adding interpretation opportunities.

Emerald Sink Property

The stairs that provide access to the sink are being replaced to provide a safer experience for visitors and divers.

Park Entrance

A new ranger station is currently being built to replace the original ranger station and provide for better flow of visitors into the park. Additional improvements include the conversion of the park's entrance road to accommodate for the proposed multi-use trail connection to the St. Marks Trail. This trail connection would run along the outside edge of the park property and will enter the park at the main entrance where the new proposed traffic pattern will begin. The entrance road is proposed to be turned into a one-way entry-only lane with the existing exit lane converted into bicycle and pedestrian lane. This new traffic pattern would start at the park entrance and end where the main park drive intersects with the road to the lodge. All traffic would exit through the current employee entrance and onto SR 61. Additional alterations to existing traffic patterns and/or rerouting of existing roads may be necessary to ensure the effectiveness of this conversion. This conversion will accommodate for visitors entering the park via the proposed multi-use trail connection to the St. Marks Trail and would provide additional recreational opportunities for guests.

Employee Entrance

The proposals for this area are to improve the entrance with a larger gate that would accommodate for the increase in visitor use as this would be the new location for all exiting traffic out of the park. Additionally, a pedestrian gate should be installed to promote bicycle and pedestrian access from the main park area to the Cherokee Sink property that lies directly across SR 61. Additional alterations to existing traffic patterns and/or rerouting of existing roads may be necessary to ensure the effectiveness of the proposed new traffic pattern.

Cherokee Sink Tract

Proposals for this area include general use area improvement and the addition of a restroom facility to allow visitor use as an additional swimming option.

Rock Road Parking Area

Improvements are proposed at this location include enhanced use for a better equestrian experience.

Objective: Develop 2 new use areas.

Sanctuary

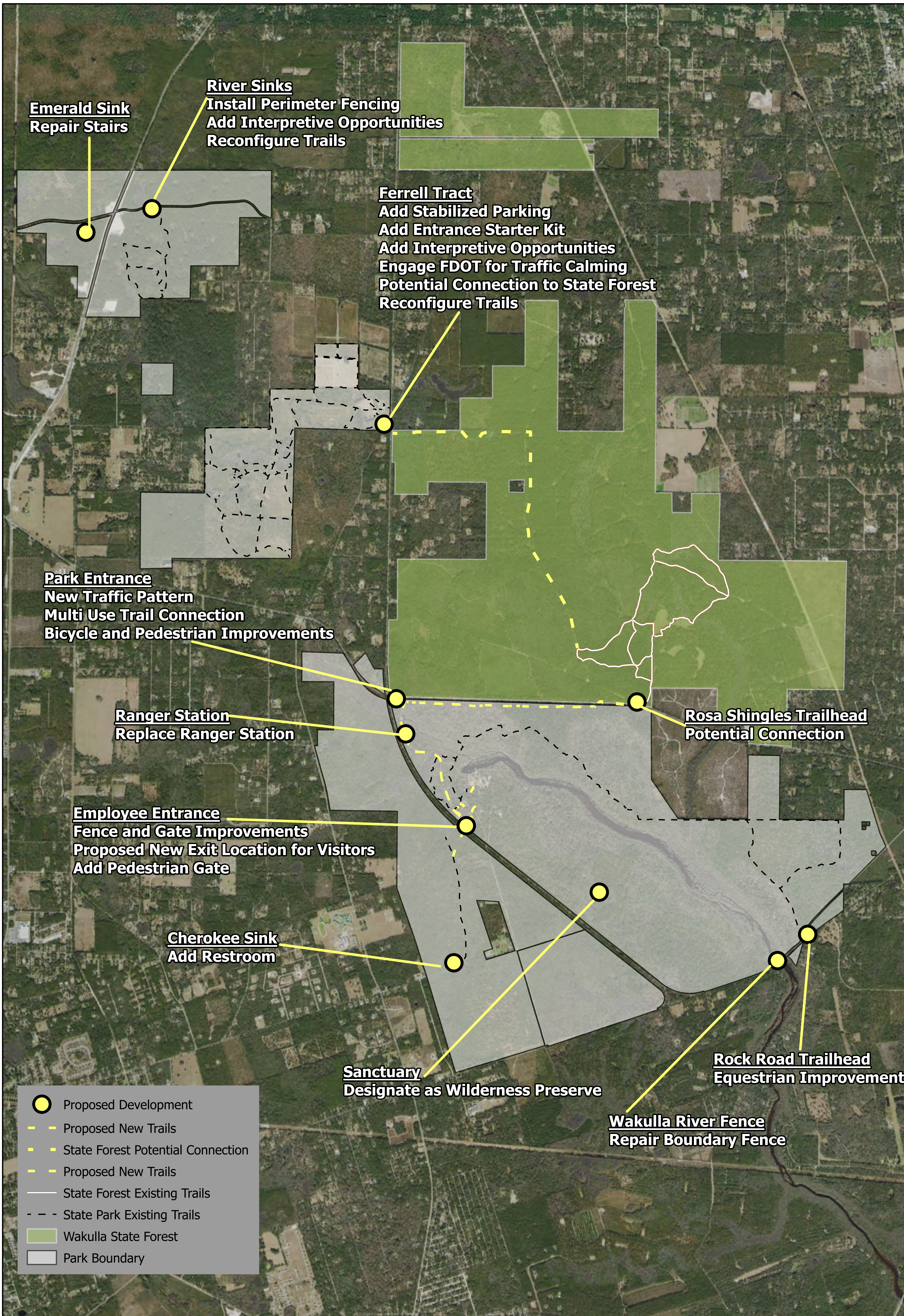
The current sanctuary area of the park acts as a wilderness preserve and should be formally designated as such to ensure the protection of this area in the future.

A wilderness preserve is an area within a state park that retains its primeval character and is managed to preserve and interpret its natural character and values. A designated wilderness preserve generally appears to have been shaped by the unaltered forces of nature, with the imprint of human influence substantially unnoticeable. A wilderness preserve offers outstanding opportunities for the conditions of solitude and remoteness that are essential for a wilderness experience. The area may contain environmental, archaeological, or other kinds of features of scenic, educational, natural, or historic value. Facilities are limited to those considered essential for resource management and specified public uses.

Ferrell Tract

This property was recently acquired through the Forest Legacy Program and provides great recreational opportunities to visitors. The property comprises 717 acres with numerous sinkholes, ecotonal changes, and pristine natural beauty.

The proposals for this acquisition will be minimal in nature to allow the property to stay in its natural state while allowing access for the public. Proposals for this property include adding a stabilized parking area, adding a trailhead kiosk with trail maps and wayfinding guidance, a potential connection to the Wakulla Springs State Forest to lengthen the current experience for equestrians and other trail users, and engagement with FDOT for traffic calming and safety enhancements for the intersection of Old Shell Point Road and SR 61 for a safe crossing of SR 61 for the potential connection to the state forest. New trail should be established for users that provide a great experience while minimizing the potential for degradation of the sensitive resources on this property. New trails should allow



Edward Ball Wakulla Springs State Park
Conceptual Land Use Plan Page 1

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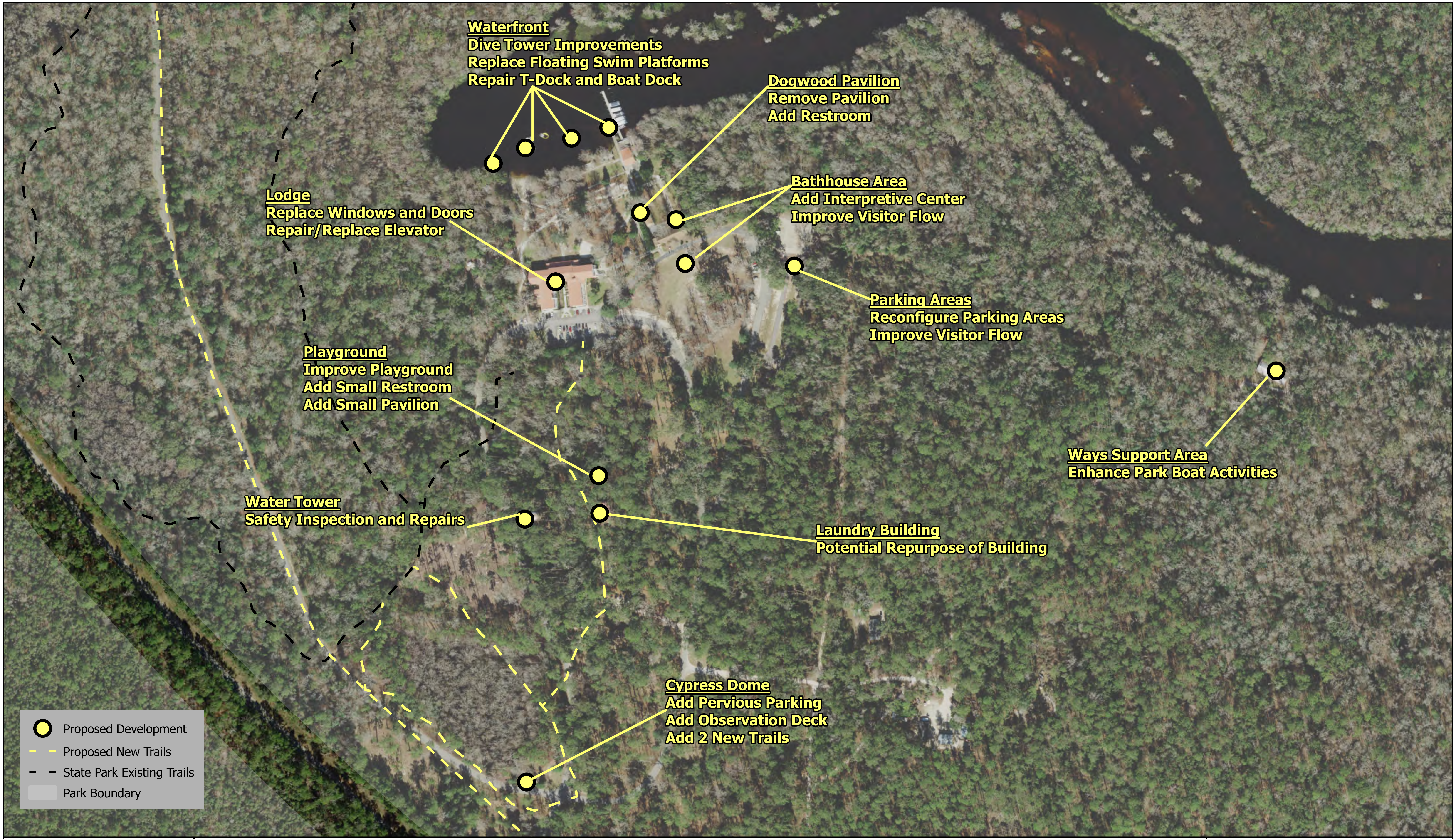

Edward Ball Wakulla Springs State Park
Conceptual Land Use Plan Page 2

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Sources: ESRI; Florida Department of Environmental Protection
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visitors to experience the amenities of the property while avoiding direct access to sinkhole and other karst features. The trails should provide strategic interpretive opportunities to educate visitors on the importance of springs protection.

Visitor Use Management

The DRP manages visitor use to sustain the quality of natural and cultural resources and the visitor experience, consistent with the purposes and significance of the park. The dynamic nature of visitor use requires an adaptive approach to managing resource impacts from recreation. As such, the DRP will rely on a variety of tools and strategies to manage visitor use. These tools and strategies potentially include specifying modes of access and establishing limits on the number of people within certain areas of the park.

The premise of the visitor use management strategy is to protect the natural and cultural resources of the park. Site-specific indicators and thresholds may be selected to monitor resource conditions and visitor experience. By monitoring conditions over time and clearly documenting when conditions become problematic, the DRP can implement actions to prevent unacceptable resource conditions. As monitoring continues, collected data may be used to determine baseline and desired conditions, which are in turn used to establish thresholds.

Indicators are defined as specific attributes or characteristics of natural/cultural resources or visitor experiences that can be measured to track changes in conditions.

Thresholds are defined as the minimally acceptable conditions for each indicator and represent the point at which resource impacts will require management action. Thresholds are assigned based on the desired resource conditions, longitudinal data, and current visitor use patterns. Based on these continued monitoring efforts and adaptive management principles, actions may also be required prior to reaching the established thresholds.

This section outlines visitor use management strategies for locations and impact types that were evident at the time of plan development. Over the course of this 10-year planning period, additional areas of the park may also be identified for visitor use management strategies.

Locations and Impacts of Concern

- Main Springhead Shoreline and Swimming Area
    - Erosion
    - Visitor Experience
- Cherokee Sink Shoreline
    - Erosion
    - Visitor Experience

Two specific use areas are identified as being at risk of detrimental impacts from routine visitor use – the upland shorelines and submerged swimming areas of the main Wakulla Springhead and Cherokee Sink.

Baseline Data Collection

- Erosion
    - Determine extent of existing soil coverage along shorelines, including coverage or exposure of tree roots.
- Visitor Experience
    - Estimate typical and peak visitation rates, including density of persons within the subject use area.

To objectively gauge erosional change over time, initial quantitative measurements and/or qualitative condition assessments are needed. Future measurements or assessments collected/conducted during the prescribed monitoring process will be compared to the initial or "baseline" data. Along the heavily traversed perimeters of the spring and sink, the extent of upland soil must be quantified. Although erosion in these areas already began in the earliest days of park visitation, the volume and rate of soil loss are unknown. This baseline data will be the first formally recorded entry in the ongoing log of measurements or assessments.

Baseline data regarding the visitor experience at these specific use areas is generally less quantifiable, however, the DRP can estimate the historical and current rates of visitation at these popular recreation sites. Future visitation data can then be compared.

Resource Monitoring and Indicators:

- Erosion
    - Loss (decrease from baseline) of beach at swimming area
    - Accumulation of displaced sediment in submerged areas
- Visitor Experience
    - Overcrowding (increase from baseline) of swimming and beach areas.
    - Satisfaction of visitors (not compared to baseline)
        - Conduct longitudinal visitor satisfaction surveys in order to capture general visitor satisfaction throughout all seasons of the year and varying patterns of visitor use.

Directly corresponding to the baseline data, monitoring efforts will focus on aspects of erosion – soil loss and displacement of sediment downstream of the disturbance. Measurements or assessments of loss and accumulation will be the indicators of change.

Counting visitors at select moments in time can be used to gauge frequency, duration, and density of crowding. Quantification of visitors at one time or over the course of a given day, however, is not necessary indicative of the quality of the visitor experience. For assessment of visitor experience, satisfaction surveys are recommended.

Thresholds of Desired Conditions

- To be established during this 10-year planning period
    - Informed by baseline data and desired conditions
        - Current or optimal soil coverages
        - Current or optimal visitor experience

The limits of acceptable change are not yet established and should be determined over duration of the planning period. A threshold may be set as the current conditions or some other desired condition. Quality of visitor experience, landscape aesthetics, ecological characteristics, the ability for park visitors to interpret park resources, and purpose of the park may all be factors in establishing thresholds.

Corrective Actions for Achieving Desired Conditions

- To be established during this 10-year planning period
    - May include:
        - Education/Interpretation
        - Construction of visitor access and/or erosion control structures
        - Reduced visitation based on carrying capacities to be established by monitoring data

If thresholds to undesirable erosion or experiential conditions are crossed, the DRP will take corrective actions to restore desirable conditions. Progressive options for achieving or maintaining desired conditions are outlined in this section, however, additional actions may be taken as needed based on the results of erosion monitoring and visitor satisfaction surveys.

Visitor Use Management Limitations

These actions will be taken and followed to ensure that the park does everything that it can for the health of Wakulla Springs and the experience of the visitors that use this resource. In addition to the efforts that the park puts in place, there are additional impacts that are occurring outside of the park boundary that need to be considered and evaluated. The park will continue to cooperate with other agencies, county and city leaders, private owners, and the public to monitor impacts, interpret these impacts, and come up with solutions to protect the springshed recharge areas and combat the impacts to Wakulla Springs.

Optimum Boundary

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

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

Florida Forever Projects

The Wakulla Springs Protection Zone Florida Forever Project will protect the spring by protecting land above the conduits that feed it, connect the state park with the Apalachicola National Forest, and provide public areas for camping, hiking, and hunting. East of Tallahassee the Upper Lake Lafayette Aquifer Protection addition to the Wakulla Springs Protection Zone will protect the sinkholes and seepages that also connect to Wakulla Springs and create a 373-acre passive recreation area. Most of the project is in intensive silviculture or pasture. The Upper Lake Lafayette portion of the project is mixed pines and hardwoods on hills sloping down to Lake Lafayette. Remnant natural areas include floodplain swamps and forests, and unique features like sinkholes, aquatic caves, and spring-run streams. The project is important to protecting the subterranean headwaters of Wakulla Springs, the state's largest first magnitude spring and source of the Wakulla River, which is one of the largest and deepest artesian springs in the world and an Outstanding Florida Water. At least five rare animals, including three crustaceans in the aquatic caves, have been found here. Eight archaeological sites, including four mounds, are known from the site, and more can be expected. There is also a historic cemetery in the project. The sinkholes in the project are vulnerable to trash dumping and development, which may degrade the quality of water flowing into Wakulla Spring; endangerment of the area is moderate.

Identified Optimum Boundary Parcels

Several parcels are highlighted throughout the Wakulla region for acquisition. The primary objective is to protect the quality and flow of Wakulla Springs but also to protect the many springs and sinkholes in the region.

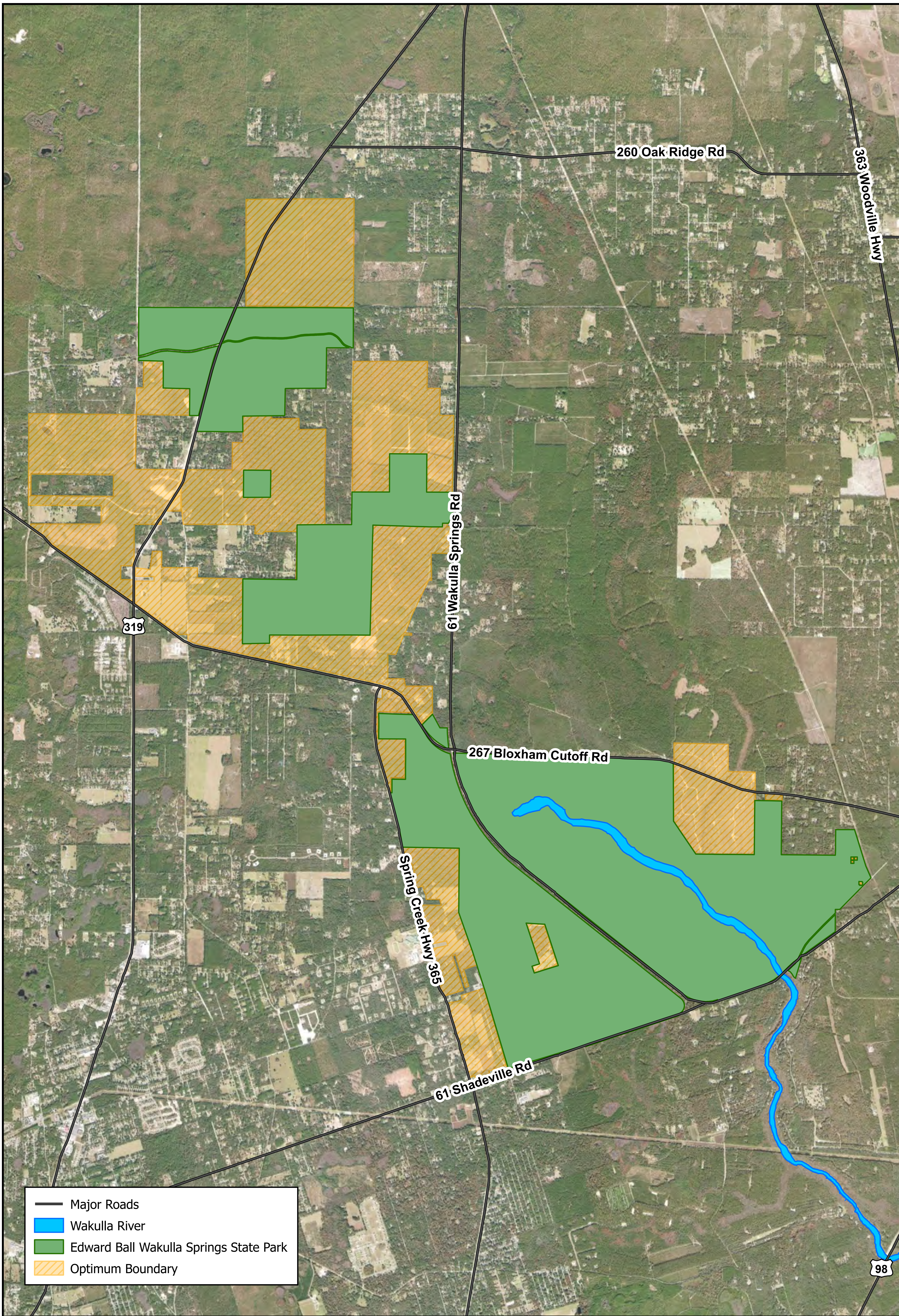
The optimum boundary for the park consists of 178 parcels that total approximately 4,903 acres. The properties are divided between numerous lands both large and small. For this description, the parcels have been divided into four geographic groups. The groups are Northwest, Northeast, Central, and South.

The Northwest Group consist of 11 parcels that total approximately 629 acres. None of the properties lie within the Wakulla Springs Protection Zone Florida Forever Project. These areas would help protect the springs recharge area, protect sinkholes and springs, and could provide a suitable site for future park activities.

The Northeast Group consist of 41 parcels that total approximately 1,773 acres. The majority of these (1,667 acres) are within the Wakulla Springs Protection Zone Florida Forever Project. These properties contain natural communities that would improve the buffer and the habitat protection potential of the park. They would also connect areas of the park that are currently disconnected, expand recreational opportunities, and protect the quality and flow of Wakulla Springs.

The Central Group consist of 59 parcels that total approximately 1,387 acres. Of this area 822 acres lie within the Wakulla Springs Protection Zone Florida Forever Project. These properties would connect the newly acquired Ferrell tract to the main park property, reduce inholdings and unify the park boundary, ensure additional protection of the springshed of Wakulla Springs, and would provide road access to Turner Sink via Bloxham Cutoff Road.

The South Group consist of 67 parcels that total approximately 1,114 acres. Of these, 886 acres are within the Wakulla Springs Protection Zone Florida Forever Project. These properties would provide further protection of the Wakulla springshed, protect additional habitat for imperiled species, reduce inholdings, further protect Cherokee Sinks, and would facilitate additional fire and invasive management practices.



EDWARD BALL WAKULLA SPRINGS STATE PARK
Optimum Boundary

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IMPLEMENTATION COMPONENT

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

MANAGEMENT PROGRESS

Since the approval of the last management plan for Edward Ball Wakulla Springs State Park in 2007, significant work has been accomplished and progress made towards meeting the DRP's management objectives for the park. These accomplishments fall within three of the five general categories that encompass the mission of the park and the DRP.

Acquisition

- Two parcels of land were acquired in 2018 as reimbursement for land lost to the widening of US Highway 319. These provide direct access to the Upper River Sink (WK-VV) and Turner Sink Tracts (WK-UU) of the park. Up to now, park staff must cross private land to access them.
- The Ferrell Tract was acquired in 2019, protecting 717 acres of sensitive habitat and recharge area for Wakulla Spring and providing additional access to Turner Sink.

Park Administration and Operations

- Created administrative cadre including Assistant Park Manager, Administrative Assistant, Park Biologist and three Park Services Specialist to collaborate on operational priorities.
- Provided flexibility in scheduling and staffing aligned with seasonal needs to provide resources consistent with visitor services pressures.
- Created an ADA transition plan and continue to stay focused on improving accessibility for all.
- Improved bunk house accommodations in Administrative office for visiting researchers and volunteers contributing to an understanding of park resources and/or assisting with pressing resource management needs.

<u>Natural Resources</u>

- Achieved good suppression of invasive weed *Hydrilla verticillata* in the river.
- Worked with City of Tallahassee and other organizations to achieve nitrate reduction in Wakulla Spring.
- Eradicated a five-acre infestation of bamboo.
- Thinned the northwest quadrant of the River Sinks Tract as a first step in restoration.

- Clearcut and planted eleven acres in resource management zone WK-EE to restore it.
- Transplanted 1,694 American eelgrass (*Vallisneria americana*) plants in the spring run to restore native submerged aquatic vegetation.
- Created and maintain photo documentation to track and count the manatees visiting the park. Manatees have been overwintering at Wakulla Spring since the winter of 2007-2008, and are seen more frequently year-round than in the past.
- Wakulla Springs Cave System expanded by 7.5 miles by Woodville Karst Plain Project divers.
- Cooperate with the USGS Sirenia Project, FFWCC, and USFWS to study and monitor the manatee population in the park.
- Restoration Project began at River Sinks in 2020.

Cultural Resources

- In 2007, park ranger Jason Vickery reported what is now recognized as the Vickery Mastodon. That discovery lead to an investigation lead by the Bureau of Archaeological Research (BAR) with the assistance of FGS and Joe Donoghue, a geologist then at FSU. The Vickery mastodon is encompassed within the underwater site 8WA24.
- In 2008, the BAR investigated the Wakulla Lodge site (8WA329). Under a National Geographic grant they successfully dated the site using Optically Stimulated Luminescence (OSL) dating. The age of the early Paleoindian component identified by the late Calvin Jones in 1996 is a minimum of 13,500 years old with a median age of 14,600.
- The Friends of Wakulla Springs, Aucilla Research Institute, and the Panhandle Archaeological Society at Tallahassee (PAST) have cooperated to extensively study the park. Since 2015, they have completed grid testing on just over 50 acres of park property, conducting 857 grid tests. This effort has allowed them to identify actual site boundaries of recorded sites and revise them, as well as to identify a few new sites. Study continues as funding allows. Most recently, ARI was awarded a grant to investigate and remediate areas where Hurricane Michael upturned trees in known cultural sites.
- In 2016, park biologist Patty Wilbur reported a new mastodon in the river, which is also being added to the Florida Master Site File.
- Level I Archaeological Study completed at River Sinks.

Recreation and Visitor Services

- Expansion of Interpretive programming, adding numerous new programs including: campfire cooking, ranger-led bike tours, plant identification walks, and birding tours, restoring glass bottom boat tours as conditions warrant and utilizing the glass bottom boat for new types of tours.
- Coordinated with Wakulla Lodge to provide enhanced programs such as the Creature of the Black Lagoon 3-D movie night, evening music festivals, dinner cruises, and more.
- In 2020, Friends of Wakulla Springs contracted HALFF to conduct a review of existing and future regional multi-use trail systems, evaluate the existing trails and pathways within the core area of the Edward Ball Wakulla Springs State Park (the Park) and review potential alternatives for a primary access way for visitors traveling on bicycles to enter the park. This resulted in a plan for connection with the Tallahassee-St. Marks trail and improved traffic conditions to allow for safe pedestrian and bicycle use on the paved park drive.

Park Facilities

- Created a wheelchair platform on the Big D riverboat so that half of the riverboats are ADA accessible. This ensures that one is readily available for visitors who need it.
- Refurbished all four riverboats, and the Henry glass bottom boat. Three riverboats were converted to run with electric motors in addition to a gas motor; two of these are solar-powered. The Limpkin engine was replaced with a new 4-cycle outboard motor. The electric motor on the Henry was replaced. All riverboat bench seats have been replaced. This project ran from 2012-2015. The refurbishment process has again begun in 2022.
- Installed prop guards on all boats to prevent harm to manatees.
- Restored all the historic paver walkways around the lodge to improve safety and appearance while bringing walkway into ADA compliance.
- Constructed a new pedestrian bridge over the Sally Ward Spring Run. The hiking trail was rerouted to take advantage of new access to this scenic area of the park.
- Improved and re-opened a loop hiking trail.
- Worked with divers to build and maintain steps at Emerald Sink and an access platform at Cheryl Sink.
- Dredged sand from behind the boat dock to improve navigation and replenish the beach, a cyclical need.
- Replaced Lodge generator in 2020.
- Replaced water supply lines in Lodge in 2021.
- Ranger Station demolished and rebuilt 2021-2022.
- Reworked Waterfront Building to serve manned or unmanned as a Visitor Center.

MANAGEMENT PLAN IMPLEMENTATION

This management plan is written for a timeframe of ten years, as required by Section 253.034 Florida Statutes. The Ten-Year Implementation Schedule and Cost Estimates (**Table 6**) summarizes the management goals, objectives and actions that are recommended for implementation over this period, and beyond. Measures are identified for assessing progress toward completing each objective and action. A time frame for completing each objective and action is provided. Preliminary cost estimates for each action are provided and the estimated total costs to complete each objective are computed. Finally, all costs are consolidated under the following five standard land management categories: Resource Management, Administration and Support, Capital Improvements, Recreation Visitor Services and Law Enforcement.

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

Statewide priorities for all aspects of land management are evaluated each year as part of the process for developing the DRP's annual legislative budget requests. When preparing these annual requests, the DRP considers the needs and priorities of the entire state park system and the projected availability of funding from all sources during the upcoming fiscal year. In addition to annual legislative appropriations, the DRP pursues supplemental sources of funds and staff resources wherever possible, including grants, volunteers and partnerships with other entities. The DRP's ability to accomplish the specific actions identified in the plan will be determined largely by the availability of funds and staff for these purposes, which may vary from year to year. Consequently, the target schedules and estimated costs identified in **Table 6** may need to be adjusted during the ten-year management planning cycle.

Table 6
Edward Ball Wakulla Springs State Park
Ten-Year Implementation Schedule and Cost Estimates

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

Goal I: Provide administrative support for all park functions.		**Measure**	**Planning Period**	**Estimated Manpower and Expense Cost* (10-years)**
Objective A	**Continue day-to-day administrative support at current levels.**	Administrative support ongoing	C	**$555,157**
Objective B	**Expand administrative support as new lands are acquired, new facilities are developed, or as other needs arise.**	Administrative support expanded	C	**$885,054**
Goal II: Protect water quality and quantity in the park, restore hydrology to the extent feasible, and maintain the restored condition.		**Measure**	**Planning Period**	**Estimated Manpower and Expense Cost* (10-years)**
Objective A	**Conduct/obtain an assessment of the park's hydrological needs.**	Assessment conducted	ST or LT	**$5,000**
Objective B	**Restore and protect natural hydrological conditions and function within all 813 acres of the park's wetland natural communities.**	# Acres restored or with restoration underway	UFN	**$225,506**
Objective C	**Monitor water quality and quantity.**	Samples collected	LT	**$6,200**
Goal III: Restore and maintain the natural communities/habitats of the park.		**Measure**	**Planning Period**	**Estimated Manpower and Expense Cost* (10-years)**
Objective A	**Within 10 years have 3,500 acres of the park maintained within optimal fire return interval.**	# Acres within fire return interval target	LT	**$130,000**
Action 1	Develop/update annual burn plan.	Plan updated	C	$5,000
Action 2	Manage fire dependent communities for ecosystem function, structure and processes by burning between 875 - 1,920 acres annually, as identified by the annual burn plan.	Average # acres burned annually	C	$125,000
Objective B	**Conduct habitat/natural community restoration activities on 890 acres of upland pine natural community.**	# Acres restored or with restoration underway	ST or LT	**$59,000**

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

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

Action 1	Develop/update site specific restoration plan for portions of the River Sinks property. This plan will include measures and timeframes for timbering roughly 350 acres of off-site loblolly pine, groundcover reintroduction and replanting with longleaf pine seedlings. Project shall be monitored via photo points	Plan developed/updated	ST	$2,000
Action 2	Implement the approved restoration plan.	# Acres with restoration underway	LT	$50,000
Action 3	Conduct timber harvest in stages for the purposes of the restoration project on 350 acres. *This will be a net revenue producing activity. Estimated expenditures are listed to the right.*	# Acres improved or with improvements underway	LT	$7,000
Objective C	**Conduct habitat/natural community improvement activities on 250 acres of upland pine or upland mixed woodland natural communities.**	# Acres improved or with improvements underway	ST or LT	**$16,000**
Goal IV: Maintain, improve or restore imperiled species populations and habitats in the park.		**Measure**	**Planning Period**	**Estimated Manpower and Expense Cost* (10-years)**
Objective A	**Update baseline imperiled species occurrence inventory lists for plants and animals, as needed.**	List updated	C	**$2,200**
Objective B	**Monitor and document 3 selected imperiled animal species in the park.**	# Species monitored	C	**$16,500**
Objective C	**Monitor and document 4 selected imperiled plant species in the park.**	# Species monitored	C	**$1,100**
Goal V: Remove invasive plants and animals from the park and conduct needed maintenance-control.		**Measure**	**Planning Period**	**Estimated Manpower and Expense Cost* (10-years)**
Objective A	**Annually treat 5 acres of invasive plant species in the park.**	# Acres treated	C	**$45,100**
Action 1	Annually develop/update invasive plant management work plan.	Plan developed/updated	C	$5,100
Action 2	Implement annual work plan by treating a minimum of 5 acres of invasive plant infestation annually, with continuing maintenance and follow-up treatments as needed.	Plan implemented	C	$40,000
Objective B	**Implement control measures on 1 invasive and nuisance animal species in the park.**	# Species for which control measures	C	**$4,000**

* 2015 Dollars
ST = actions within 2 years
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UFN = currently unfunded need

Table 6
Edward Ball Wakulla Springs State Park
Ten-Year Implementation Schedule and Cost Estimates
Sheet 3 of 5

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

Goal VI: Protect, preserve and maintain the cultural resources of the park.		Measure	Planning Period	Estimated Manpower and Expense Cost* (10-years)
Objective A	**Assess and evaluate 89 of 89 recorded cultural resources in the park.**	Documentation complete	LT	**$133,500**
Objective B	**Compile reliable documentation for all recorded historic and archaeological sites.**	Documentation complete	LT	**$154,000**
Objective C	**Maintain 89 of 89 recorded cultural resources into good condition.**	# Sites in good condition	LT	**$7,792**
Action 1	Continue regular monitoring programs for 89 cultural sites.	# Sites monitored	C	$6,992
Action 2	Maintain protocols for protection of each cultural resource, including measures such as vegetation control and routine site visits to identify and deter negative impacts.	Programs implemented	C	$800
Goal VII: Provide public access and recreational opportunities in the park.		**Measure**	**Planning Period**	**Estimated Manpower and Expense Cost* (10-years)**
Objective A	**Maintain the park's current recreational use.**	# Recreation/visitor	C	**$2,313,155**
Objective B	**Expand the park's recreational use.**	# Recreation/visitor	ST or LT	**$3,687,725**
Objective C	**Continue to provide the current repertoire of 20 interpretive, educational and recreational programs on a regular basis.**	# Interpretive/education programs	C	**$100,000**
Objective D	**Develop 5 new interpretive, educational and recreational programs.**	# Interpretive/education programs	ST or LT	**$35,000**
Goal VIII: Develop and maintain the capital facilities and infrastructure necessary to meet the goals and objectives of this management plan.		**Measure**	**Planning Period**	**Estimated Manpower and Expense Cost* (10-years)**
Objective A	**Maintain all public and support facilities in the park.**	Facilities maintained	C	**$5,273,992**
Objective B	**Continue to implement the park's transition plan to ensure facilities are accessible in accordance with the American with Disabilities Act of 1990.**	Plan implemented	ST or LT	**$170,000**
Objective C	**Improve visitor use in 9 use areas.**	# Facilities/Miles of Trail/Miles of Road	LT	**$2,570,242**

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

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

Objective D	**Construct 2 new use areas.**	# Facilities/Miles of Trail/Miles of Road	LT	**$54,550**
Objective E	**Expand maintenance activities as existing facilities are improved and new facilities are developed.**	Facilities maintained	C	**$8,408,014**

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

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

Summary of Estimated Costs

Management Categories		Total Estimated Manpower and Expense Cost* (10-years)
Resource Management		$805,898
Administration and Support		$1,440,211
Capital Improvements		$11,032,806
Recreation Visitor Services		$6,000,880
Law Enforcement Activities	Note: Law enforcement activities in Florida State Parks are conducted by the FWC Division of Law Enforcement and by local law enforcement agencies.	

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

Addendum 1—Acquisition History

Edward Ball Wakulla Springs State Park Acquisition History

Land Acquisition History Report					
Park Name	Edward Ball Wakulla Springs State Park				
County	Wakulla				
Trustees Lease Number	Lease No. 3463				
Current Park Acreage	6,786.41				
Management Lease & Amendments					
Lease Number	**Date Leased or Amended**	**Initial Lessor**	**Initial Lessee**	**Current Term**	**Expiration Date**
Initial Agreement	10/1/1986	The Board of Trustees of the Internal Improvement Trust Fund of the State of Florida	Department of Natural Resources, Division of Recreation and Parks	50 years	10/20/2036
Parent Lease No. 3463	10/20/1986	The Board of Trustees of the Internal Improvement Trust Fund of the State of Florida	Department of Natural Resources, Division of Recreation and Parks	50 years	10/20/2036
Lease No. 3463 Amendment 1	2/17/1988	The Board of Trustees of the Internal Improvement Trust Fund of the State of Florida	Florida Department of Environmental Protection, Division of Recreation and Parks	50 years	10/20/2036
Lease No. 3463 Amendment 2	8/8/2000	The Board of Trustees of the Internal Improvement Trust Fund of the State of Florida	Florida Department of Environmental Protection, Division of Recreation and Parks	50 years	10/20/2036
Lease No. 3463 Amendment 3	5/23/2000	The Board of Trustees of the Internal Improvement Trust Fund of the State of Florida	Florida Department of Environmental Protection, Division of Recreation and Parks	50 years	10/20/2036
Lease No. 3463 Amendment 4	4/28/2003	The Board of Trustees of the Internal Improvement Trust Fund of the State of Florida	Florida Department of Environmental Protection, Division of Recreation and Parks	50 years	10/20/2036
Lease No. 3463 Amendment 5	3/3/2004	The Board of Trustees of the Internal Improvement Trust Fund of the State of Florida	Florida Department of Environmental Protection, Division of Recreation and Parks	50 years	10/20/2036
Lease No. 3463 Corrected Amendment 5	2/28/2005	The Board of Trustees of the Internal Improvement Trust Fund of the State of Florida	Florida Department of Environmental Protection, Division of Recreation and Parks	50 years	10/20/2036
Lease No. 3463 Amendment 6	7/18/2019	The Board of Trustees of the Internal Improvement Trust Fund of the State of Florida	Florida Department of Environmental Protection, Division of Recreation and Parks	50 years	10/20/2036
Lease No. 3463 Amendment 7	5/4/2021	The Board of Trustees of the Internal Improvement Trust Fund of the State of Florida	Florida Department of Environmental Protection, Division of Recreation and Parks	50 years	10/20/2036
Acquisition History					
Parcel DM-ID	**Date Acquired and Funding Source**	**Grantor**	**Grantee**	**Acreage**	**Instrument Type**
DM-ID 4247	9/17/1986 CARL	The Nemours Foundation	Trustees	2,857.60	Warranty Deed
DM-ID 338940	7/9/1999 P2000	Kenneth Kirton	Trustees	23.43	Eminent Domain
DM-ID 331244	12/28/1999 CARL, P2000	The Nemours Foundation	Trustees	1,840.73	Special Warranty Deed
DM-ID 327219	12/26/2002 Florida Forever	The St. Joe Company	Trustees	1,211.96	Warranty Deed
DM-ID 331245	12/2/2003 Florida Forever	The St. Joe Company	Trustees	103.12	Warranty Deed
DM-ID 379906	12/13/2018 Donation	Florida Department of Transportation	Trustees	32.93	Quit Claim Deed
DM-ID 381369	3/27/2020 Florida Forever	John Ferrell Jr.	Trustees	716.64	Warranty Deed

Addendum 2—Advisory Group Members and Report

Ralph Thomas
Commissioner
Wakulla County BOCC

Wayne Cooper
Chairman
Wakulla Soil and Water

Amy Conyers
Park Manager
Wakulla Springs State Park

Shelly Wayte
Forester
FFS

Jon Creamer
Regional Director
FFWCC

Fred Rondeau
Regional Commander
FFWCC Law Enforcement

Emily Evans
Biologist
FFWCC Biology

George Roberts
Chair
NWFWMD

Jason O'Donoughue
Archaeologist
DHR

Harley Means
State Geologist
FGS

Tommy Welch
Adjacent Landowner

Rich Abrams
Adjacent Landowner

Bucky Ferrell
Adjacent Landowner

Blake Burns
Adjacent Landowner

Grant Gelhardt
Chair
Sierra Club

Kathleen Carr
President
Apalachee Audubon

David Roddenberry
President
Florida Native Plant

Robert Knight
Executive Director
Florida Springs Institute

Bob Deyle
Vice Chair
Wakulla Springs Alliance

Casey McKinlay
Director
Woodville Karst Plain Project

Elwood McElhaney
Chair
Florida Trail Association

Bryan Roddenberry
Director
Wakulla County Recreation

Thomas Herndon
Outreach Coordinator
Wakulla County TDC

Julie Harrington
President
Friends of Wakulla Springs

To Whom it May Concern
Manager
Lodge at Wakulla Springs

Edward Ball Wakulla Springs State Park
Advisory Group Members and Report

The Advisory Group meeting to review the proposed unit management plans (UMP) for Edward Ball Wakulla Springs State Park was held at the Wakulla Springs Lodge on Tuesday July 19, 2022, at 9:00 AM.

Shelly Wayte and Cat Ingram represented Florida Forest Service, Nicholas Yarbrough attended with Jason O'Donoughue for DHR, Joyce Papp, Linda Vause, and Sue Noyes attended to represent Southern Trailriders Association, and Robert Thompson and Dale Allen attended as members of the public. Appointed members unable to attend included Ralph Thomas, Wayne Cooper, Jason Love, Jon Creamer, Fred Rondeau, Emily Evans, George Roberts, Tommy Welch, Rich Abrams, Grant Gelhardt, Kathleen Carr, David Roddenberry, Robert Knight, Bob Deyle, Casey McKinlay, Elwood McElhaney, Bryan Roddenberry, Thomas Herndon, and a representative from the Lodge at Wakulla Springs.

Attending Division of Recreation and Parks (DRP) staff members from the park, district office, and the Office of Park Planning were Amy Conyers, John Melton, Patricia Wilbur, Steve Cutshaw, India Hodges, Tannyr Bush, Brian Fugate, Daniel Alsentzer, James Gaddis, and Joel Allbritton.

Mr. Allbritton gave a presentation covering the management plan process, intended ARC date, a broad overview of the park, natural and cultural resources, and the conceptual land use plan. Among various objectives, Mr. Allbritton described the visitor use management strategies for the park's day use areas. Mr. Allbritton mention two items proposed in the plan that are not contingent upon ARC approval and are currently in initial stages of implementation: a new ranger station and new traffic circulation. Mr. Allbritton also gave an in-depth overview of the conceptual land use plan. After the presentation was over, Mr. Allbritton began taking comments and questions from the advisory group members as they were seated around the tables.

Summary of Advisory Group Comments

Southern Trailriders Association- encourages improvements at the Rock Road trailhead. They also commented on the abundance of ticks. Mr. Allbritton added that connections will be made to the Wakulla State Forest for extended trail mileage. Joyce Papp commented that corralling and surfacing improvements are needed. Mr. Allbriton and Amy Conyers explained the conditionals that would be needed with DOT.

Tannyr Bush inquired for clarification on the location and details of the cypress dome proposal. Mrs. Conyers referenced the site and details on the conceptual land use map.

Bucky Ferrell inquired about plans for the Ferrell Tract and Mr. Allbritton elaborated on the proposals for the Ferrell Tract and the interpretive trail concepts. The group discussed pervious parking and materials that would be the best options for users.

Cal Jamison echoed comments of Mr. Ferrell. Mr. Jamison stated that trail routes should minimize adverse impacts to the sensitive flora and karst features of the tract.

Bob Thompson, retired park ranger, referenced his collaboration with Bob Deyle and their extensive written comments about hydrology and natural communities that they had provided to park staff in advance of the meeting. Mr. Allbritton reaffirmed that edits will be made according to appropriate advisory group member and good public comments.

Amy Conyers revisited the topic of trailhead surfacing. The preference as expressed by Joyce Papp is for grass and soil, rather than gravel, which is harsh on horse hooves.

Jason O'Donoughue affirmed that the cultural resources table is complete and accurate, matching the FMSF. Additionally Mr. O'Donoughue stated that the goals and objectives are appropriate for the type and scope of resources in the park. Mr. O'Donoughue added that annual monitoring of all the many sites recorded in this park is commendable. Mrs. Conyers noted that this cultural resource monitoring is supported largely by visiting archaeologists. Mr. O'Donoughue advised that he would provide a follow up email about outdated reference document and a few significance discrepancies.

Shelly Wayte echoed the remarkable inventory and monitoring scope detailed in the cultural resources section of the plan, as compared to the Wakulla State Forest. Mrs. Wayte commented on significance of bedding on the hydrological disruptions at the park. Mrs. Wayte commented on the excessive fire return interval and that reducing it would limit the regrowth of hardwoods. Patty Wilbur and other district biologists discussed this further, agreeing that a 3-year interval may be favorable. Harley Means inquired when the burns take place at the park. Mrs. Conyers and Mrs. Wilbur replied that burns are often opportunistic given the many conditional constraints. Mrs. Wayte elaborated on the seeding patterns of longleaf pine and the optimal season being approximately April/May.

Dale Allen inquired about statute vs. code basis for management plans and how the 10-year intervals are timed. Mr. Allen inquired about funding implications behind urgent plans. Brian Fugate explained funding and that proposals are not directly linked to funding but may be selected for funding and implementation once the plan is approved. Mr. Allen commented about US98 bicycle riding hazards and disconnect or poor/slow timing frustration. Mr. Allen noted that the route study document from HALFF was not included in this plan. Mr. Allen state that he and the parks Friends group are very interested in the interpretive center. Mr. Allen noted that this park has substantial needs and strongly encourages cooperation between park and the CSO. Mr. Allen stated that overall the plan contains a great inventory of resources and needs but does not clearly describe intentions or mechanisms for implementation. In response to Mr. Allen's comments, Mrs. Conyers elaborated on the results of the current traffic flow. She said that it has been successful so far as a temporary need during ranger station construction. It is likely to function well in perpetuity as planned in the UMP.

Julie Harrington affirmed Mr. Allen's comments on the plan. Mrs. Harrington noted that the plan is well written and thorough but the linear process of what will be done, when and how is not clear. Mrs. Harrington suggested since the replacement, repair and maintenance of the boats is included throughout the UMP, to move that line item to the list of proposed developments/improvements short list (i.e., with the other 22 or so other listed improvements on the cover/summary page).

Harley Means commented that Wakulla Springs is one of the most significant and well-known springs of Florida and its interpretation/education is vital. Mr. Means encourages the plan to assess the effects of sea level rise on Wakulla Springs because it will alter the hydrology of this park. Mr. Means mentioned that the paleontological resources of this park are remarkable and call for protection and interpretation. Mr. Means detailed that FGS was the first to conduct research diving in the spring. Mr. Means discussed that the mastodon fossils recovered from the spring in the 1930's by the FGS that are now on display in the Museum of Florida History could eventually, with DOS concurrence, be put on display in an interpretive center onsite in the park.

Nicholson Scarborough noted DHR's willingness to support developed interpretive programming. Mr. Scarborough commented on various topics about the significance of park resources.

Cat Ingram discussed the Forest Legacy Program and the Ferrell Tract. Mrs. Ingram expressed support of the plan and that it should propose for the interpretation of karst features. Mrs. Ingram detailed how FFS is adding parcels to Wakulla State Forest in the area.

Daniel Alsentzer read Casey McKinley's comments (that were provided ahead of the meeting) for the group's consideration.

Dale Allen reaffirmed that certain concepts that have been broadly considered in years past are not included in this UMP.

Mr. Allbritton described the next steps for the planning process and concluded the meeting.

Written Advisory Group Comments

Robert Deyle, Harley Means, Cat Ingram, and Casey McKinlay provided written comments on the management plan.

Staff Recommendations

- Revise the plan as needed based off of the comments provided at the meeting and via email.

Notes on Composition of the Advisory Group

Florida Statutes Chapter 259.032 Paragraph 10(b) establishes a requirement that all state land management plans for properties greater than 160 acres will be reviewed by an advisory group:
"Individual management plans required by s. 253.034(5), for parcels over 160 acres, shall be developed with input from an advisory group. Members of this advisory group shall include, at a minimum, representatives of the lead land managing agency, co-managing entities, local private property owners, the appropriate soil and water conservation district, a local conservation organization, and a local elected official."
Advisory groups that are composed in compliance with these requirements complete the review of State Park management plans. Additional members may be appointed to the groups, such as a representative of the park's Citizen Support Organization (if one exists), representatives of the recreational activities that exist in or are planned for the park, or representatives of any agency with an ownership interest in the property. Special issues or conditions that require a broader representation for adequate review of

the management plan may require the appointment of additional members. The DRP's intent in making these appointments is to create a group that represents a balanced cross-section of the park's stakeholders. Decisions on appointments are made on a case-by-case basis by Division of Recreation and Parks staff.

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Addendum 4—Soil Descriptions

4 - Arents, nearly level - Arents consist of nearly level, heterogeneous soil material. This material has been excavated, reworked, and reshaped by earthmoving equipment. Arents are near urban centers, phosphate-mining operations, major highways and sanitary landfills.

Arents do not have an orderly sequence of soil layers. This map unit is not associated with or confined to a particular kind of soil. Arents are variable and contain discontinuous lenses, pockets, or streaks of black, gray, grayish brown, brown, or yellowish brown sandy or loamy fill material. The thickness of the fill material ranges from 30 to 80 inches or more.

Included in this map unit are areas used as sanitary landfills. Refuse consists of concrete, glass, metal, plastic, wood, and other materials and ranges in thickness from 2 to 10 feet. It is generally stratified with layers of soil material that were used as daily cover. These areas are identified on soil maps by the words “sanitary landfill.” Also included are small areas of soil that has slope that ranges from 0 to 5 percent.

Most soil properties are variable. The depth to the seasonal high water table varies with the amount of fill material and artificial drainage. Permeability and the available water capacity vary widely from one area to another.

5 - Basinger, Holopaw and Samsula soils, depressional - The soils in this map unit are nearly level and very poorly drained. They are in swamps and depressions on the flatwoods. Generally, Basinger soil is along the exterior of swamps or in shallow depressions. Holopaw and Samsula soils are in the interior areas of the swamps or in deeper depressions. Undrained areas are frequently ponded for very long periods. The slope is 0 to percent.

In 90 percent of the areas of this map unit, Basinger, Holopaw and Samsula soils, depressional, and similar soils make up 78 to 96 percent of the mapped areas, and dissimilar soils make up about 4 to 22 percent of the mapped areas. Generally, the mapped areas consist of about 35 percent Basinger soil and similar soils, 31 percent Holopaw soil and similar soils, and 18 percent Samsula soil and similar soils. The individual soils are generally in large enough areas to be mapped may be suited to the production of cypress and hardwoods through natural regeneration.

If these soils are used for building site development or for onsite waste disposal, ponding is the main limitation. Drainage is needed to lower the water table, and fill material is needed in most areas. While surface drainage helps to control ponding, the seasonal high water table is continuing limitation.

The soils in this map unit are in capability subclass VIIw. Basinger and Holopaw soils are in woodland group 2W. Samsula soil has not been assigned to a woodland group. This soils in this map unit are in the Freshwater Marshes and Ponds range.

7 - Candler fine sand, 0 to 5 percent slopes - This soil is nearly level to gently sloping and excessively drained. It is on the uplands.

In 95 percent of the areas mapped as Candler fine sand, 0 to 5 percent slopes, the Candler soil and similar soils make up 82 to 96 percent of the mapped areas. Dissimilar soils make up 4 to 18 percent of the mapped areas.

Typically, this soil has a surface layer of dark gray fine sand about 6 inches thick. The upper part of the subsurface layer, to a depth of about 35 inches, is light yellowish brown fine sand. The middle part, to a depth of about 72 inches, is very pale brown fine sand. The lower part to a depth of about 80 inches is a mixture of very pale brown fine sand and strong brown loamy sand lamellae that are about one-sixteenth to one-quarter of an inch thick and 2 to 6 inches long. In some places, similar soils included in the mapped areas do not have lamellae in the lower part of the subsurface layer. Other similar soils, in some areas, have a subsurface layer that consists of 5 to 10 percent silt and clay; and some similar soils also included in mapping, in some of the lower parts of the landscape, are well drained.

Dissimilar soils included in mapping are Kendrick and Millhopper soils in small areas. Kendrick soils are well drained, and Millhopper soils are moderately well drained. Also included are areas of unnamed soils on upper side slopes that are well drained and have a sandy clay loam subsoil within 40 to 80 inches of the surface.

A seasonal high water table is at a depth of more than 80 inches. Permeability is rapid. The available water capacity is very low.

The natural vegetation consists of bluejack oak, Chapman oak, scrub live oak, and turkey oak. The understory includes indiangrass, hairy panicum, panicum, and running oak. In most areas, this Candler soil is used for citrus crops. In a few areas, it is used for pasture or for homesite or urban development.

12 - Chobee sandy loam, frequently flooded - The soil is nearly level and very poorly drained. It is on bottom lands mainly along the Hillsborough River and Blackwater Creek. This soil is flooded for very long periods following prolonged intense rain. The slope is dominantly less than 1 percent.

In 90 percent of the areas mapped as Chobee sandy loam, frequently flooded, the Chobee soil and similar soils make up 78 to 99 percent of the mapped areas. Dissimilar soils make up 1 to 22 percent of the mapped areas.

Typically, this soil has a surface layer of clack sandy loam about 15 inches thick. The subsoil extends to a depth of about 60 inches. The upper part is very dark gray, mottled sandy clay loam. The lower part is gray mottled sandy clay loam. The substratum to a depth of about 80 inches is light gray, mottled loamy sand. In some areas, similar soils included in mapping have a surface layer of mucky fine sand, fine sand, or loamy fine sand. Other similar soils have a thinner surface layer than Chobee soil, and in places, some similar soils have thin, discontinuous strata of limestone in the underlying material.

Dissimilar soils included in mapping are Felda and Wabasso soils in small areas. These soils are poorly drained.

A seasonal high water table fluctuates from the soil surface to a depth of about 1 inches. Permeability is moderately rapid in the surface layer, slow or very slow in the subsoil, and very slow to moderately rapid in the substratum. The available water capacity is high.

In most areas, this Chobee soil has been left in the natural vegetation. In a few areas, it is used for pasture. The natural vegetation consists of baldcypress, Coastal Plain willow, red maple, cabbage palm, and sweetgum. The understory includes buttonbush, maidencane, sawgrass, smartweed, and sedges.

In its natural state, this soil is generally not suited to cultivated crops. If a water control system, such as dikes, ditches, and pumps, is established and maintained, this soil is suited to cultivated crops, citrus crops, and pasture.

This soil is generally not suited to the production of pine trees because of flooding or extended wetness. It may be suited to the production of cypress and hardwoods through natural regeneration.

If this soil is used for building site development or for onsite waste disposal, flooding is the main hazard. Major flood control structures and extensive local drainage systems are needed to control flooding.

This Chobee soil is in capability subclass Vw, in woodland group 6W, and in the Freshwater marshes and Ponds range site.

15 - Felda fine sand - This soil is nearly level and poorly drained. It is on broad sloughs on the flatwoods. The slope is 0 t 2 percent.

In 95 percent of the areas mapped as Felda fine sand, the Felda soil and similar soils make up 90 to 99 percent of the mapped areas. Dissimilar soils make up 1 to 10 percent of the mapped areas.

Typically, this soil has a surface layer of very dark gray fine sand about 5 inches thick. The upper part of the subsurface layer, to a depth of about 18 inches, is dark gray, mottled fine sand. The lower part, to a depth of about 22 inches, is dark grayish brown, mottled fine sand. The subsoil to a depth of about 45 inches, is light brownish gray, mottled sandy clay loam. The substratum to a depth of about 80 inches is light fray loamy sand that contains many shell fragments. Similar soils included in mapping have a subsoil at a depth of more than 40 inches of the surface.

Dissimilar soils included in mapping are Pinellas and Wabasso soils in small areas. Pinellas soils are calcareous in the upper part of the subsoil. Wabasso soils have a sandy subsoil above a loamy subsoil.

A seasonal high water table fluctuates from the soil surface to a depth of about 10 inches for 2 to 6 months I most years. Permeability is rapid in the surface and subsurface layers and is moderate In the subsoil. The available water capacity is moderate.

In most areas, this Felda soil is used for pasture. In a few areas, it is used for cultivated crops or for homesite or urban development or it has been left idle in natural vegetation. The natural vegetation consists of cabbage palm and slash pine. The understory includes saw palmetto, pineland threeawn, and waxmyrtle.

If a water control system is established and maintained and soil-improving measures applied, this soil is well suited to most cultivated crops. If suitable outlets are available, lateral ditches and tile drains can be used to lower the water table. Returning all crop residue to the soils and using a cropping system that includes grasses, legumes, or a grass-legume mixture help to maintain fertility.

This soil is suited to pasture. Wetness limits the choice of plants that can be grown and restricts grazing during rotation, and timely deferment of grazing help keep the pasture in good condition.

The potential of this soil for the production of slash pines is moderately high. The main management concern for producing and harvesting timber is seedling mortality. Water-tolerant trees should be planted. Planting and harvesting operations should be scheduled during dry periods. Bedding of rows helps to minimize the excessive wetness limitation.

If this soil is used for building site development, the main management concern is excessive wetness. Population growth has resulted in increased construction of houses on this soil. Drainage is needed to lower the high water table, and fill material is needed in most areas. Septic tank absorption fields need to be moved in most areas.

This Felda soil is in capability subclass, IIIw, in woodland group 10W, and in the Slough range site.

21 - Immokalee fine sand - This soil is nearly level and poorly drained. It is on broad plains on the flatwoods. The slope is 0 to 2 percent.

In 80 percent of the areas mapped as Immokalee fine sand, the Immokalee soil and similar soils make up 77 to 99 percent of the mapped areas. Dissimilar soils make up 1 to 23 percent of the mapped areas.

Typically, this soil has a surface layer of very dark gray fine sand about 8 inches thick. The subsurface layer, to a depth of 36 inches, is light gray fine sand. The upper part of the subsoil, to a depth of about 46 inches, is black fine sand. The middle part, to a depth of about 52 inches, is dark reddish brown fine sand. The lower part to a depth of about 80 inches is dark brown fine sand. Similar soils included in mapping have a subsoil that is at a depth of more than 50 inches. Other similar soils, in some areas, have a subsoil within 30 inches of the surface. Also, some included similar soils, in places, have a subsoil that is brown or dark brown.

Dissimilar soils included in mapping are Ona and Wabasso soils in small areas. Ona soils do not have a subsurface layer. Wabasso soils have a sandy subsoil above a loamy subsoil.

In most years, a seasonal high water table fluctuates from the soil surface to a depth of 10 inches for more than 2 months and recedes to a depth of 10 to 40 inches for 8 months or more. Permeability is rapid in the surface and subsurface layers and moderate in the subsoil. The available water capacity is low.

The natural vegetation consists of longleaf pine and slash pine. The understory includes creeping bluestem, chalky bluestem, lopsided indiangrass, saw palmetto, pineland threeawn, and waxmyrtle. In most areas, this Immokalee soil is used for native pasture. In a few areas, it is used for cultivated crops, improved pasture, or citrus crops or for homesite or urban development.

29 - Myakka fine sand - This soil is nearly level and poorly drained. It is on broad plains on the flatwoods. The slope is 0 to 2 percent.

In 95 percent of the areas mapped as Myakka fine sand, the Myakka soil and similar soils make up 84 to 93 percent of the mapped areas. Dissimilar soils make up 7 to 16 percent of the mapped areas.

Typically, this soil has a surface layer of very dark gray fine sand about 5 inches thick. The subsurface layer, to a depth of about 20 inches, is gray fine sand. The upper part of the subsoil, to a depth of about 25 inches, is black fine sand. The middle part, to a depth of 30 inches, is dark reddish brown fine sand. The lower park to a depth of about 38 inches, is brownish yellow fine sand. The upper part of the substratum, to a depth of about 55 inches, is very pale brown sand. The lower part to depth of about 80 inches is dark grayish brown fine sand. Similar soils included in mapping, in some areas, have a surface layer that is more than 8 inches thick. Other similar soils, in some planes, have a subsoil within 20 inches of the surface, and some included similar soils have a subsoil at a depth of more than 30 inches or have a brown or dark brown subsoil, or both.

Dissimilar soils included in mapping are Basinger and Wabasso soils in small areas. Basinger soils are very poorly drained. Wabasso soils have a loamy subsoil below a sandy subsoil.
In most years a seasonal high water table fluctuates from the soil surface to a depth of 10 inches for 1 to 4 months and recedes to a depth of 40 inches during prolonged dry periods. Permeability is rapid in the surface and subsurface layers, moderate or moderately rapid in the subsoil, and rapid in the substratum. The available water capacity is low.

In most areas, this Myakka soil is used for native pasture or cultivated crops. In a few areas, it is used for improved pasture or citrus crops, or it is used for homesite or urban development. The natural vegetation consists of longleaf pine and slash pine. The understory includes gallberry, running oak, saw palmetto, pineland threeawn, and waxmyrtle.

If a water control system is established and maintained and soil-improving measures applied, this soil is suited to most cultivated crops, citrus crops, and pasture. Proper arrangement and bedding of tree rows, lateral ditches or tile drains, and well constructed outlets will help lower the water table. Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or a grass-legume mixture help to maintain fertility. Frequent applications of fertilizer and lime are generally needed to improve soil quality.

If a water control system is established and maintained, this soil is well suited to pasture. Wetness limits the choice of plants that can be frown and restricts grazing during periods of excessive wetness. Proper stocking, pasture rotation, and restricted grazing during wet periods help keep the pasture and the soil in good condition. Fertilizer and lime are needed for optimum growth of grasses and legumes.

The potential of this soil for the production of slash pines is moderate. The main management concerns for producing and harvesting timber are the equipment use limitations and seedling mortality. Equipment use limitations are a concern if the soil is not properly drained. Water-tolerant trees should be planted. Planting and harvesting operations should be scheduled during dry periods. Bedding of rows helps to minimize the excessive wetness limitation.

If this soil is used for building site development, the main management concerns are excessive wetness, possible contamination of the ground water, and instability of cutbanks. Population growth has resulted in increased construction of houses on this soil. Drainage is needed to lower the high water table, and fill material is needed in most areas. Septic tank absorption fields need to be mounded in most areas. If the density of housing is moderate to high, a community sewage system can help to prevent contamination of water supplies by seepage. Cutbanks are not stable and are subject to slumping.

This Myakka soil is in capability subclass IVw, in woodland group 8W, and in the South Florida Flatwoods range site.

53 - Tavares-Millhopper fine sands, 0 to 5 percent slopes - The soils in this map unit are nearly level to gently sloping and moderately well drained. They are in low-lying areas on the uplands and on low ridges on the flatwoods.

In 95 percent of the areas of this map unit, Tavares-Millhopper fine sands, 0 to 5 percent slopes, and similar soils make up 87 to 99 percent of the mapped area, and dissimilar soils make up 1 to 13 percent of the mapped areas. Generally, the mapped areas consist of about 63 percent Tavares soil and similar soils and 26 percent Millhopper soil and similar soils.

Typically, the surface layer of the Tavares soil is dark grayish brown fine sand about 6 inches thick. The upper part of the underlying material, to a depth of about 32 inches, is pale brown fine sand. The middle part, to a depth of about 40 inches, is very pale brown fine sand. The lower part to a depth of about 80 inches is light gray fine sand. Similar soils included in mapping, in some areas, have a brown or dark brown layer in the lower part of the underlying material.

Other similar soils, in some of the lower parts of the landscape, are somewhat poorly drained.

Typically, the surface layer of the Millhopper soil is dark gray fine sand about 4 inches thick. The upper part of the subsurface layer, to a depth of about 9 inches, is brown fine sand. The next layer, to a depth of about 25 inches, is light yellowish brown fine sand. The next layer, to a depth of about 48 inches, is light gray, mottled fine sand. The lower part, to a depth of about 57 inches, is light gray fine sand. The upper part of the subsoil, to a depth of about 62 inches, is very pale brown, mottled sandy clay loam. The lower part to a depth of about 80 inches is gray, mottled sandy clay loam. Similar soils included in mapping, in some areas, have a dark surface layer more than 10 inches thick.

Dissimilar soils which are included in this map unit are Candler, Myakka, and Smyrna soils in small areas. Candler soils are excessively drained. Myakka and Smyrba soils are poorly drained.

Tavares soil has a seasonal high water table at a depth of 40 to 80 inches for more than 6 months, and it recedes to a depth of more than 80 inches during prolonged dry periods. Millhopper soil has a seasonal high water table at a depth of 40 to 60 inches for 1 to 4 months, and it recedes to a depth of 60 to 72 inches for 2 to 4 months. Permeability of Tavares soil is rapid. Permeability of Millhopper soil is rapid in the surface and subsurface layers and moderate in the subsoil. The available water capacity is very low in Tavares soil and low in Millhopper soil.

The natural vegetation consists of bluejack oak, turkey oak, live oak, and longleaf pine. The understory includes creeping bluestem, lopsided indiangrass, panicum, and pineland threeawn. In most areas, the soils in this map unit are used for pastures associated with homesites and urban development. In a few areas, they are used for cultivated crops or citrus crops or are left in natural vegetation.

57 - Wabasso fine sand - This soil is nearly level and poorly rained. It is on plains on the flatwoods. The slope is 0 to 2 percent.

In 95 percent of the areas mapped as Wabasso fine sand, the Wabasso soil and similar soils make up 85 to 99 percent of the mapped areas. Dissimilar soils make up 1 to 15 percent of the mapped areas.

Typically, the soil has a surface layer of very dark gray find sand about 7 inches thick. The subsurface layer, to a depth of about 29 inches, is gray fine sand. The upper part of the subsoil, to a depth of about 32 inches, is black fine sand. The next layer, to a depth of about 38 inches, is dark brown fine sand. The next layer, to a depth of about 46 inches, is light gray sandy clay loam. The lower part, to a depth of about 60 inches, is light greenish gray, mottled sandy clay loam. The substratum to a depth of about 80 inches is gray loamy sand. Similar soils included in mapping, in some areas, have a subsoil at a depth of more than 30 inches. Other similar soils, in some places, have a subsoil at a depth of more than 40 inches, or have a very strong acid subsoil, or have both. Other similar soils, in some areas, have subsoil that is brown or dark yellowish brown; and in some places, the similar soils have thin discontinuous strata of limestone fragments in the underlying material.

Dissimilar soils included in mapping are Myakka and Pinellas soils in small areas. Myakka soils do not have a loamy subsoil below the sandy subsoil. Pinellas soils have a calcareous layer above the subsoil.

In most years, a seasonal high water table fluctuates from the soil surface to a depth of 10 inches for 2 months and recedes to a depth of 40 inches during prolonged dry periods. Permeability is rapid in the surface and subsurface layers. It Is moderate in the upper part of the subsoil and slow in the lower parts, and it is rapid in the substratum. The available water capacity is low or moderate.

In most areas, this Wabasso soil is used as native pasture. In a few areas, it is used for cultivated crops, improved pasture, citrus corps, or homesite or urban development. The natural vegetation consists of longleaf pine and slash pine. The understory includes lopsided indiangrass, gallberry, saw palmetto, pineland threeawn, and waxmyrtle.

If a water control system is established and maintained and soil-improving measures applied, this soil is well suited to most cultivated crops and pasture. If drained, this soil is moderately suited to citrus crops in areas, that are relatively free of freezing temperatures. Proper arrangement and bedding of tree rows, lateral ditches or tile drains, and well constructed outlets will remove excess surface water and will help lower the water table. Droughtiness, a result of the low to moderate available water capacity, is a management concern, especially during extended dry periods. This soil is suited to most irrigation systems. Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or a grass-legume mixture help to maintain fertility. Frequent applications of fertilizer and lime are generally needed to improve crop production.

If a water control system is established and maintained, this soil is well suited to pasture. Wetness limits the choice of plants that can be grown and restricts grazing during periods of excessive wetness. Proper stocking, pasture rotation, and restricted grazing during wet periods help to keep the pasture and the soil in good condition. Fertilizer and lime are needed for optimum growth of grasses and legumes.

The potential of this soil for the production of slash pines is moderately high. Equipment use limitations and seedling mortality are the main limitations. Equipment use limitation is a concern if the soil is not properly drained. Water-tolerant trees should be planted. Planting and harvesting operations should be scheduled during dry periods. Bedding or rows helps to minimize the excessive wetness limitations.

If this soil is used for building site development, the main management concerns are excessive wetness and slow permeability of the lower subsoil. Population growth has resulted in increased construction of houses on this soil. Drainage is needed to lower the high water table, and fill material is needed in most areas. The slow permeability of lower subsoil and the high water table increase the possibility that the septic tank absorption fields will not function properly. The slow permeability limitation can be minimized by increasing the size of the absorption field.

This Wabasso soil is in capability subclass IIIw, in woodland group 10W, and in South Florida Flatwoods range site.

59 - Winder fine sand - This soil is nearly level and poorly drained. It is on broad, low-lying sloughs on the flatwoods. The slope is 0 to 2 percent.

In 95 percent of the areas, mapped as Winder fine sand, the Winder soil and similar soils make up 88 to 99 percent of the mapped areas. Dissimilar soils make up 1 to 12 percent of the mapped areas.

Typically, this soil has a surface layer of very dark gray fine sand about 4 inches thick. The subsurface layer, to a depth of about 10 inches, is grayish brown fine sand. The upper part of the subsoil, to a depth of about 14 inches, is dark grayish brown, mottled sandy loam and gray fine sand. The lower part of the subsoil, to a depth of about 30 inches, is gray sandy clay loam. The upper part of the substratum, to a depth of about 58 inches, is light gray, mottled sandy clay loam. The lower part to a depth of about 80 inches is gray sandy loam. Similar soils included in mapping, in some areas, have subsoil at a depth of more than 20 inches. Other similar soils, in some areas, have a thin discontinuous strata of fragmented limestone in the upper part of the subsoil.

Dissimilar soils included in mapping are Basinger, Myakka, and Wabasso soils in small areas. Basinger soils are very poorly drained. Myakka soils have a dark color sandy subsoil Wabasso soils have a dark color sandy subsoil above a loamy subsoil.

In most years, a seasonal high water table fluctuates from the soil surface to a depth of about 10 inches for 2 to 6 moths. Permeability is rapid in the surface and subsurface layers. It is slow or very slow in the subsoil and in the substratum. The available water capacity is moderate.

In most areas, this Winder soil is used as pasture. In a few areas, it is used for cultivated crops or for homesite or urban development. The natural vegetation consists of live oak, cabbage palm, and slash pine. The understory includes saw palmetto, pineland threeawn, and waxmyrtle.

If a water control system is established and maintained and soil-improving measures applied, this soil is well suited to most cultivated crops. If suitable outlets are available, lateral ditches and tile drains can be used to lower the water table. Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or a grass-legume mixture help to maintain fertility. Frequent applications of fertilizer and lime are generally needed to improve crop production.

This soil is suited to pasture. Wetness limits the choice of plants that can be grown and restricts grazing during periods of excessive wetness. Proper stocking, pasture rotation , and timely deferment of grazing help keep the pasture in good condition.

The potential of this soil for the production of slash pines is high. This soil has few limitations for woodland use and management. Equipment use limitation is a concern if the soil is not properly drained. Water-tolerant trees should be planted. Planting and harvesting operations should be scheduled during dry periods.

If this soil is used for building site development, the main management concerns are excessive wetness and slow to very slow permeability of the subsoil and substratum. Population growth has resulted in increased construction of homes on this soil. The slow or very slow permeability of the subsoil and substratum and the high water table increase the possibility that the septic tank absorption fields will not function properly. The slow or very slow permeability limitation can be minimized by increasing the size of the absorption field. Drainage is needed to lower the high water table, and fill material is needed in most areas.

This Winder soil is in capability subclass IIIw, in woodland group 11W, and in the Cabbage Palm Hammocks range site.

Addendum 5—Plant and Animal List

Wakulla Springs Plant List

Groups	Common Name	*Scientific Name*
Angiosperm	Three-seeded mercury	*Acalypha gracilens*
Angiosperm	Diamond threeseed mercury	*Acalypha rhomboidea*
Angiosperm	Red maple	*Acer rubrum*
Angiosperm	Florida maple	*Acer saccharum subsp. floridanum*
Angiosperm	Oppositeleaf spotflower	*Acmella oppositifolia*
Angiosperm	Southern maidenhair	*Adiantum capillus-veneris*
Angiosperm	Shyleaf	*Aeschynomene americana*
Angiosperm	California bullrush	*Schoenoplectus californicus*
Angiosperm	Red buckeye	*Aesculus pavia*
Angiosperm	Beach false foxglove	*Agalinis fasciculata*
Angiosperm	Chattahoochee false foxglove	*Agalinis pulchella*
Angiosperm	Century plant	*Agave americana*
Angiosperm	Wild hoarhound	*Ageratina aromatica*
Angiosperm	Harvest lice	*Agrimonia microcarpa*
Angiosperm	Common bugle	*Ajuga reptans*
Angiosperm	Mimosa, silktree	*Albizia julibrissin*
Angiosperm	Meadow garlic	*Allium canadense*
Angiosperm	Prince feather	*Amaranthus hypocondriacus*
Angiosperm	Common ragweed	*Ambrosia artemisiifolia*
Angiosperm	Common serviceberry	*Amelanchier arborea*
Angiosperm	Bastard false indigo	*Amorpha fruticosa*
Angiosperm	Climbing aster	*Ampelaster carolinianus*
Angiosperm	Hog peanut	*Amphicarpaea bracteata*
Angiosperm	Bushy bluestem	*Andropogon glomeratus*
Angiosperm	Bushy bluestem	*Andropogon glomeratus var. hirsutior*
Angiosperm	Chalky bluestem	*Andropogon virginicus var. glaucus*
Angiosperm	Broomsedge bluestem	*Andropogon virginicus var. virginicus*
Angiosperm	Coastal plain angelica	*Angelica dentata*
Angiosperm	Dwarf snapdragon	*Antirrhinum majus*
Angiosperm	Groundnut	*Apios americana*
Angiosperm	Marsh parsley	*Apium leptophyllum*
Angiosperm	Columbine	*Aquilegia canadensis*
Angiosperm	Grassnut	*Arachis glabrata*
Angiosperm	Devil's-walkingstick	*Aralia spinosa*
Angiosperm	Thymeleaf sandwort	*Arenaria serpyllifolia*
Angiosperm	Green dragon	*Arisaema dracontium*
Angiosperm	Jack-in-the-pulpit	*Arisaema triphyllum*
Angiosperm	Wiregrass	*Aristida stricta*
Angiosperm	Virginia snakeroot	*Aristolochia serpentaria*
Angiosperm	Red chokeberry	*Aronia arbutifolia*
Angiosperm	Switchcane	*Arundinaria gigantea*
Angiosperm	Fewflower milkweed	*Asclepias lanceolata*
Angiosperm	Pedicellate milkweed	*Asclepias pedicellata*
Angiosperm	Milkweed	*Asclepias perennis*
Angiosperm	Butterfly-weed	*Asclepias tuberosa*
Angiosperm	Redring milkweed	*Asclepias variegata*
Angiosperm	Showy milkwort	*Asemeia violacea*
Angiosperm	Smallflower pawpaw	*Asimina parviflora*
Angiosperm	Pawpaw	*Asimina spatulata*
Angiosperm	Cast iron plant	*Aspidistra elatior*
Angiosperm	Ebony spleenwort	*Asplenium platyneuron*
Angiosperm	Smooth yellow false foxglove	*Aureolaria flava*
Angiosperm	Fernleaf yellow false foxglove	*Aureolaria pectinata*
Angiosperm	Common carpetgrass	*Axonopus fissifolius*

Wakulla Springs Plant List

Groups	Common Name	*Scientific Name*
Angiosperm	Silverling	*Baccharis glomeruliflora*
Angiosperm	Groundsel tree	*Baccharis halimifolia*
Angiosperm	Herb-of-grace	*Bacopa monnieri*
Angiosperm	Angel wing begonia	*Begonia hybrid 'Lucerna'*
Angiosperm	Mixed colors begonia	*Begonia semperflorens*
Angiosperm	Shrimp plant	*Beloperone guttata*
Angiosperm	Rattan vine	*Berchemia scandens*
Angiosperm	Soft greeneyes	*Berlandiera pumila*
Angiosperm	Beggar tick	*Bidens alba*
Angiosperm	Spanish needles	*Bidens bipinnata*
Angiosperm	Spanish needles	*Bidens pilosa*
Angiosperm	Cross vine	*Bignonia capreolata*
Angiosperm	False nettle	*Boehmeria cylindrica*
Angiosperm	Red spiderling, Wineflower	*Boerhavia diffusa*
Angiosperm	Sekito ornamental cabbage	*Brassica oleracea*
Angiosperm	False boneset	*Brickellia eupatorioides*
Angiosperm	American bluehearts	*Buchnera americana*
Angiosperm	Capillary hairsedge	*Bulbostylis ciliatifolia*
Angiosperm	Black-haw, gum bumelia	*Bumelia lanuginosa*
Angiosperm	Pindo palm	*Butia capitata*
Angiosperm	American boxwood	*Buxus sempervirens*
Angiosperm	Fancy-leafed caladium	*Caladium bicolor*
Angiosperm	Pot marigold	*Calendula officinalis*
Angiosperm	Beautyberry	*Callicarpa americana*
Angiosperm	Sweet shrub	*Calycanthus floridus*
Angiosperm	Straggler daisy	*Calyptocarpus vialis*
Angiosperm	Camellia	*Camellia japonica*
Angiosperm	Camellia sasanqua	*Camellia sasanqua*
Angiosperm	Trumpet vine, Trumpet creeper	*Campsis radicans*
Angiosperm	Canna - 4 color varieties	*Canna indica*
Angiosperm	Tropical bushmint	*Cantinoa mutabilis*
Angiosperm	Hairy bittercress	*Cardamine hirsuta*
Angiosperm	Pennsylvania bittercress	*Cardamine pensylvanica*
Angiosperm	Greenwhite sedge	*Carex albolutescens*
Angiosperm	Godfreys sedge	*Carex amphibola*
Angiosperm	Sedge	*Carex basiantha*
Angiosperm	Cherokee sedge	*Carex cherokeensis*
Angiosperm	Longhair sedge	*Carex comosa*
Angiosperm	Ravenfoot sedge	*Carex crus-corvi*
Angiosperm	Sandywoods sedge	*Carex dasycarpa*
Angiosperm	Slender woodland sedge	*Carex digitalis*
Angiosperm	Fescue sedge	*Carex festucacea*
Angiosperm	Blackedge sedge	*Carex floridana*
Angiosperm	Gholsons sedge	*Carex gholsonii*
Angiosperm	Giant sedge	*Carex gigantea*
Angiosperm	Godfreys sedge	*Carex godfreyi*
Angiosperm	Cypress swamp sedge	*Carex joorii*
Angiosperm	Bristlystalked sedge	*Carex leptalea*
Angiosperm	Longs sedge	*Carex longii*
Angiosperm	Louisana sedge	*Carex louisianica*
Angiosperm	Hop sedge	*Carex lupulina*
Angiosperm	Muhlenbergs sedge	*Carex muehlenbergii*
Angiosperm	Walters sedge	*Carex striatula*
Angiosperm	Wire sedge	*Carex tenax*

Wakulla Springs Plant List

Groups	Common Name	*Scientific Name*
Angiosperm	Blunt broom sedge	*Carex tribuloides*
Angiosperm	Vanillaleaf	*Carphephorus odoratissimus*
Angiosperm	Deer tongue	*Carphephorus sp.*
Angiosperm	American hornbean, Bluebeech	*Carpinus caroliniana*
Angiosperm	Wild olive	*Cartrema americanum*
Angiosperm	Bitternut hickory	*Carya cordiformis*
Angiosperm	Pignut hickory	*Carya glabra*
Angiosperm	Mockernut hickory	*Carya tomentosa*
Angiosperm	Wild sensitive plant	*Cassia nictitans*
Angiosperm	Chinkapin	*Castanea pumila*
Angiosperm	Madagascar periwinkle	*Catharanthus roseus*
Angiosperm	New Jersey tea	*Ceanothus americanus*
Angiosperm	Cockcomb	*Celosia argentea cristata*
Angiosperm	Plumosa, prince feather	*Celosia argentea pyramidalis*
Angiosperm	Hackberry, Sugarberry	*Celtis laevigata*
Angiosperm	Southern sandspur	*Cenchrus echinatus*
Angiosperm	Butterfly-pea	*Centrosema virginianum*
Angiosperm	Buttonbush	*Cephalanthus occidentalis*
Angiosperm	Gray chickweed	*Cerastium brachypetalum*
Angiosperm	Sticky chickweed	*Cerastium glomeratum*
Angiosperm	Hornwort	*Ceratophyllum demersum*
Angiosperm	Redbud	*Cercis canadensis*
Angiosperm	Wild chervil	*Chaerophyllum tainturieri*
Angiosperm	Partridge pea	*Chamaecrista fasciculata*
Angiosperm	Sensitive pea	*Chamaecrista nictitans*
Angiosperm	Indian woodoats, River oats	*Chasmanthium latifolium*
Angiosperm	Spikegrass	*Chasmanthium laxum*
Angiosperm	Spikegrass	*Chasmanthium nitidum*
Angiosperm	Spikegrass	*Chasmanthium sessiliflorum*
Angiosperm	White fringetree	*Chionanthus virginicus*
Angiosperm	Florist chrysanthemum	*Chrysanthemum indicum*
Angiosperm	Ox-eye daisy	*Chrysanthemum leucanthemum*
Angiosperm	Maryland goldenaster	*Chrysopsis mariana*
Angiosperm	Water hemlock	*Cicuta maculata*
Angiosperm	Camphor tree	*Cinnamomum camphora*
Angiosperm	Purple thistle	*Cirsium horridulum*
Angiosperm	Nuttalls thistle	*Cirsium nuttallii*
Angiosperm	Hardy orange	*Citrus trifoliata*
Angiosperm	Sawgrass	*Cladium jamaicense*
Angiosperm	Satincurls	*Clematis catesbyana*
Angiosperm	Swamp leather-flower	*Clematis crispa*
Angiosperm	Butterfly pea	*Clitoria mariana*
Angiosperm	Tread softly	*Cnidoscolus stimulosus*
Angiosperm	Coralbeads	*Cocculus carolinus*
Angiosperm	Beaked panicum	*Coleataenia anceps*
Angiosperm	Redtop panicum	*Coleataenia rigidula*
Angiosperm	Coleus	*Coleus scutellarioides*
Angiosperm	Dayflower	*Commelina erecta*
Angiosperm	Mist flower (Ageratum)	*Conoclinium coelestinum*
Angiosperm	Canadian horseweed	*Conyza canadensis*
Angiosperm	Tickseed	*Coreopsis gladiata*
Angiosperm	Lance-leaved coreopsis	*Coreopsis lanceolata*
Angiosperm	Roughleaf dogwood	*Cornus asperifolia*
Angiosperm	Flowering dogwood	*Cornus florida*

Wakulla Springs Plant List

Groups	Common Name	*Scientific Name*
Angiosperm	Dogwood-Cherokee princess	*Cornus florida hybrid*
Angiosperm	Dogwood-Cloud 9	*Cornus florida hybrid*
Angiosperm	Dogwood-Plena	*Cornus florida hybrid*
Angiosperm	Stiff cornel dogwood	*Cornus foemina*
Angiosperm	Pampas grass	*Cortaderia selloana*
Angiosperm	Smallflower fumewort	*Corydalis micrantha subsp. australis*
Angiosperm	Sargents hawthorn	*Crataegus flava*
Angiosperm	Parsley haw	*Crataegus marshallii*
Angiosperm	Yellowleaf hawthorn	*Crataegus sargentii*
Angiosperm	Littlehip hawthorn	*Crataegus spathulata*
Angiosperm	Dwarf thorn	*Crataegus uniflora*
Angiosperm	Green haw	*Crataegus viridis*
Angiosperm	Swamp lily	*Crinum americanum*
Angiosperm	Milk and wine crinum lily	*Crinum zeylanicum*
Angiosperm	Coastalsand frostweed	*Crocanthemum arenicola*
Angiosperm	Carolina frostweed	*Crocanthemum carolinianum*
Angiosperm	Georgia frostweed	*Crocanthemum georgianum*
Angiosperm	Montbretia	*Crocosmia x crocosmiiflora*
Angiosperm	Crocus	*Crocus candidus*
Angiosperm	Scratch daisy	*Croptilon divaricatum*
Angiosperm	Rabbit-bells	*Crotalaria rotundifolia*
Angiosperm	Silver croton	*Croton argyranthemus*
Angiosperm	Vente conmigo	*Croton glandulosus*
Angiosperm	Rushfoil	*Croton michauxii*
Angiosperm	Rush	*Crotonopsis linearis*
Angiosperm	Marsh parsley	*Cyclospermum leptophyllum*
Angiosperm	Baldwin's flatsedge	*Cyperus croceus*
Angiosperm	Baldwin florsedge	*Cyperus globulosus*
Angiosperm	Low spikesedge	*Cyperus hortensis*
Angiosperm	Asian spikesedge	*Cyperus metzii*
Angiosperm	Pinebarren flatsedge	*Cyperus ovatus*
Angiosperm	Marsh flatsedge	*Cyperus pseudovegetus*
Angiosperm	Fourangle flatsedge	*Cyperus tetragonus*
Angiosperm	Titi	*Cyrilla racemiflora*
Angiosperm	Durban crowfootgrass	*Dactyloctenium aegyptium*
Angiosperm	Whitetassels	*Dalea carnea var. gracilis*
Angiosperm	American wild carrot	*Daucus pusillus*
Angiosperm	Wood vamp climbing hydrangea	*Decumaria barbara*
Angiosperm	Florida ticktrefoil	*Desmodium floridanum*
Angiosperm	Zarzabacoa comun	*Desmodium incanum*
Angiosperm	Sand ticktrefoil	*Desmodium lineatum*
Angiosperm	Ticktrefoil, beggar's lice	*Desmodium marilandicum var. ciliare*
Angiosperm	Stiff ticktrefoil	*Desmodium obtusum*
Angiosperm	Panicled ticktrefoil	*Desmodium paniculatum var. glabellum*
Angiosperm	Panicled ticktrefoil	*Desmodium paniculatum var. paniculatum*
Angiosperm	Beggar's ticks	*Desmodium rotundifolium*
Angiosperm	Pinebarren ticktrefoil	*Desmodium strictum*
Angiosperm	Slimleaf ticktrefoil	*Desmodium tenuifolium*
Angiosperm	Dixie ticktrefoil	*Desmodium tortuosum*
Angiosperm	Threeflower ticktrefoil	*Desmodium triflorum*
Angiosperm	Needleleaf witchgrass	*Dichanthelium aciculare*
Angiosperm	Tapered witchgrass	*Dichanthelium acuminatum*
Angiosperm	Bosc's witchgrass	*Dichanthelium boscii*
Angiosperm	Deertongue witchgrass	*Dichanthelium clandestinum*

Wakulla Springs Plant List

Groups	Common Name	*Scientific Name*
Angiosperm	Variable witchgrass	*Dichanthelium commutatum*
Angiosperm	Cypress witchgrass	*Dichanthelium dichotomum*
Angiosperm	Panic grass	*Dichanthelium laxiflorum*
Angiosperm	Pony-foot	*Dichondra carolinensis*
Angiosperm	Slender crabgrass	*Digitaria filiformis*
Angiosperm	Voilet crabgrass	*Digitaria violascens*
Angiosperm	Buttonweed	*Diodia virginiana*
Angiosperm	Air potato	*Dioscorea bulbifera*
Angiosperm	Yam	*Dioscorea villosa*
Angiosperm	Persimmon	*Diospyros virginiana*
Angiosperm	Gulf sebastian-bush	*Ditrysinia fruticosa*
Angiosperm	Dwarf sundew	*Drosera brevifolia*
Angiosperm	West indian chickweed	*Drymaria cordata*
Angiosperm	Indian strawberry	*Duchesnia indica*
Angiosperm	Dyschoriste	*Dyschoriste oblongifolia*
Angiosperm	Eastern purple coneflower	*Echinacea purpurea*
Angiosperm	Brazilian elodea	*Egeria densa*
Angiosperm	Silverthorn, Thorny olive	*Elaeagnus pungens*
Angiosperm	Elephant's-foot	*Elephantopus carolinianus*
Angiosperm	Florida flephant's-foot	*Elephantopus elatus*
Angiosperm	Smooth elephantsfoot	*Elephantopus nudatus*
Angiosperm	Devil's grandmother	*Elephantopus tomentosus*
Angiosperm	Indian goosegrass	*Eleusine indica*
Angiosperm	Virginia wild rye	*Elymus virgincus*
Angiosperm	Green-fly orchid	*Epidendrum conopseum*
Angiosperm	Beech drops	*Epifagus virginiana*
Angiosperm	Feather lovegrass	*Eragrostis amabilis*
Angiosperm	Bigtop lovegrass	*Eragrostis hirsuta*
Angiosperm	Red lovegrass	*Eragrostis secundiflora ssp. oxylepis*
Angiosperm	Lovegrass	*Eragrostis sp.*
Angiosperm	Purple lovegrass	*Eragrostis spectabilis*
Angiosperm	American burnweed, Fireweed	*Erechtites hieraciifolius*
Angiosperm	Centipedegrass	*Eremochloa ophiuroides*
Angiosperm	Oakleaf fleabane	*Erigeron quercifolius*
Angiosperm	White-tops	*Erigeron strigosus*
Angiosperm	Dog-tongue	*Eriogonum tomentosum*
Angiosperm	Coralbean	*Erythrina herbacea*
Angiosperm	Swamp doghobble	*Eubotrys racemosus*
Angiosperm	Tasmanian blue gum	*Eucalyptus globulus*
Angiosperm	Cider gum	*Eucalyptus gunni*
Angiosperm	Strawberry bush	*Euonymus americanus*
Angiosperm	Aureo-picta euonymus	*Euonymus japonica*
Angiosperm	White thoroughwort	*Eupatorium album*
Angiosperm	Dog fennel	*Eupatorium capillifolium*
Angiosperm	Dog fennel	*Eupatorium compositifolium*
Angiosperm	Mohr's thoroughwort	*Eupatorium mohrii*
Angiosperm	Boneset	*Eupatorium perfoliatum*
Angiosperm	Spurge	*Euphorbia discoidalis*
Angiosperm	Spurge	*Euphorbia excerta*
Angiosperm	Hyssopleaf sandmat	*Euphorbia hyssopifolia*
Angiosperm	Spotted sandmat	*Euphorbia maculata*
Angiosperm	Twospike fingergrass	*Eustachys floridana*
Angiosperm	Pinewoods fingergrass	*Eustachys petraea*
Angiosperm	Slender flattop goldenrod	*Euthamia caroliniana*

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Groups	Common Name	*Scientific Name*
Angiosperm	Annual trampweed	*Facelis retusa*
Angiosperm	American beech	*Fagus grandifolia*
Angiosperm	Sixweeks fescue	*Festuca octoflora*
Angiosperm	Pink thoroughwort	*Fleischmannia incarnata*
Angiosperm	White ash	*Fraxinus americana*
Angiosperm	Popash, Carolina ash	*Fraxinus caroliniana*
Angiosperm	Green ash	*Fraxinus pennsylvanica*
Angiosperm	Pumpkin ash	*Fraxinus profunda*
Angiosperm	Drug fumitory, Earthsmoke	*Fumaria officinalis*
Angiosperm	Goblin gaillardia	*Gaillardia arstata hybrid*
Angiosperm	Elliotts milkpea	*Galactia elliottii*
Angiosperm	Soft milkpea	*Galactia mollis*
Angiosperm	Milkpea	*Galactia sp.*
Angiosperm	Eastern milkpea	*Galactia volubilis*
Angiosperm	Goosegrass	*Galium aparine*
Angiosperm	Coastal bedstraw	*Galium bermudense*
Angiosperm	Wild licorice	*Galium circaezans*
Angiosperm	Bluntleaf bedstraw	*Galium obtusum*
Angiosperm	Hairy bedstraw	*Galium pilosum var. laevicaule*
Angiosperm	Hairy bedstraw	*Galium pilosum var. puncticulosum*
Angiosperm	Stiff marsh bedstraw	*Galium tinctorium*
Angiosperm	Sweet-scented bedstraw	*Galium uniflorum*
Angiosperm	Delicate everlasting	*Gamochaeta antillana*
Angiosperm	Elegant cudweed	*Gamochaeta coarctata*
Angiosperm	Spoonleaf cudweed	*Gamochaeta purpurea*
Angiosperm	Cudweed	*Gamochaeta sp.*
Angiosperm	Dwarf huckleberry	*Gaylussacia dumosa*
Angiosperm	Dangleberry	*Gaylussacia frondosa*
Angiosperm	Yellow jessamine	*Gelsemium sempervirens*
Angiosperm	Gopher apple	*Geobalanus oblongifolius*
Angiosperm	Cranesbill	*Geranium carolinianum*
Angiosperm	Gerbera daisy	*Gerbera jamesonnii*
Angiosperm	Large-flowered sword lily	*Gladiolus sp.*
Angiosperm	Water locust	*Gleditsia aquatica*
Angiosperm	Sweet everlasting	*Gnaphalium obtusifolium*
Angiosperm	Angularfruit milkvine	*Gonolobus suberosus*
Angiosperm	Loblolly bay	*Gordonia lasianthus*
Angiosperm	Longhorn false rein ordhid	*Habenaria quinqueseta*
Angiosperm	Witch hazel	*Hamamelis virginiana*
Angiosperm	Firebush	*Hamelia patens*
Angiosperm	English ivy	*Hedera helix*
Angiosperm	Bitter weed	*Helenium amarum*
Angiosperm	Rockrose	*Helianthemum arenicola*
Angiosperm	Annual sunflower	*Helianthus annuus*
Angiosperm	Rough sunflower	*Helianthus hirsutus*
Angiosperm	Day lily 'Astec gold'	*Hemerocallis fulva var.*
Angiosperm	Day lily 'Garnet and gold'	*Hemerocallis fulva var.*
Angiosperm	Day lily 'Yellow'	*Hemerocallis fulva var.*
Angiosperm	Camphorweed	*Heterotheca subaxillaris*
Angiosperm	Spike crested coral root	*Hexalectris spicata*
Angiosperm	Poor joe, Buttonweed	*Hexasepalum teres*
Angiosperm	Comfort root	*Hibiscus aculeatus*
Angiosperm	Halberdleaf rosemallow	*Hibiscus laevis*
Angiosperm	Halberd-leaved marhmallow	*Hibiscus militaris*

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Groups	Common Name	*Scientific Name*
Angiosperm	Rose-of-Sharon	*Hibiscus syriacus*
Angiosperm	Hawkweed	*Hieracium gronovii*
Angiosperm	Amaryllis	*Hippeastrum equestre*
Angiosperm	Innocence	*Houstonia procumbens*
Angiosperm	Dutch hyacinth	*Hyacinthus orientalis*
Angiosperm	Cowitch vine, Climbing hydrangea	*Hydrangea barbara*
Angiosperm	Hortensia hydrangea	*Hydrangea macrophylla*
Angiosperm	Oakleaf hydrangea	*Hydrangea quercifolia*
Angiosperm	Hydrilla	*Hydrilla verticillata*
Angiosperm	Manyflower marshpennywort	*Hydrocotyle umbellata*
Angiosperm	Whorled marshpennywort	*Hydrocotyle verticillata*
Angiosperm	Nakedflower ticktrefoil	*Hylodesmum nudiflorum*
Angiosperm	Fewflower ticktrefoil	*Hylodesmum pauciflorum*
Angiosperm	Spider lily	*Hymenocallis rotata*
Angiosperm	Carolina woollywhite	*Hymenopappus scabiosaeus*
Angiosperm	Greater marsh St Johns-wort	*Hypericum walteri*
Angiosperm	St. Peters-wort	*Hypericum crux-andreae*
Angiosperm	Bedstraw St Johns-wort	*Hypericum galioides*
Angiosperm	Pineweeds, Orangegrass	*Hypericum gentianoides*
Angiosperm	St Andrew's-cross	*Hypericum hypericoides*
Angiosperm	Flatwoods St Johns-wort	*Hypericum microsepalum*
Angiosperm	Dwarf St Johns-wort	*Hypericum mutilum*
Angiosperm	Early St Johns-wort	*Hypericum nudiflorum*
Angiosperm	Common yellow stargrass	*Hypoxis curtissii*
Angiosperm	Yellow stargrass	*Hypoxis juncea*
Angiosperm	Swamp stargrass	*Hypoxis leptocarpa*
Angiosperm	Stiff yellow stargrass	*Hypoxis rigida*
Angiosperm	Glosssyseed yellow stargrass	*Hypoxis sessilis*
Angiosperm	Carolina holly	*Ilex ambigua*
Angiosperm	Dahoon holly	*Ilex cassine*
Angiosperm	Large or sweet gallberry	*Ilex coriacea*
Angiosperm	Burford holly	*Ilex cornuta*
Angiosperm	Deciduous holly	*Ilex decidua*
Angiosperm	Inkberry, Gallberry	*Ilex glabra*
Angiosperm	Myrtle holly	*Ilex myrtifolia*
Angiosperm	American holly	*Ilex opaca*
Angiosperm	Yaupon holly	*Ilex vomitoria*
Angiosperm	East Palatka holly	*Ilex x attenuata*
Angiosperm	Savannah holly	*Ilex x attenuata*
Angiosperm	Yellow anise	*Illicium parviflorum*
Angiosperm	Balsam impatiens	*Impatiens balsamina*
Angiosperm	Busy lizzy impatiens	*Impatiens wallerana*
Angiosperm	Cogongrass	*Imperata cylindrica*
Angiosperm	Carolina indigo	*Indigofera caroliniana*
Angiosperm	Hairy indigo	*Indigofera hirsuta*
Angiosperm	Tievine	*Ipomoea cordatotriloba*
Angiosperm	Whitestar	*Ipomoea lacunosa*
Angiosperm	Man-of-the-earth	*Ipomoea pandurata*
Angiosperm	Cypress vine	*Ipomoea quamoclit*
Angiosperm	Blue morning glory	*Ipomoea trichocarpa*
Angiosperm	Virginia willow	*Itea virginica*
Angiosperm	Leathery rush	*Juncus coriaceus*
Angiosperm	Soft rush	*Juncus effusus*
Angiosperm	Shore rush	*Juncus marginatus*

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Groups	Common Name	*Scientific Name*
Angiosperm	Bighead rush	*Juncus megacephalus*
Angiosperm	Manyhead rush	*Juncus polycephalos*
Angiosperm	Needlepod rush	*Juncus scirpoides*
Angiosperm	Water willow	*Justicia ovata*
Angiosperm	Dwarf dandelion	*Krigia virginicum*
Angiosperm	Japanese clover	*Kummerowia striata*
Angiosperm	Whitehead bogbutton (Hatpins)	*Lachnocaulon anceps*
Angiosperm	Blue lettuce	*Lactuca floridana*
Angiosperm	Grassleaf lettuce	*Lactuca graminifolia*
Angiosperm	Crape myrtle	*Lagerstroemia indica*
Angiosperm	Henbit deadnettle	*Lamium amplexicaule*
Angiosperm	Hairy pinweed	*Lechea mucronata*
Angiosperm	Piedmont pinweed	*Lechea torreyi*
Angiosperm	Lesser duckweed	*Lemna acquinoctiales*
Angiosperm	Little duckweed	*Lemna obscura*
Angiosperm	Valdivia duckweed	*Lemna valdiviana*
Angiosperm	Poor man's pepper	*Lepidium virginicum*
Angiosperm	Hairy lespedeza	*Lespedeza hirta*
Angiosperm	Chapmans gayfeather	*Liatris chapmanii*
Angiosperm	Pinkscale gayfeather	*Liatris elegans*
Angiosperm	Grassleaf gayfeather	*Liatris elegantula*
Angiosperm	Slender gayfeather	*Liatris gracilis*
Angiosperm	Shortleaf gayfeather	*Liatris tenuifolia*
Angiosperm	Glossy privet	*Ligustrum lucidum*
Angiosperm	California privet	*Ligustrum ovalifoium*
Angiosperm	Japanese privet	*Ligustrum sinense*
Angiosperm	Canadian toadflax	*Linaria canadensis*
Angiosperm	Texas toadflax	*Linaria texana*
Angiosperm	Spice bush	*Lindera benzoin*
Angiosperm	Sweetgum	*Liquidambar styraciflua*
Angiosperm	Yellow poplar, Tuliptree	*Liriodendron tulipifera*
Angiosperm	Big blue lilyturf	*Liriope muscari*
Angiosperm	Monkey-grass, Border-grass	*Liriope spicata*
Angiosperm	Twayblade	*Listera australis*
Angiosperm	False gromwell, Wild job's tears	*Lithospermum virginianum*
Angiosperm	Cardinal flower	*Lobelia cardinalis*
Angiosperm	Bellflower	*Lobelia floridana*
Angiosperm	Downy lobelia	*Lobelia puberula*
Angiosperm	Japanese honeysuckle	*Lonicera japonica*
Angiosperm	Coral honeysuckle	*Lonicera sempervirens*
Angiosperm	Seaside primrosewillow	*Ludwigia maritima*
Angiosperm	Smallfruit primrosewillow	*Ludwigia microcarpa*
Angiosperm	Water primrose	*Ludwigia repens*
Angiosperm	Savannah primrose willow	*Ludwigia virgata*
Angiosperm	Foxtail club-moss	*Lycopodiella alopecuroides*
Angiosperm	Taperleaf waterhorehound	*Lycopus rubellus*
Angiosperm	Hurricane lily, Magic lily	*Lycoris radiata*
Angiosperm	Rose-rush	*Lygodesmia aphylla*
Angiosperm	Rusty lyonia (Staggerbush)	*Lyonia ferruginea*
Angiosperm	Coastalplain staggerbush	*Lyonia fruticosa*
Angiosperm	Fetterbush	*Lyonia lucida*
Angiosperm	White fetterbush	*Lyonia mariana*
Angiosperm	Fringed loosestrife	*Lysimachia lanceolata*
Angiosperm	Southern magnolia	*Magnolia grandiflora*

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Groups	Common Name	*Scientific Name*
Angiosperm	Saucer magnolia	*Magnolia soulangiana*
Angiosperm	Sweet bay	*Magnolia virginiana*
Angiosperm	Florida addersmouth orchid	*Malaxis spicata*
Angiosperm	Green addersmouth orchid	*Malaxis unifolia*
Angiosperm	Southern crabapple	*Malus angustifolia*
Angiosperm	Angle pod	*Matelea gonocarpa*
Angiosperm	Mecardonia	*Mecardonia acuminata*
Angiosperm	Black medick	*Medicago lupulina*
Angiosperm	Burr clover	*Medicago polymorpha*
Angiosperm	Chinaberry	*Melia azedarach*
Angiosperm	Creeping cucumber	*Melothria pendula*
Angiosperm	Climbing hempweed	*Mikania scandens*
Angiosperm	Sensitive briar	*Mimosa quadrivalvis var. angustata*
Angiosperm	Partridge berry, twin berry	*Mitchella repens*
Angiosperm	Miterwort	*Mitreola petiolata*
Angiosperm	Horse mint	*Monarda punctata*
Angiosperm	Indian pipe	*Monotropa uniflora*
Angiosperm	Wax myrtle, Southern bayberry	*Morella cerifera*
Angiosperm	Red mulberry	*Morus rubra*
Angiosperm	Nakedstem dewflower	*Murdannia nudiflora*
Angiosperm	Parrot's-feather	*Myriophyllum brasiliense*
Angiosperm	Cankerweed, Lionsfoot	*Nabalus serpentaria*
Angiosperm	Southern naiad	*Najas guadalupensis*
Angiosperm	Nandina	*Nandina domestica*
Angiosperm	Various cultivars	*Narcissus sp.*
Angiosperm	Water-cress	*Nasturtium microphyllum*
Angiosperm	European watercress*	*Nasturtium officinale*
Angiosperm	Pepper vine	*Nekemias arborea*
Angiosperm	Yellow water lily	*Nymphaea mexicana*
Angiosperm	White water Lily	*Nymphaea odorata*
Angiosperm	Water tupelo	*Nyssa aquatica*
Angiosperm	Swamp tupelo	*Nyssa biflora*
Angiosperm	Blackgum, Sourgum	*Nyssa sylvatica*
Angiosperm	Cut-leaved evening primrose	*Oenothera laciniata*
Angiosperm	Southern beeblossom	*Oenothera simulans*
Angiosperm	Flattop mille graines	*Oldenlandia corymbosa*
Angiosperm	Mondo grass	*Ophiopogon japonicus*
Angiosperm	Woodsgrass, Basketgrass	*Oplismenus setarius*
Angiosperm	Prickly-pear cactus	*Opuntia humifusa*
Angiosperm	Star of Bethlehem	*Ornathagolum thyrsoides*
Angiosperm	Tea olive	*Osmanthus fragrans*
Angiosperm	Hop hornbeam	*Ostrya virginiana*
Angiosperm	Common yellow woodsorrel	*Oxalis corniculata*
Angiosperm	Pink woodsorrel	*Oxalis debilis*
Angiosperm	Broadleaf woodsorrel	*Oxalis intermedia*
Angiosperm	Butterweed	*Packera glabella*
Angiosperm	Maidencane	*Panicum hemitomon*
Angiosperm	Switchgrass	*Panicum virgatum*
Angiosperm	Blackberry lily hybrid	*Paradancana norrissii hybrid*
Angiosperm	Florida pellitory	*Parietaria floridana*
Angiosperm	Whitlow-wort	*Paronychia baldwinii*
Angiosperm	Virginia creeper	*Parthenocissus quinquefolia*
Angiosperm	Florida paspalum	*Paspalum floridanum*
Angiosperm	Bahiagrass	*Paspalum notatum*

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Groups	Common Name	*Scientific Name*
Angiosperm	Brownseed paspalum	*Paspalum plicatulum*
Angiosperm	Thin paspalum	*Paspalum setaceum var. ciliatifolium*
Angiosperm	Thin paspalum	*Paspalum setaceum var. setaceum*
Angiosperm	Thin paspalum	*Paspalum setaceum var. villosisimum*
Angiosperm	Vaseygrass	*Paspalum urvillei*
Angiosperm	Passionflower	*Passiflora incarnata*
Angiosperm	Yellow passion flower	*Passiflora lutea*
Angiosperm	Geranium	*Pelargonium hortorum hybrid*
Angiosperm	Green arrow arum	*Peltandra virginica*
Angiosperm	Redbay	*Persea borbonia*
Angiosperm	Swampbay	*Persea palustris*
Angiosperm	Denseflower knotweed	*Persicaria glabra*
Angiosperm	Mild waterpepper, Swamp smartweed	*Persicaria hydropiperoides*
Angiosperm	Pennsylvania smartweed	*Persicaria pensylvanica*
Angiosperm	Dotted smartweed	*Persicaria punctata*
Angiosperm	Bog smartweed	*Persicaria setacea*
Angiosperm	Parsley	*Petroselinum crispum*
Angiosperm	Garden petunia	*Petunia hybrida*
Angiosperm	Thicket bean	*Phaseolus polystachios*
Angiosperm	Florida phlox	*Phlox floridana*
Angiosperm	Mistletoe	*Phoradendron serotinum*
Angiosperm	Red-leaf photinia	*Photinia glabra*
Angiosperm	Turkey tangle fogfruit, Capeweed	*Phyla nodiflora*
Angiosperm	Chamber bitter	*Phyllanthus urinaria*
Angiosperm	Golden bamboo	*Phyllostachys aurea*
Angiosperm	Husk tomato, Ground cherry	*Physalis pubescens*
Angiosperm	Obedient plant	*Physostegia leptophylla*
Angiosperm	Pokeberry; Pokeweed	*Phytolacca americana*
Angiosperm	Blackseed needlegrass	*Piptochaetium avenaceum*
Angiosperm	Pitted stripeseed	*Piriqueta cistoides ssp. carolinana*
Angiosperm	Water lettuce	*Pistia stratiotes*
Angiosperm	Japanese cheesewood	*Pittosporum tobira*
Angiosperm	Pineland silkgrass	*Pityopsis aspera*
Angiosperm	Zigzag silkgrass	*Pityopsis flexuosa*
Angiosperm	Narrowleaf silkgrass	*Pityopsis graminifolia*
Angiosperm	Hoary plantain	*Plantago virginica*
Angiosperm	Green wood orchid, Green reinorchid	*Platanthera clavellata*
Angiosperm	Southern rein-orchid	*Platanthera flava*
Angiosperm	Sycamore	*Platanus occidentalis*
Angiosperm	Marsh fleabane, camphor weed	*Pluchea camphorata*
Angiosperm	Cape leadwort	*Plumbago auriculata*
Angiosperm	Annual bluegrass	*Poa annua*
Angiosperm	Yew podocarpus	*Podocarpus macrophylla*
Angiosperm	Orange milkwort (candyweed)	*Polygala lutea*
Angiosperm	Bachelor button	*Polygala nana*
Angiosperm	Low pinebarren milkwort	*Polygala ramosa*
Angiosperm	Wild water-pepper	*Polygonum hydropiperoides*
Angiosperm	Pinkweed	*Polygonum pensylvanicum*
Angiosperm	Tall jointweed	*Polygonum pinicola*
Angiosperm	Smartweed	*Polygonum sp.*
Angiosperm	Rustweed	*Polypremum procumbens*
Angiosperm	Pickerelweed	*Pontederia cordata*
Angiosperm	Shadow witch orchid	*Pontheiva racemosa*
Angiosperm	Cottonwood	*Populus deltoides*

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Groups	Common Name	*Scientific Name*
Angiosperm	Purslane rose	*Portulaca sp.*
Angiosperm	Illinois pondweed	*Potamogeton illinoensis*
Angiosperm	Gall-of-the-earth	*Prenanthes serpentaria*
Angiosperm	Mermaid-weed	*Proserpinaca palustris*
Angiosperm	Wildplum	*Prunus americana*
Angiosperm	Chickasaw plum	*Prunus angustifolia*
Angiosperm	Carolina laurel cherry	*Prunus caroliniana*
Angiosperm	Wild cherry, Black cherry	*Prunus serotina*
Angiosperm	Ornamental cherry	*Prunus sp.*
Angiosperm	Hog plum	*Prunus umbellata*
Angiosperm	Rabbit tobacco, Sweet everlasting	*Pseudognaphalium obtusifolium*
Angiosperm	Blackroot	*Pterocaulon pycnostachyum*
Angiosperm	Mock bishop's weed	*Ptilimnium capillaceum*
Angiosperm	Firethorn	*Pyracantha coccinea*
Angiosperm	False dandelion	*Pyrrhopappus carolinianus*
Angiosperm	White oak	*Quercus alba*
Angiosperm	Bluff oak	*Quercus austrina*
Angiosperm	Southern red oak	*Quercus falcata*
Angiosperm	Laurel oak	*Quercus hemisphaerica*
Angiosperm	Bluejack oak	*Quercus incana*
Angiosperm	Turkey oak	*Quercus laevis*
Angiosperm	Sand Post oak	*Quercus margaretta*
Angiosperm	Swamp chestnut oak	*Quercus michauxii*
Angiosperm	Dwarf live oak	*Quercus minima*
Angiosperm	Water oak	*Quercus nigra*
Angiosperm	Runner oak	*Quercus pumila*
Angiosperm	Shumard oak	*Quercus shumardii*
Angiosperm	Post oak	*Quercus stellata*
Angiosperm	Live oak	*Quercus virginiana*
Angiosperm	Needle palm	*Rhapidophyllum hystrix*
Angiosperm	Savannah meadowbeauty	*Rhexia alifanus*
Angiosperm	Pale meadowbeauty	*Rhexia mariana*
Angiosperm	Fringed meadowbeauty	*Rhexia petiolata*
Angiosperm	Macroalgae	*Rhizoclonium hieroglyphicum*
Angiosperm	Azalea - Southern Indian hybrids	*Rhododendron indicum*
Angiosperm	Azalea - Kurume hybrids	*Rhododendron obtusum*
Angiosperm	Swamp azalea	*Rhododendron viscosum*
Angiosperm	Winged sumac, Shining sumac	*Rhus copallina*
Angiosperm	Doubleform snoutbean	*Rhynchosia difformis*
Angiosperm	Dollarleaf	*Rhynchosia reniformis*
Angiosperm	Anglestem beaksedge	*Rhynchospora caduca*
Angiosperm	Shortbristle horned beaksedge	*Rhynchospora corniculata*
Angiosperm	Globe beaksedge	*Rhynchospora globularis*
Angiosperm	Southern beaksedge	*Rhynchospora microcarpa*
Angiosperm	Millet beaksedge	*Rhynchospora miliacea*
Angiosperm	Mingled beaksedge	*Rhynchospora mixta*
Angiosperm	Mexican clover	*Richardia brasiliensis*
Angiosperm	Black locust	*Robinia pseudoacacia*
Angiosperm	Lady Banks rose	*Rosa banksiae*
Angiosperm	Swamp rose	*Rosa palustris*
Angiosperm	Highbush blackberry	*Rubus argutus*
Angiosperm	Sand blackberry	*Rubus cuneifolius*
Angiosperm	Sawtooth blackberry, Pennsylvania blackberry	*Rubus pensilvanicus*
Angiosperm	Dewberry	*Rubus trivialis*

Wakulla Springs Plant List

Groups	Common Name	*Scientific Name*
Angiosperm	Black-eyed susan	*Rudbeckia hirta*
Angiosperm	Wild petunia	*Ruellia caroliniensis*
Angiosperm	Sourdock	*Rumex hastatulus*
Angiosperm	Dwarf palmetto	*Sabal minor*
Angiosperm	Cabbage palm	*Sabal palmetto*
Angiosperm	White sabatia	*Sabatia brevifolia*
Angiosperm	Swamp pink	*Sabatia calycina*
Angiosperm	Silver plumegrass	*Saccharum alopecuroides*
Angiosperm	Sugarcane plumegrass	*Saccharum giganteum*
Angiosperm	Smallflower mock buckthorn	*Sageretia minutiflora*
Angiosperm	Pearlwort	*Sagina decumbens*
Angiosperm	Chapmans arrowhead	*Sagittaria graminea var. chapmanii*
Angiosperm	Eel grass	*Sagittaria kurziana*
Angiosperm	Arrowhead	*Sagittaria lancifolia*
Angiosperm	Carolina willow	*Salix caroliniana*
Angiosperm	Black Willow	*Salix nigra*
Angiosperm	Lyreleaf sage	*Salvia lyrata*
Angiosperm	Perennial blue sage	*Salvia sp.*
Angiosperm	Pineland pimperel	*Samolus parviflorus*
Angiosperm	Pineland pimpernel, Seaside brookweed	*Samolus valerandi var. parviflorus*
Angiosperm	Black snakeroot	*Sanicula canadensis*
Angiosperm	Sassafras	*Sassafras albidum*
Angiosperm	Lizard's tail	*Saururus cernuus*
Angiosperm	Sensitive brier	*Schrankia microphylla*
Angiosperm	Bulrush	*Scirpus lineatus*
Angiosperm	Nutrush	*Scleria oligantha*
Angiosperm	Nutrush	*Scleria triglomerata*
Angiosperm	Hoary skullcap	*Scutellaria incana*
Angiosperm	Skullcap	*Scutellaria integrifolia*
Angiosperm	Sebastian bush	*Sebastiania fruticosa*
Angiosperm	Dusty miller	*Senecio cineraria*
Angiosperm	Butter weed	*Senecio glabellus*
Angiosperm	Coffeeweed	*Senna obtusifolia*
Angiosperm	Saw palmetto	*Serenoa repens*
Angiosperm	White-topped aster	*Sericocarpus tortifolius*
Angiosperm	Whitetop aster, Dixie aster	*Sericocarpus tortifolius*
Angiosperm	Knotroot	*Setaria geniculata*
Angiosperm	Knotroot foxtail	*Setaria parviflora*
Angiosperm	Foxtail grass	*Setaria sp.*
Angiosperm	Foxtail millet	*Setaria viridis*
Angiosperm	Purple heart	*Setcreasea purpurea*
Angiosperm	Yaupon blacksenna	*Seymeria cassioides*
Angiosperm	Indian hemp	*Sida rhombifolia*
Angiosperm	Gum bully	*Sideroxylon lanuginosum*
Angiosperm	Starry rosinweed	*Silphium asteriscus*
Angiosperm	Rosinweed	*Silphium simpsonii*
Angiosperm	Annual blue-eyed grass	*Sisyrinchium rosulatum*
Angiosperm	Water parsnip	*Sium suave*
Angiosperm	Greenbrier	*Smilax auriculata*
Angiosperm	Catbrier	*Smilax bona-nox*
Angiosperm	Greenbrier	*Smilax ecirrhata*
Angiosperm	Wild sarsaparilla	*Smilax glauca*
Angiosperm	Sarsaparilla vine	*Smilax pumila*
Angiosperm	Jackson-brier	*Smilax smallii*

Wakulla Springs Plant List

Groups	Common Name	Scientific Name
Angiosperm	Greenbrier	*Smilax tamnoides*
Angiosperm	Coral greenbrier	*Smilax walteri*
Angiosperm	American black nightshade	*Solanum americanum*
Angiosperm	Florida horsenettle	*Solanum carolinense var. floridanum*
Angiosperm	Western horsenettle	*Solanum dimidiatum*
Angiosperm	Tropical soda apple	*Solanum viarum*
Angiosperm	Carolina goldenrod	*Solidago arguta var. caroliniana*
Angiosperm	Dixie goldenrod	*Solidago brachyphylla*
Angiosperm	Canada goldenrod	*Solidago canadensis var. scabra*
Angiosperm	Virginia goldenrod	*Solidago gracillima*
Angiosperm	Sweet goldenrod, Anisescented goldenrod	*Solidago odora*
Angiosperm	Field burrweed	*Soliva sessilis*
Angiosperm	Sowthistle	*Sonchus sp.*
Angiosperm	Shaggy hedgehyssop	*Sophronanthe pilosa*
Angiosperm	Slender indiangrass	*Sorghastrum elliottii*
Angiosperm	Prairie wedgescale	*Sphenopholis obtusata*
Angiosperm	Indian pink	*Spigelia marilandica*
Angiosperm	Nodding ladies'-tresses	*Spiranthes odorata*
Angiosperm	Little ladies'-tresses	*Spiranthes tuberosa*
Angiosperm	Spring ladiestresses	*Spiranthes vernalis*
Angiosperm	Bridalwreath	*Spireae arguta*
Angiosperm	Smutgrass	*Sporobolus indicus*
Angiosperm	Common chickweed	*Stellaria media*
Angiosperm	Queen's delight	*Stillingia sylvatica*
Angiosperm	Black cat grass	*Stipa avenacea*
Angiosperm	Stoke's aster	*Stokesia laevis*
Angiosperm	Stylisma	*Stylisma humistrata*
Angiosperm	Stylodon	*Stylodon careus*
Angiosperm	Climbing aster	*Symphyotrichum carolinianum*
Angiosperm	Eastern silver aster	*Symphyotrichum concolor*
Angiosperm	Rice button aster	*Symphyotrichum dumosum*
Angiosperm	Simmonds aster	*Symphyotrichum simmondsii*
Angiosperm	Wavyleaf aster	*Symphyotrichum undulatum*
Angiosperm	Aster	*Symphyotrichum urophyllum*
Angiosperm	Horse sugar, sweetleaf	*Symplocos tinctoria*
Angiosperm	Yellow hatpin	*Syngonanthus flavidulus*
Angiosperm	Hoary pea	*Tephrosia spicata*
Angiosperm	Rice-paper plant	*Tetrapanax papyriferus*
Angiosperm	Basswood	*Tilia americana*
Angiosperm	Bartrum's airplant	*Tillandsia bartramii*
Angiosperm	Spanish moss	*Tillandsia usneoides*
Angiosperm	Crane-fly orchid	*Tipularia discolor*
Angiosperm	Poison ivy	*Toxicodendron radicans*
Angiosperm	Climbing dogbane	*Trachelospermun difforme*
Angiosperm	Windmill palm	*Trachycarpus fortunei*
Angiosperm	Ohio spiderwort	*Tradescantia ohiensis*
Angiosperm	Wavyleaf noseburn	*Tragia urens*
Angiosperm	Chinese tallow, popcorntree	*Triadica sebifera*
Angiosperm	Forked bluecurls	*Trichostema dichotomum*
Angiosperm	Chapmans purpletop tridens	*Tridens flavus var. chapmanii*
Angiosperm	Tall redtop, Purpletop tridens	*Tridens flavus var. flavus*
Angiosperm	Field clover, Hop clover	*Trifolium campestre*
Angiosperm	Carolina clover	*Trifolium carolinianum*
Angiosperm	Low hop clover, Suckling clover	*Trifolium dubium*

Wakulla Springs Plant List

Groups	Common Name	*Scientific Name*
Angiosperm	White clover, Dutch clover	*Trifolium repens*
Angiosperm	Red trillium	*Trillium sessile*
Angiosperm	Venus' looking-glass	*Triodanis biflora*
Angiosperm	Venus' looking-glass	*Triodanis perfoliata*
Angiosperm	Eastern gamagrass, Fakahatchee grass	*Tripsacum dactyloides*
Angiosperm	Cattail	*Typha sp.*
Angiosperm	Winged elm	*Ulmus alata*
Angiosperm	American elm	*Ulmus americana var floridana*
Angiosperm	Browntop millet, Dixie signalgrass	*Urochloa ramosa*
Angiosperm	Zigzag bladderwort	*Utricularia subulata*
Angiosperm	Sparkleberry	*Vaccinium arboreum*
Angiosperm	Darrow's blueberry	*Vaccinium darrowii*
Angiosperm	Highbush blueberry	*Vaccinium elliottii*
Angiosperm	Shiny blueberry	*Vaccinium myrsinites*
Angiosperm	Deerberry	*Vaccinium stamineum*
Angiosperm	Eelgrass	*Vallisneria americana*
Angiosperm	Carolina false vervain	*Verbena carnea*
Angiosperm	Sandpaper vervain, Harsh vervain	*Verbena scabra*
Angiosperm	Tall ironweed	*Vernonia angustifolia*
Angiosperm	Corn speedwell	*Veronica arvensis*
Angiosperm	Southern arrow-wood	*Viburnum dentatum*
Angiosperm	Possum haw	*Viburnum nudum*
Angiosperm	Walter viburnum	*Viburnum obovatum*
Angiosperm	Rusty haw, Southern black haw	*Viburnum rufidulum*
Angiosperm	Common vetch	*Vicia sativa*
Angiosperm	Common blue violet	*Viola hirsutula*
Angiosperm	Early blue violet	*Viola septemloba*
Angiosperm	Common blue violet	*Viola sororia*
Angiosperm	Prostrate blue violet	*Viola walteri*
Angiosperm	Summer grape	*Vitis aestivalis*
Angiosperm	Florida grape	*Vitis cinerea var floridana*
Angiosperm	Muscadine grape	*Vitis rotundifolia*
Angiosperm	Frost grape	*Vitis vulpina*
Angiosperm	Voehmena	*Voehmena cylindrica*
Angiosperm	Southern rockbell	*Wahlenbergia marginata*
Angiosperm	American wisteria	*Wisteria frutescens*
Angiosperm	Chinese wisteria	*Wisteria sinensis*
Angiosperm	Carolina yelloweyed grass	*Xyris caroliniana*
Angiosperm	Oriental false hawksbeard	*Youngia japonica*
Angiosperm	Bear grass/Adams needle	*Yucca filamentosa*
Angiosperm	Adams needle	*Yucca flaccida*
Angiosperm	Atamasco lily, Rain lily	*Zephyranthes atamasca*
Angiosperm	Indian rice	*Zizania aquatica*
Bryophytes	Sphagnum moss	*Sphagnum sp.*
Charophytes	Musk-grass	*Chara spp.*
Charophytes	Macroalgae	*Spirogyra sp.*
Chlorophytes	Macroalgae	*Cladophora sp.*
Chlorophytes	Macroalgae	*Hydrodictyon sp.*
Cyanobacteria	Macroalgae	*Lyngbya wollei*
Cyanobacteria	Macroalgae	*Oscillatoria sp.*
Fungi	Fungi	*Agaricus abruptibulbus*
Fungi	Fungi	*Agaricus auricolor*
Fungi	Fungi	*Agaricus pocillator*
Fungi	Fungi	*Agaricus sp.*

Wakulla Springs Plant List

Groups	Common Name	Scientific Name
Fungi	Fungi	*Amanita arkandana*
Fungi	Fungi	*Amanita bisporigera*
Fungi	Fungi	*Amanita brunnescens*
Fungi	Mushroom sp.	*Amanita citrina*
Fungi	Fungi	*Amanita crenulata*
Fungi	Fungi	*Amanita magnivelaris*
Fungi	Fungi	*Amanita roanokensis*
Fungi	Fungi	*Amanita spreta*
Fungi	Fungi	*Amanita vaginata*
Fungi	Fungi	*Amthracophyllum lateritium*
Fungi	Fungi	*Austroboletus subflavidus*
Fungi	Fungi	*Boletellus russellii*
Fungi	Fungi	*Boletus auripes*
Fungi	Fungi	*Boletus auriporus*
Fungi	Fungi	*Boletus frostii*
Fungi	Fungi	*Boletus grisecus*
Fungi	Fungi	*Boletus hortonii*
Fungi	Fungi	*Boletus patriotius*
Fungi	Fungi	*Boletus spadiceus*
Fungi	Fungi	*Boletus speciosus*
Fungi	Fungi	*Cantharellus amethysteus*
Fungi	Fungi	*Cantharellus cibarius*
Fungi	Fungi	*Cantharellus minor*
Fungi	Fungi	*Chlorophyllum molybdites*
Fungi	Fungi	*Clavulina cincerea*
Fungi	Fungi	*Clitocybe gibba*
Fungi	Fungi	*Collybia iocephala*
Fungi	Fungi	*Collybia spongiosa*
Fungi	Fungi	*Coltricia cinnamomea*
Fungi	Fungi	*Crinipellis sp.*
Fungi	Fungi	*Cymatoderma caperatum*
Fungi	Fungi	*Daedalea sp.*
Fungi	Fungi	*Dictyopanus sp.*
Fungi	Fungi	*Favolus sp.*
Fungi	Fungi	*Geastrum saccatum*
Fungi	Fungi	*Geastrum sp.*
Fungi	Fungi	*Geastrum triplex*
Fungi	Fungi	*Gloerporus dichrous*
Fungi	Fungi	*Gyroporus castaneus*
Fungi	Fungi	*Gyroporus purpurinus*
Fungi	Fungi	*Gyroporus subalbellus*
Fungi	Mushroom sp.	*Hapalopilus croceus*
Fungi	Fungi	*Hohenbuhelia sp.*
Fungi	Mushroom sp.	*Hygrophores subsordius*
Fungi	Fungi	*Hygrophorus autoconicus*
Fungi	Fungi	*Hygrophorus miniatus*
Fungi	Fungi	*Hygrophorus miniatus var crenulata*
Fungi	Fungi	*Lactarius allardii*
Fungi	Fungi	*Lactarius argillaceifolius*
Fungi	Fungi	*Lactarius atroviridis*
Fungi	Fungi	*Lactarius corrugis*
Fungi	Fungi	*Lactarius deceptivus*
Fungi	Fungi	*Lactarius hygrophoroides*
Fungi	Fungi	*Lactarius indigo*

Wakulla Springs Plant List

Groups	Common Name	Scientific Name
Fungi	Fungi	*Lactarius luteolus*
Fungi	Fungi	*Lactarius subservifluus*
Fungi	Fungi	*Lactarius subvellereus*
Fungi	Fungi	*Lactarius subvernalis*
Fungi	Fungi	*Lactarius tomentoso-marginatus*
Fungi	Fungi	*Lactarius volemus*
Fungi	Fungi	*Lactarius volemus var. flavuus*
Fungi	Fungi	*Lactarius yazooensis*
Fungi	Fungi	*Latarius glaucescens*
Fungi	Fungi	*Leccinum rugosiceps*
Fungi	Fungi	*Lentinellus ursinus*
Fungi	Fungi	*Lentinus crinitis*
Fungi	Fungi	*Lentinus detonsus*
Fungi	Fungi	*Lepiota procera*
Fungi	Fungi	*Lepiota subrachodes*
Fungi	Fungi	*Leucoagaricus brunnescens*
Fungi	Fungi	*Leucoagaricus cepaestipes*
Fungi	Fungi	*Leucoagaricus rubrotincta*
Fungi	Fungi	*Limacella glioderma*
Fungi	Fungi	*Micromphale foetidus*
Fungi	Fungi	*Mutinus elegans*
Fungi	Fungi	*Panellus pusillus*
Fungi	Fungi	*Panus crinitus*
Fungi	Fungi	*Phallus rubicundus*
Fungi	Fungi	*Pholiota polychroa*
Fungi	Fungi	*Phylloporus boletinoides*
Fungi	Fungi	*Phylloporus rhodoxanthus*
Fungi	Fungi	*Pleurotus ostreatus*
Fungi	Fungi	*Pseudofavolus cucullatus*
Fungi	Fungi	*Buchwaldoboletus lignicola*
Fungi	Fungi	*Ramariopsis kunzei*
Fungi	Fungi	*Ripartitella braziliensis*
Fungi	Fungi	*Russula amoenolens*
Fungi	Fungi	*Russula albonigra*
Fungi	Fungi	*Russula laurocerasi*
Fungi	Fungi	*Russula pectinatoides*
Fungi	Fungi	*Russula subgraminicolor*
Fungi	Fungi	*Russula copacta*
Fungi	Fungi	*Russula foetentula*
Fungi	Fungi	*Russula mariae*
Fungi	Fungi	*Russula mutabilis*
Fungi	Fungi	*Russula rubescens*
Fungi	Fungi	*Russula subsection griseinae*
Fungi	Fungi	*Russula variata*
Fungi	Fungi	*Sarcodon fennicum*
Fungi	Fungi	*Steccherinum sp*
Fungi	Fungi	*Stereum ostrea*
Fungi	Mushroom sp,	*Stereum ostrim*
Fungi	Fungi	*Stereum striatum*
Fungi	Fungi	*Strobilomvces confuses*
Fungi	Fungi	*Strobilurus sp.*
Fungi	Fungi	*Trametes cubensis*
Fungi	Fungi	*Trametes sector*
Fungi	Fungi	*Tremella concrescens*

Wakulla Springs Plant List

Groups	Common Name	Scientific Name
Fungi	Fungi	*Tremellodendron pallidum*
Fungi	Mushroom sp.	*Tricholoma sp.*
Fungi	Fungi	*Tylopilus indecisus*
Fungi	Fungi	*Tylopilus rhoadsiae*
Fungi	Fungi	*Tyopilus rubrobrunneus*
Fungi	Fungi	*Xanthoconium affinis*
Fungi	Fungi	*Xylaria magnoliae*
Gymnosperms	Southern red cedar	*Juniperus silicicola*
Gymnosperms	Red cedar	*Juniperus virginiana*
Gymnosperms	Shortleaf pine	*Pinus echinata*
Gymnosperms	Slash pine	*Pinus elliottii*
Gymnosperms	Spruce pine	*Pinus glabra*
Gymnosperms	Longleaf pine	*Pinus palustris*
Gymnosperms	Loblolly pine	*Pinus taeda*
Gymnosperms	Pond cypress	*Taxodium ascendens*
Gymnosperms	Bald cypress	*Taxodium distichum*
Lichens	Lichen	*Amandinea polyspora*
Lichens	Lichen	*Arthonia palmulacea*
Lichens	Lichen	*Bacidia polychroa*
Lichens	Lichen	*Bathelium carolinianum*
Lichens	Brick-spored fire dot lichen	*Brigantiaea leucoxantha*
Lichens	Lichen	*Buellia curtisii*
Lichens	Lichen	*Buellia lauri-cassiae*
Lichens	Lichen	*Buellia erubescens*
Lichens	Salted eyelace lichen	*Bulbothrix isidiza*
Lichens	Lichen	*Lacrima epiphora*
Lichens	Carolina cloud lichen	*Canoparmelia caroliniana*
Lichens	Powdered cloud lichen	*Canoparmelia cryptochlorophaea*
Lichens	Lichen	*Chrysothrix candelaris*
Lichens	Deer moss, Powder-puff lichen	*Cladina evansii*
Lichens	Dixie deer moss lichen	*Cladina subtenuis*
Lichens	Bramble lichen	*Cladonia floridana*
Lichens	Jester lichen	*Cladonia leporina*
Lichens	Turban lichen	*Cladonia peziziformis*
Lichens	Cup lichen	*Cladonia ramulosa*
Lichens	Powdery lichen	*Cladonia subradiata*
Lichens	Christmas lichen	*Herpothallon rubrocinctum*

Wakulla Springs Animal List

Groups	**Common Name**	***Scientific Name***
Annelid	Earthworm	*Lumbricus terrestris*
Annelida	Aulodrilus pigueti	*Aulodrilus pigueti*
Annelida	Bratislavia unidentata	*Bratislavia unidentata*
Annelida	Dero digitata complex	*Dero digitata complex*
Annelida	Eclipidrilus	*Eclipidrilus*
Annelida	Erpobdella	*Erpobdella*
Annelida	Gloiobdella elongata	*Gloiobdella elongata*
Annelida	Helobdella stagnalis complex	*Helobdella stagnalis complex*
Annelida	Helobdella triserialis	*Helobdella triserialis*
Annelida	Ilyodrilus templetoni	*Ilyodrilus templetoni*
Annelida	Limnodrilus hoffmeisteri	*Limnodrilus hoffmeisteri*
Annelida	Myzobdella lugubris	*Myzobdella lugubris*
Annelida	Nais communis complex	*Nais(animal) communis complex*
Annelida	Nais simplex	*Nais(animal) simplex*
Annelida	Placobdella parasitica	*Placobdella parasitica*
Annelida	Pristina aequiseta	*Pristina aequiseta*
Annelida	Pristina leidyi	*Pristina leidyi*
Annelida	Polychaeta	
Arthropod	Leaf-footed Bug	*Acanthocephala femorata*
Arthropod	Hoary Edge Butterfly	*Achalarus lyciades*
Arthropod	House Cricket	*Acheta domestica*
Arthropod	Luna Moth	*Actias luna*
Arthropod	Two-spotted Lady Beetle	*Adalia bipunctata*
Arthropod	Cave Isopod	*Adellus sp. (undescribed)*
Arthropod	Summer Mosquitoes	*Aedes sp.*
Arthropod	Gulf Fritillary Butterfly	*Agraulis vanillae*
Arthropod	Giant strong-nosed stink bug	*Alcaeorrhynchus grandis*
Arthropod	Biting Midge	*Allohelea nebulosi*
Arthropod	Biting Midge	*Alluaudamyia bella*
Arthropod	Biting Midge	*Alluaudomyia needhami*
Arthropod	Biting Midge	*Alluaudomyia parva*
Arthropod	Lace-winged Roadside Skipper	*Amblyscirtes aesculapius*
Arthropod	Oak Gallmaking Cynipids	*Amphibolips quercusracemaria*
Arthropod	Common Green-darter dragonfly	*Anax junius*
Arthropod	Least Skipper	*Ancyloxypha numitor*
Arthropod	Leafy Oak Gall Wasp	*Andricus quercusfoliatus*
Arthropod	Oak Petiole Gall Wasp	*Andricus quercuspetiolicola*
Arthropod	Palmetto Walkingstick	*Anismorpha buprestoides*
Arthropod	Gopher tortoise aphodius beetle	*Aphodius troglodytes*
Arthropod	Western Honey Bee	*Apis mellifera*
Arthropod	Common Water Strider	*Aquarius nebularis*
Arthropod	Black dancer Damselfly	*Argia fumipennis atra*
Arthropod	Powdered dancer Damselfly	*Argia moesta*
Arthropod	Blue-ringed dancer Damselfly	*Argia sedula*
Arthropod	Blue-tipped dancer Damselfly	*Argia tibialis*
Arthropod	Hackberry Emperor Butterfly	*Asterocampa celtis*
Arthropod	Tawny Emperor Butterfly	*Asterocampa clyton*
Arthropod	Great Purple Hairstreak Butterfly	*Atlides halesus*
Arthropod	Biting Midge	*Atrichopogon fusculus*
Arthropod	IO Moth	*Automeris io*
Arthropod	Pipevine Swallowtail Butterfly	*Battus philenor*
Arthropod	Gall Wasp (species inquirenda)	*Belonocnema quercussvirens*
Arthropod	Biting Midge	*Bezzia circumdata*
Arthropod	Biting Midge	*Bezzia dorsasetula*

Wakulla Springs Animal List

Arthropod	Biting Midge	*Bezzia glabra*
Arthropod	Biting Midge	*Bezzia nobilis*
Arthropod	Biting Midge	*Bezzia perplexa*
Arthropod	German Cockroach	*Blattella germanica*
Arthropod	American Bumble Bee	*Bombus pennsylvanicus*
Arthropod	Biting Midge	*Brachypogon canadensis*
Arthropod	Backswimmer	*Buenoa limnocastoris*
Arthropod	Little Metalmark Butterfly	*Calephelis virginiensis*
Arthropod	Blue Crab	*Callinectes sapidus*
Arthropod	Horned Oak Gall Wasp	*Callirhytis cornigera*
Arthropod	Southern Live Oak Stem Gall Wasp	*Callirhytis quercusbatatoides*
Arthropod	Oak Gall Wasp (nrn)	*Callirhytis quercusrugosa*
Arthropod	Oak Gall Wasp (ncn)	*Callirhytis quercusventricosa*
Arthropod	Wool Sower	*Callirhytis seminator*
Arthropod	Henry’s Elfin Butterfly	*Callophrys henrici*
Arthropod	Ebony Jewelwing Damselfly	*Calopteryx maculata*
Arthropod	Sparkling Jewelwing Damselfly	*Calopteryx dimidiata*
Arthropod	Brazilian Skipper	*Calpodes ethlius*
Arthropod	Red-banded Hairstreak Butterfly	*Calycopis cecrops*
Arthropod	Spring Azure Butterfly	*Celastrina ladon*
Arthropod	Long-horned caddisfly (ncn)	*Ceraclea transversa*
Arthropod	Gopher tortoise hister beetle	*Chelyoxenus xerobatis*
Arthropod	(ncn)	*Cheumatopsyche burksi*
Arthropod	Deer Fly	*Chrysops sp.*
Arthropod	Regal Moth	*Citheronia regalis*
Arthropod	Biting Midge	*Clinohelea bimaculata*
Arthropod	Southern Dogface	*Colias cesonia*
Arthropod	Orange Sulphur Butterfly	*Colias eurytheme*
Arthropod	Regal Darner Dragonfly	*Coryphaeschna ingens*
Arthropod	Green June Beetle	*Cotinus nitida*
Arthropod	Hobbs’ Cave Amphipod	*Crangonyx hobbsi*
Arthropod	Florida Cave Amphipod	*Crangonyx grandimanus*
Arthropod	Cave Amphipod	*Crangonyx floridanus*
Arthropod	Amphipod	*Crangonyx hobbsi*
Arthropod	House Mosquitoes	*Culex pipiens*
Arthropod	Biting Midge	*Culicoides scanloni*
Arthropod	Biting Midge	*Culicoides villosipennis*
Arthropod	Biting Midge	*Culicoides debilipalpis*
Arthropod	Biting Midge	*Culicoides edeni*
Arthropod	Biting Midge	*Culicoides furens*
Arthropod	Biting Midge	*Culicoides hinmani*
Arthropod	Biting Midge	*Culicoides mississippiensis*
Arthropod	Biting Midge	*Culicoides pallidicornis*
Arthropod	Biting Midge	*Culicoides paraensis*
Arthropod	Predacious Diving Beetle	*Cybister fimbriolatus*
Arthropod	Gemmed Satyre Butterfly	*Cyllopsis gemma*
Arthropod	Monarch Butterfly	*Danaus plexippus*
Arthropod	Queen Butterfly	*Danaus gilippus*
Arthropod	Biting Midge	*Dasyhelea stemlerae*
Arthropod	Cow Killer "Velvet Ant"	*Dasymutilla occidentalis*
Arthropod	Post-burn Datana	*Datana ranaeceps*
Arthropod	Black Turpentine Beetle	*Dendroctonus terebrans*
Arthropod	Whirligig Beetle	*Dineutus carolinus*
Arthropod	Whirligig Beetle	*Dineutus serrulatus*
Arthropod	Round Bullet Gall Wasp	*Disholcaspis quercusglobulus*

Arthropod	Same Species of Gall Wasp (link)	*Disholcaspis quercussuccinipes*
Arthropod	Same Species of Gall Wasp (link)	*Disholcaspis quercusvirens*
Arthropod	Rosy Maple Moth	*Dryocampa sp.*
Arthropod	Oak Gall Wasp (nra)	*Dryocosmus nova*
Arthropod	Oak Gall Wasp (ncn)	*Dryocosmus quercuslaurifoliae*
Arthropod	Oak Gall Wasp (ncn)	*Dryocosmus quercusnotha*
Arthropod	Orange Bluet Damselfly	*Enallagma signatum*
Arthropod	Purple Bluet Damselfly	*Enallagma cardenium*
Arthropod	Familiar Bluet Damselfly	*Enallagma civile*
Arthropod	Cherry Bluet Damselfly	*Enallagma concisum*
Arthropod	Bluet Damselfly (ncn)	*Enallagma daeckei*
Arthropod	Burgundy Bluet Damselfly	*Enallagma dubium*
Arthropod	Big Bluet Damselfly	*Enallagma durum*
Arthropod	Skimming Bluet Damselfly	*Enallagma geminatum*
Arthropod	Pale Bluet Damselfly	*Enallagma pallidum*
Arthropod	Florida Bluet Damselfly	*Enallagma pollutum*
Arthropod	Vesper Bluet Damsefly	*Enallagma vesperum*
Arthropod	Blackwater Bluet Damselfly	*Enallagma weewa*
Arthropod	Southern Pearly-eye Butterfly	*Enodia portlandia*
Arthropod	Silver-spotted Skipper	*Epargyreus clarus*
Arthropod	Juvenal’s Duskywing Skipper	*Erynnis juvenalis*
Arthropod	Horace’s Duskywing Skipper	*Erynnis horatius*
Arthropod	Zarucco Duskywing Skipper	*Erynnis zarucco*
Arthropod	Dion Skipper	*Euohyes dion*
Arthropod	Dun Skipper	*Euphyes vestris*
Arthropod	Variegated Fritillary Butterfly	*Euptoieta claudia*
Arthropod	Barred Yellow Butterfly	*Eurema daira*
Arthropod	Little Yellow Butterfly	*Eurema lisa*
Arthropod	Sleepy Orange Butterfly	*Eurema nicippe*
Arthropod	Zebra Swallowtail Butterfly	*Eurytides marcellus*
Arthropod	Harvester Butterfly	*Feniseca tarquinius*
Arthropod	Biting Midge	*Forcipomyia bipunctualata*
Arthropod	Biting Midge	*Forcipomyia bystraki*
Arthropod	Biting Midge	*Forcipomyia calcarata*
Arthropod	Biting Midge	*Forcipomyia glauca*
Arthropod	Crab-like Spiny Orb Weaver	*Gasteracantha cancriformis*
Arthropod	Toad Bug	*Gelastocoris oculatus*
Arthropod	Equal-clawed tortoise hister	*Geomysaprinus floridae*
Arthropod	Northern Mole Cricket	*Gryllotalpa hexadactyla*
Arthropod	Field Cricket	*Gyrillus pennsylvanicus*
Arthropod	Whirligig Beetle	*Gyrinus pachysomus*
Arthropod	Whirligig Beetle	*Gyrinus woodruffi*
Arthropod	Zebra Butterfly	*Heliconius charithonius*
Arthropod	Snail-case caddisfly	*Helicopsyche borealis*
Arthropod	Ceranus Blue Butterfly	*Hemiargus ceranus*
Arthropod	Carolina Satyre Butterfly	*Hermeuptychia sosybius*
Arthropod	Smoky Rubyspot Damselfly	*Hetaerina titia*
Arthropod	Red Fly Midge	*Heteromyia fasciata*
Arthropod	Burrowing Mayfly	*Hexagenia limbata*
Arthropod	netspinning caddisfly (ncn)	*Hydropsyche rossi*
Arthropod	Wakulla Springs microcaddisfly	*Hydroptila wakulla*
Arthropod	Microcaddisfly (ncn)	*Hydroptila armata*
Arthropod	Wakulla Springs Vari-colored Microcaddisfly	*Hydroptila wakulla*
Arthropod	Fiery Skipper	*Hylephila phyleus*
Arthropod	Ips Engraver Beetle	*Ips sp.*

Wakulla Springs Animal List

Arthropod	Crowned slug moth	*Isa textula*
Arthropod	Citrine Forktail Damselfly	*Ischnura hastata*
Arthropod	Lilypad Forktail Damselfly	*Ischnura kellicotti*
Arthropod	Fragile Forktail Damselfly	*Ischnura posita*
Arthropod	Furtive Forktail Damselfly	*Ischnura prognata*
Arthropod	Rambur's Forktail Damselfly	*Ischnura ramburii*
Arthropod	Deer Tick	*Ixodes scapularis*
Arthropod	Common Buckeye Butterfly	*Junonia coenia*
Arthropod	Black Widow Spider	*Latrodectus mactans*
Arthropod	Daddy-long-legs	*Leiobunum sp.*
Arthropod	Clouded Skipper	*Lerema accius*
Arthropod	Eufala Skipper	*Lerodea eufala*
Arthropod	Southern Spreadwing Damselfly	*Lestes disjunctus australis*
Arthropod	Swamp Spreadwing Damselfly	*Lestes vigilax*
Arthropod	American Snout Butterfly	*Libytheana carinenta*
Arthropod	Red-spotted Purple Butterfly	*Limenitis arthemis*
Arthropod	Viceroy Butterfly	*Limenitis archippus*
Arthropod	Carolina Wolf Spider	*Lycosa carolinensis*
Arthropod	Swift river cruiser dragonfly	*Macromia illinoiensis*
Arthropod	Biting Midge	*Mallochohelea atripes*
Arthropod	Biting Midge	*Mallochohelea caudellii*
Arthropod	Yucca Giant Skipper	*Megathymus yuccae*
Arthropod	Little Wood Satyre Butterfly	*Megisto cymela*
Arthropod	Broad-winged Katydid	*Microcentrum rhombifolium*
Arthropod	House Fly	*Musca domestica*
Arthropod	Dainty Sulphur Butterfly	*Nathalis iole*
Arthropod	Long-horned caddisfly (ncn)	*Nectopsyche pavida*
Arthropod	(ncn)	*Nectopsyche spiloma*
Arthropod	Southern Sprite Damselfly	*Nehalennia integricollis*
Arthropod	Water Strider	*Neogerris hesione*
Arthropod	Rasmussen’s caddisfly	*Neotrichia rasmusseni*
Arthropod	Microcaddisfly (ncn)	*Neotrichia rasmusseni*
Arthropod	Oak Gall Wasp (nra)	*Neuroterus nova*
Arthropod	Oak Gall Wasp (ncn)	*Neuroterus quercusbatatus*
Arthropod	Velvety Shore Bug	*Ochterus banksi*
Arthropod	Tan Spotted-Wing Long-Horned Sedge caddisfly	*Oecetis avara*
Arthropod	Long-horned caddisfly (ncn)	*Oecetis cinerascens*
Arthropod	Long-horned caddisfly (ncn)	*Oecetis inconspicua*
Arthropod	Long-horned caddisfly (ncn)	*Oecetis persimilis*
Arthropod	Twin-spot Skipper	*Oligoria maculata*
Arthropod	Punctate onthophagus beetle	*Onthophagus polyhemi polyphemi*
Arthropod	Little-entrance microcaddisfly	*Oxyethira janella*
Arthropod	Microcaddisfly (ncn)	*Oxyethira abacatia*
Arthropod	(ncn)	*Oxyethira janella*
Arthropod	Eastern Grass Shrimp	*Palaemonetes paludosus*
Arthropod	Ocala Skipper	*Panoquina ocala*
Arthropod	Black Swallowtail Butterfly	*Papilio polyxenes*
Arthropod	Giant Swallowtail Butterfly	*Papilio cresphontes*
Arthropod	Eastern Tiger Swallowtail	*Papilio glaucus*
Arthropod	Spicebush Swallowtail Butterfly	*Papilio troilus*
Arthropod	Palamedes Swallowtail Butterfly	*Papilio palamedes*
Arthropod	Biting Midge	*Parabezzia bystraki*
Arthropod	American Cockroach	*Periplaneta americana*
Arthropod	Rainbow Scarab	*Phanaeus vindex*
Arthropod	Gopher tortoise rove beetle	*Philonthus gopheri*

Arthropod	Cloudless Sulphur Butterfly	*Phoebis sennae*
Arthropod	Pyralis Firefly	*Photinus pyralis*
Arthropod	Phaon Crescent Butterfly	*Phycoides phaon*
Arthropod	Texan Crescent Butterfly	*Phycoides texana*
Arthropod	Pearl Crescent Butterfly	*Phycoides tharos*
Arthropod	Love Bug	*Plecia nearctica*
Arthropod	Cottonwood borer	*Plectrodera scalator*
Arthropod	Eastern bumelia borer	*Plinthocoelium suaveolens suaveolens*
Arthropod	Yehi Skipper	*Poanes yehi*
Arthropod	Zabulon Skipper	*Poanes Zabulon*
Arthropod	Whirlabout Skipper	*Polites vibex*
Arthropod	Question Mark Butterfly	*Polygonia interrogationis*
Arthropod	Little Glassywing Skipper	*Pompeius verna*
Arthropod	Byssus Skipper	*Problema byssus*
Arthropod	Woodville Karst Cave Crayfish	*Procambarus orcinus*
Arthropod	Big Blue Spring Cave Crayfish	*Procambarus horsti*
Arthropod	Florida Crayfish	*Procambarus paeninsulanus*
Arthropod	Common Checkered Skipper	*Pyrgus communis*
Arthropod	Tropical Checkered Skipper	*Pyrgus oileus*
Arthropod	Swimming Little Florida Cave Isopod	*Remasellus parvus*
Arthropod	Eastern Subterranean termite	*Reticulitermis flavipes*
Arthropod	Southeastern Lubber Grasshopper	*Romalea microptera*
Arthropod	Banded Hairstreak Butterfly	*Satyrium calanus*
Arthropod	Oak Hairstreak Butterfly	*Satyrium favonius*
Arthropod	Coral Hairstreak Butterfly	*Satyrium titus*
Arthropod	King Hairstreak Butterfly	*Satyrium kingi*
Arthropod	Appalachian Satyre Butterfly	*Satyrodes appalachia*
Arthropod	Red Fire Ant	*Solenopsis invicta*
Arthropod	Blue Purse-web Spider	*Sphodros abboti*
Arthropod	Carolina Mantid Praying Mantis	*Stagmomantis carolina*
Arthropod	Predaceous Midge	*Stilobezzia amnigena*
Arthropod	Predaceous Midge	*Stilobezzia beckae*
Arthropod	Predaceous Midge	*Stilobezzia stonei*
Arthropod	Predaceous Midge	*Stilobezzia viridis*
Arthropod	Longhorned beetle	*Strangalia luteicornis*
Arthropod	Gray Hairstreak Butterfly	*Strymon melinus*
Arthropod	Black Horse Fly	*Tabanus atratus*
Arthropod	Horse Fly	*Tabanus molestus mixus*
Arthropod	Duckweed Firetail Damselfly	*Telebasis byersi*
Arthropod	Southern Cloudywing Skipper	*Thorybes bathyllus*
Arthropod	Northern Cloudywing Skipper	*Thorybes pylades*
Arthropod	Little-fork triaenode caddisfly	*Triaenodes furcellus*
Arthropod	Long-horned caddisfly (ncn)	*Triaenodes furcella*
Arthropod	Golden-silk Spider	*Trichonephila clavipes*
Arthropod	Feather-legged Fly	*Trichopoda plumipes*
Arthropod	Long-tailed Skipper	*Urbanus proteus*
Arthropod	Dorantes Longtail Skipper	*Urbanus dorantes*
Arthropod	American Lady Butterfly	*Vanessa virginiensis*
Arthropod	Red Admiral Butterfly	*Vanessa atalanta*
Arthropod	Eastern Yellow Jacket	*Vespula maculifrons*
Arthropod	Southern Broken-Dash Skipper	*Wallengrenia otho*
Arthropod	Northern Broken-Dash Skipper	*Wallengrenia egeremet*
Arthropod	Convict caterpillar, Spanish moth	*Xanthopastis regnatrix*
Arthropod	Gall Wasp (nra)	*Xystoteras sp.*
Arthropoda	Ablabesmyia mallochi	*Ablabesmyia mallochi*

Arthropoda	Aphylla williamsoni	*Aphylla williamsoni*
Arthropoda	Argia	*Argia*
Arthropoda	Arrenurus	*Arrenurus*
Arthropoda	Atractides	*Atractides*
Arthropoda	Atrichopogon	*Atrichopogon*
Arthropoda	Baetis intercalaris	*Baetis intercalaris*
Arthropoda	Beardius	*Beardius*
Arthropoda	Caecidotea	*Caecidotea*
Arthropoda	Caenis	*Caenis*
Arthropoda	Callibaetis floridanus	*Callibaetis floridanus*
Arthropoda	Cernotina	*Cernotina*
Arthropoda	Cheumatopsyche	*Cheumatopsyche*
Arthropoda	Chironomus	*Chironomus*
Arthropoda	Cladotanytarsus aeiparthenus	*Cladotanytarsus aeiparthenus*
Arthropoda	Cladotanytarsus cf. daviesi	*Cladotanytarsus cf. daviesi*
Arthropoda	Cladotanytarsus sp. f epler	*Cladotanytarsus sp. f epler*
Arthropoda	Cladotanytarsus sp. g epler	*Cladotanytarsus*
Arthropoda	Clinotanypus	*Clinotanypus*
Arthropoda	Corynoneura	*Corynoneura*
Arthropoda	Crangonyx	*Crangonyx*
Arthropoda	Cricotopus absurdus	*Cricotopus absurdus*
Arthropoda	Cricotopus bicinctus	*Cricotopus bicinctus*
Arthropoda	Cricotopus or orthocladius	*Cricotopus or orthocladius*
Arthropoda	Cryptochironomus	*Cryptochironomus*
Arthropoda	Cryptotendipes	*Cryptotendipes*
Arthropoda	Dicrotendipes hulberti	*Dicrotendipes hulberti*
Arthropoda	Dicrotendipes modestus	*Dicrotendipes modestus*
Arthropoda	Dicrotendipes neomodestus	*Dicrotendipes neomodestus*
Arthropoda	Dicrotendipes simpsoni	*Dicrotendipes simpsoni*
Arthropoda	Dineutus	*Dineutus*
Arthropoda	Dubiraphia vittata	*Dubiraphia vittata*
Arthropoda	Enallagma coecum	*Enallagma coecum*
Arthropoda	Endotribelos hesperium	*Endotribelos hesperium*
Arthropoda	Gaeyia	*Gaeyia*
Arthropoda	Gammarus	*Gammarus*
Arthropoda	Geayia	*Geayia*
Arthropoda	Glyptotendipes	*Glyptotendipes*
Arthropoda	Gomphus lividus	*Gomphus lividus*
Arthropoda	Hedriodiscus	*Hedriodiscus*
Arthropoda	Helicopsyche borealis	*Helicopsyche borealis*
Arthropoda	Hemerodromia	*Hemerodromia*
Arthropoda	Hyalella azteca	*Hyalella azteca*
Arthropoda	Hydrodroma	*Hydrodroma*
Arthropoda	Hydropsyche rossi	*Hydropsyche rossi*
Arthropoda	Hydroptila	*Hydroptila*
Arthropoda	Hygrobates	*Hygrobates*
Arthropoda	Ischnura	*Ischnura*
Arthropoda	Isotomurus tricolor	*Isotomurus tricolor*
Arthropoda	Krendowskia	*Krendowskia*
Arthropoda	Labiobaetis propinquus	*Labiobaetis propinquus*
Arthropoda	Labrundinia johannseni	*Labrundinia johannseni*
Arthropoda	Labrundinia maculata	*Labrundinia maculata*
Arthropoda	Labrundinia neopilosella	*Labrundinia neopilosella*
Arthropoda	Labrundinia pilosella	*Labrundinia pilosella*
Arthropoda	Larsia decolorata	*Larsia decolorata*

Arthropoda	Lebertia	*Lebertia*
Arthropoda	Limnesia	*Limnesia*
Arthropoda	Maccaffertium exiguum	*Maccaffertium exiguum*
Arthropoda	Maccaffertium smithae	*Maccaffertium smithae*
Arthropoda	Macromia	*Macromia*
Arthropoda	Macronychus glabratus	*Macronychus glabratus*
Arthropoda	Matus	*Matus*
Arthropoda	Merragata hebroides	*Merragata hebroides*
Arthropoda	Mesovelia	*Mesovelia*
Arthropoda	Microtendipes pedellus grp.	*Microtendipes pedellus grp.*
Arthropoda	Nanocladius	*Nanocladius*
Arthropoda	Neumania	*Neumania*
Arthropoda	Odontomyia	*Odontomyia*
Arthropoda	Oecetis cinerascens	*Oecetis cinerascens*
Arthropoda	Oecetis georgia	*Oecetis georgia*
Arthropoda	Oecetis inconspicua cmplx.	*Oecetis inconspicua complex*
Arthropoda	Oecetis nocturna	*Oecetis nocturna*
Arthropoda	Oecetis persimilis	*Oecetis persimilis*
Arthropoda	Oecetis sp. e floyd	*Oecetis sp. e floyd*
Arthropoda	Orthotrichia	*Orthotrichia*
Arthropoda	Oxyethira	*Oxyethira*
Arthropoda	Pachydrus princeps	*Pachydrus princeps*
Arthropoda	Palaemon	*Palaemon*
Arthropoda	Palpomyia/bezzia grp.	*Palpomyia/bezzia grp.*
Arthropoda	Parachironomus supparilis	*Parachironomus supparilis*
Arthropoda	Parakiefferiella	*Parakiefferiella*
Arthropoda	Paralauterborniella nigrohalterale	*Paralauterborniella nigrohalterale*
Arthropoda	Parapoynx	*Parapoynx*
Arthropoda	Paratanytarsus	*Paratanytarsus*
Arthropoda	Paratanytarsus quadratus	*Paratanytarsus sp. c epler*
Arthropoda	Peltodytes	*Peltodytes*
Arthropoda	Pentaneura inconspicua	*Pentaneura inconspicua*
Arthropoda	Petrophila	*Petrophila*
Arthropoda	Phaenonotum	*Phaenonotum*
Arthropoda	Phaenopsectra punctipes grp.	*Phaenopsectra punctipes grp.*
Arthropoda	Piona	*Piona*
Arthropoda	Polypedilum aviceps	*Polypedilum aviceps*
Arthropoda	Polypedilum fallax	*Polypedilum fallax*
Arthropoda	Polypedilum flavum	*Polypedilum flavum*
Arthropoda	Polypedilum halterale grp.	*Polypedilum halterale grp.*
Arthropoda	Polypedilum illinoense grp.	*Polypedilum illinoense grp.*
Arthropoda	Polypedilum scalaenum grp.	*Polypedilum scalaenum grp.*
Arthropoda	Procambarus	*Procambarus*
Arthropoda	Procladius	*Procladius*
Arthropoda	Procloeon	*Procloeon*
Arthropoda	Pseudochironomus richardsoni	*Pseudochironomus richardsoni*
Arthropoda	Rheotanytarsus exiguus grp.	*Rheotanytarsus exiguus grp.*
Arthropoda	Scirtes	*Scirtes*
Arthropoda	Stempellinella fimbriata	*Stempellinella fimbriata*
Arthropoda	Stenacron floridense	*Stenacron floridense*
Arthropoda	Stenelmis	*Stenelmis*
Arthropoda	Stenochironomus	*Stenochironomus*
Arthropoda	Tanytarsus buckleyi	*Tanytarsus buckleyi*
Arthropoda	Tanytarsus sp. alpha	*Tanytarsus sp. alpha*
Arthropoda	Tanytarsus sp. l epler complex	*Tanytarsus sp. l epler complex*

Arthropoda	Tanytarsus sp. t epler	*Tanytarsus sp. t epler*
Arthropoda	Taphromysis	*Taphromysis*
Arthropoda	Thienemanniella lobapodema	*Thienemanniella lobapodema*
Arthropoda	Thienemanniella similis	*Thienemanniella similis*
Arthropoda	Thienemanniella xena	*Thienemanniella xena*
Arthropoda	Torrenticola	*Torrenticola*
Arthropoda	Triaenodes injustus	*Triaenodes injustus*
Arthropoda	Tribelos fuscicornis	*Tribelos fuscicornis*
Arthropoda	Tricorythodes albilineatus	*Tricorythodes albilineatus*
Arthropoda	Unionicola	*Unionicola*
Arthropoda	Xestochironomus	*Xestochironomus*
Arthropoda	Zavreliella marmorata	*Zavreliella marmorata*
Arthropoda	Green Mantidfly	*Zeugomantispa minuta*
Arthropoda	Aeshnidae	
Arthropoda	Cambaridae	
Arthropoda	Gerridae	
Arthropoda	Libellulidae	
Arthropoda	Polycentropodidae	
Arthropoda	Pyralidae	
Chordata	Alabama Shad	*Alosa alabamae*
Chordata	Bowfin	*Amia calva*
Chordata	American Eel	*Anguilla rostrata*
Chordata	Pirate Perch	*Aphredoderus sayanus*
Chordata	Sheepshead	*Archosargus probatocephalus*
Chordata	Flier	*Centrarchus macropterus*
Chordata	Common Snook	*Centropomus undecimalis*
Chordata	Sheepshead Minnow	*Cyprinodon variegatus*
Chordata	Gizzard Shad	*Dorosoma cepedianum*
Chordata	Everglades Pygmy Sunfish	*Elassoma evergladei*
Chordata	Okefenokee Pygmy Sunfish	*Elassoma okefenokee*
Chordata	Banded Pygmy Sunfish	*Elassoma zonatum*
Chordata	Bluespotted Sunfish	*Enneacanthus gloriosus*
Chordata	Lake Chubsucker	*Erimyzon sucetta*
Chordata	Redfin Pickeral	*Esox americanus*
Chordata	Swamp Darter	*Etheostoma fusiforme*
Chordata	Golden Topminnow	*Fundulus chrysotus*
Chordata	Eastern Starhead Topminnow	*Fundulus escambia*
Chordata	Seminole Killifish	*Fundulus seminolis*
Chordata	Eastern Mosquitofish	*Gambusia holbrooki*
Chordata	Least Killifish	*Heterandria formosa*
Chordata	White Bullhead/Catfish	*Ictalurus catus*
Chordata	Yellow Bullhead	*Ictalurus natalis*
Chordata	Brown Bullhead	*Ictalurus nebulosus*
Chordata	Channel Catfish	*Ictalurus punctatus*
Chordata	Flagfish	*Jordanella floridae*
Chordata	Brook Silverside	*Labidesthes sicculus*
Chordata	Longnose Gar	*Lepisosteus osseus*
Chordata	Florida Gar	*Lepisosteus platyrhincus*
Chordata	Redbreast Sunfish	*Lepomis auritus*
Chordata	Warmouth	*Lepomis gulosus*
Chordata	Bluegill	*Lepomis macrochirus*
Chordata	Dollar Sunfish	*Lepomis marginatus*
Chordata	Redear Sunfish	*Lepomis microlophus*
Chordata	Spotted Sunfish	*Lepomis punctatus*
Chordata	Pygmy Killifish	*Leptolucania ommata*

Wakulla Springs Animal List

Chordata	Bluefin Killifish	*Lucania goodei*
Chordata	Suwannee Bass	*Micropterus notius*
Chordata	Largemouth Bass	*Micropterus salmoides*
Chordata	Spotted Sucker	*Minytrema melanops*
Chordata	Striped bass	*Morone saxatilis*
Chordata	Flathead Grey Mullet	*Mugil cephalus*
Chordata	Golden Shiner	*Notomigonus crysoleucase*
Chordata	Ironcolor Shiner	*Notropis chalybaeus*
Chordata	Dusky Shiner	*Notropis cummingsae*
Chordata	Pugnose Minnow	*Notropis emiliae*
Chordata	Redeye Chub	*Notropis harperi*
Chordata	Sailfin Shiner	*Notropis hypselopterus*
Chordata	Coastal Shiner	*Notropis petersoni*
Chordata	Tadpole Madtom	*Noturus gyrinus*
Chordata	Speckled Madtom	*Noturus leptacanthus*
Chordata	Blackbanded Darter	*Percina nigrofasciata*
Chordata	Sailfin Molly	*Poecilia latipinna*
Chordata	Black Crappie	*Pomoxis nigromaculatus*
Chordata	Sailfin Shiner	*Pteronotropis hypselopterus*
Chordata	Hogchoker	*Trinectes maculatus*
Chordata	Slimy Salamander	*Plethodon glutinosus*
Chordata	Central Newt	*Notophthalmus viridescens*
Chordata	Eastern Narrow-mouthed Toad	*Gastrophryne carolinensis*
Chordata	Eastern Spadefoot Toad	*Scaphiopus holbrookii*
Chordata	Fowlers Toad	*Anaxyrus fowleri*
Chordata	Cope's Gray Teefrog	*Dryophytes chrysoscelis*
Chordata	American Green Treefrog	*Dryophytes cinereus*
Chordata	Spring Peeper	*Pseudacris crucifer*
Chordata	Pine Woods Treefrog	*Dryophytes femoralis*
Chordata	Squirrel Treefrog	*Dryophytes squirellus*
Chordata	American Bullfrog	*Lithobates catesbeianus*
Chordata	Pig Frog	*Lithobates grylio*
Chordata	Southern Leopard Frog	*Lithobates sphenocephalus*
Chordata	Southern Toad	*Anaxyrus terrestris*
Chordata	Siren	*Siren sp.*
Chordata	Florida Snapping Turtle	*Chelydra serpentina osceola*
Chordata	Alligator Snapping Turtle	*Macrochelys temminckii*
Chordata	Suwannee Cooter	*Pseudemys suwanniensis*
Chordata	Gopher Tortoise	*Gopherus polyphemus*
Chordata	Eastern Mud Turtle	*Kinosternon subrubrum*
Chordata	River Cooter	*Pseudemys concinna*
Chordata	Florida Cooter	*Pseudemys floridana*
Chordata	Common Musk Turtle	*Sternotherus odoratus*
Chordata	Gulf Coast Box Turtle	*Terrapene carolina major*
Chordata	Yellow-bellied Slider	*Trachemys scripta scripta*
Chordata	Florida Softshell Turtle	*Apalone ferox*
Chordata	American Alligator	*Alligator mississippiensis*
Chordata	Green Anole	*Anolis carolinensis*
Chordata	Brown Anole	*Anolis sagrei*
Chordata	Fence Lizard	*Sceloporus undulatus*
Chordata	Six-lined Racerunner	*Aspidoscelis sexlineatus*
Chordata	Eastern Glass Lizard	*Ophisaurus ventralis*
Chordata	Broad-headed Skink	*Plestiodon laticeps*
Chordata	Southeastern Five-lined Skink	*Plestiodon inexpectatus*
Chordata	Ground Skink	*Scincella laterale*

Wakulla Springs Animal List

Chordata	Eastern Cottonmouth	*Agkistrodon piscivorus*
Chordata	Eastern/Black Racer	*Coluber constrictor*
Chordata	Eastern Diamondback Rattlesnake	*Crotalus adamanteus*
Chordata	Dusky Pigmy Rattlesnake	*Sistrurus miliarius barbouri*
Chordata	Ring-necked Snake	*Diadophis punctatus*
Chordata	Scarlet Snake	*Cemophora coccinea*
Chordata	Scarlet King Snake	*Lampropeltis elapsoides*
Chordata	Red Rat Snake	*Pantherophis guttatus*
Chordata	Gray Rat Snake	*Pantherophis spiloides*
Chordata	Eastern Hognose Snake	*Heterodon platirhinos*
Chordata	Eastern Kingsnake	*Lampropeltis getula*
Chordata	Coachwhip	*Masticophis flagellum*
Chordata	Eastern Coral Snake	*Micrurus fulvius*
Chordata	Brown Watersnake	*Nerodia taxispilota*
Chordata	Plain-bellied Watersnake	*Nerodia erythrogaster*
Chordata	Banded Watersnake	*Nerodia fasciata*
Chordata	Rough Green Snake	*Opheodrys aestivus*
Chordata	Pine Snake	*Pituophis melanoleucus*
Chordata	Common Garter Snake	*Thamnophis sirtalis*
Chordata	Red-bellied Mudsnake	*Farancia abacura*
Chordata	Rainbow Snake	*Farancia erytrogramma*
Chordata	Common Loon	*Gavia immer*
Chordata	Pied-billed Grebe	*Podilymbus podiceps*
Chordata	Horned Grebe	*Podiceps auritus*
Chordata	Great Cormorant	*Phalacrocorax carbo*
Chordata	Double-crested Cormorant	*Phalacrocorax auritus*
Chordata	Anhinga	*Anhinga anhinga*
Chordata	Great Blue Heron	*Ardea herodias*
Chordata	Great Egret	*Ardea alba*
Chordata	Snowy Egret	*Egretta thula*
Chordata	Little Blue Heron	*Egretta caerulea*
Chordata	Tricolored Heron	*Egretta tricolor*
Chordata	Green Heron	*Butorides virescens*
Chordata	Black-crowned Night-Heron	*Nycticorax nycticorax*
Chordata	Yellow-crowned Night-Heron	*Nycticorax violaceus*
Chordata	American Bittern	*Botaurus Lentiginosus*
Chordata	Least Bittern	*Ixobrychus exilis*
Chordata	American White Ibis	*Eudocimus albus*
Chordata	Roseate Spoonbill	*Ajaia ajaja*
Chordata	Wood Stork	*Mycteria americana*
Chordata	Canada Goose	*Branta canadensis*
Chordata	Snow Goose	*Chen caerulescens*
Chordata	Black Vulture	*Coragyps atratus*
Chordata	Turkey Vulture	*Cathartes aura*
Chordata	Wood Duck	*Aix sponsa*
Chordata	Green-winged Teal	*Anas crecca*
Chordata	American Black Duck	*Anas rubripes*
Chordata	Mallard	*Anas platyrhynchos*
Chordata	Blue-winged Teal	*Anas discors*
Chordata	Northern Shoveler	*Anas clypeata*
Chordata	Gadwall	*Anas strepera*
Chordata	Eurasian Wigeon	*Anas penelope*
Chordata	American Wigeon	*Anas americana*
Chordata	Canvasback	*Aythya valisineria*
Chordata	Redhead	*Aythya americana*

Wakulla Springs Animal List

Chordata	Ring-necked Duck	*Aythya collaris*
Chordata	Greater Scaup	*Aythya marila*
Chordata	Lesser Scaup	*Aythya affinis*
Chordata	Bufflehead	*Bucephala albeola*
Chordata	Common Goldeneye	*Bucephala clangula*
Chordata	Hooded Merganser	*Lophodytes cucullatus*
Chordata	Red-breasted Merganser	*Mergus serrator*
Chordata	Osprey	*Pandion haliaetus*
Chordata	Swallow-tailed Kite	*Elanoides forficatus*
Chordata	Snail Kite	*Rostrhamus sociabilis*
Chordata	Mississippi Kite	*Ictinia mississippiensis*
Chordata	Bald Eagle	*Haliaeetus leucocephalus*
Chordata	Northern Harrier	*Circus hudsonius*
Chordata	Sharp-shinned Hawk	*Accipiter striatus*
Chordata	Cooper's Hawk	*Accipiter cooperii*
Chordata	Red-shouldered Hawk	*Buteo lineatus*
Chordata	Broad-winged Hawk	*Buteo platypterus*
Chordata	Red-tailed Hawk	*Buteo jamaicensis*
Chordata	Golden Eagle	*Aquila chrysaetos*
Chordata	American Kestrel	*Falco sparverius*
Chordata	Merlin	*Falco columbarius*
Chordata	Peregrine Falcon	*Falco peregrinus*
Chordata	Wild Turkey	*Meleagris gallopavo*
Chordata	Northern Bobwhite	*Colinus virginianus*
Chordata	Virginia Rail	*Rallus limicola*
Chordata	Sora	*Porzana carolina*
Chordata	Purple Gallinule	*Porphyrio martinicus*
Chordata	Common Gallinule	*Gallinula chloropus*
Chordata	American Coot	*Fulica americana*
Chordata	American Oystercatcher	*Haematopus palliatus*
Chordata	Limpkin	*Aramus guarauna*
Chordata	Sandhill Crane	*Antigone canadensis*
Chordata	Killdeer	*Charadrius vociferus*
Chordata	Solitary Sandpiper	*Tringa solitaria*
Chordata	Spotted Sandpiper	*Actitis macularius*
Chordata	Common Snipe	*Gallinago gallinago*
Chordata	American Woodcock	*Scolopax minor*
Chordata	Magnificent Frigatebird	*Fregata magnificens*
Chordata	Laughing Gull	*Leucophaeus atricilla*
Chordata	Bonaparte's Gull	*Chroicocephalus philadelphia*
Chordata	Ring-billed Gull	*Larus delawarensis*
Chordata	Black Tern	*Chlidonias niger*
Chordata	Forster's Tern	*Sterna forsteri*
Chordata	Sooty Tern	*Onychoprion fuscatus*
Chordata	Common Ground Dove	*Columbina passerine*
Chordata	Mourning Dove	*Zenaida macroura*
Chordata	Yellow-billed Cuckoo	*Coccyzus americanus*
Chordata	Common Barn Owl	*Tyto alba*
Chordata	Eastern Screech Owl	*Megascops asio*
Chordata	Great Horned Owl	*Bubo virginianus*
Chordata	Barred Owl	*Strix varia*
Chordata	Common Nighthawk	*Chordeiles minor*
Chordata	Chuck-will's-widow	*Caprimulgus carolinensis*
Chordata	Whip-poor-will	*Caprimulgus vociferus*
Chordata	Chimney Swift	*Chaetura pelagica*

Chordata	Ruby-throated Hummingbird	*Archilochus colubris*
Chordata	Belted Kingfisher	*Megaceryle alcyon*
Chordata	Red-headed Woodpecker	*Melanerpes erythrocephalus*
Chordata	Red-bellied Woodpecker	*Melanerpes carolinus*
Chordata	Yellow-bellied Sapsucker	*Sphyrapicus varius*
Chordata	Downy Woodpecker	*Dryobates pubescens*
Chordata	Hairy Woodpecker	*Dryobates villosus*
Chordata	Northern Flicker	*Colaptes auratus*
Chordata	Pileated Woodpecker	*Dryocopus pileatus*
Chordata	Eastern Wood-Pewee	*Contopus virens*
Chordata	Eastern Phoebe	*Sayornis phoebe*
Chordata	Acadian Flycatcher	*Empidonax virescens*
Chordata	Great Crested Flycatcher	*Myiarchus crinitus*
Chordata	Eastern Kingbird	*Tyrannus tyrannus*
Chordata	Purple Martin	*Progne subis*
Chordata	Tree Swallow	*Tachycineta bicolor*
Chordata	Northern Rough-winged Swallow	*Stelgidopteryx serripennis*
Chordata	Bank Swallow	*Riparia riparia*
Chordata	Barn Swallow	*Hirundo rustica*
Chordata	Blue Jay	*Cyanocitta cristata*
Chordata	American Crow	*Corvus brachyrhynchos*
Chordata	Fish Crow	*Corvus ossifragus*
Chordata	Carolina Chickadee	*Parus carolinensis*
Chordata	Tufted Titmouse	*Parus bicolor*
Chordata	Red-breasted Nuthatch	*Sitta canadensis*
Chordata	White-breasted Nuthatch	*Sitta carolinensis*
Chordata	Brown-headed Nuthatch	*Sitta pusilla*
Chordata	Brown Creeper	*Certhia americana*
Chordata	Carolina Wren	*Thryothorus ludovicianus*
Chordata	House Wren	*Troglodytes aedon*
Chordata	Winter Wren	*Troglodytes troglodytes*
Chordata	Marsh Wren	*Cistothorus palustris*
Chordata	Sedge Wren	*Cistothorus platensis*
Chordata	Golden-crowned Kinglet	*Regulus satrapa*
Chordata	Ruby-crowned Kinglet	*Regulus calendula*
Chordata	Blue-gray Gnatcatcher	*Polioptila caerulea*
Chordata	Eastern Bluebird	*Sialia sialis*
Chordata	Veery	*Catharus fuscescens*
Chordata	Gray-cheeked Thrush	*Catharus minimus*
Chordata	Swainson's Thrush	*Catharus ustulatus*
Chordata	Hermit Thrush	*Catharus guttatus*
Chordata	Wood Thrush	*Hylocichla mustelina*
Chordata	American Robin	*Turdus migratorius*
Chordata	Gray Catbird	*Dumetella carolinensis*
Chordata	Northern Mockingbird	*Mimus polyglottos*
Chordata	Brown Thrasher	*Toxostoma rufum*
Chordata	Cedar Waxwing	*Bombycilla cedrorum*
Chordata	Loggerhead Shrike	*Lanius ludovicianus*
Chordata	White-eyed Vireo	*Vireo griseus*
Chordata	Solitary Vireo	*Vireo solitarius*
Chordata	Yellow-throated Vireo	*Vireo flavifrons*
Chordata	Red-eyed Vireo	*Vireo olivaceus*
Chordata	Golden-winged Warbler	*Vermivora chrysoptera*
Chordata	Tennessee Warbler	*Vermivora peregrina*
Chordata	Orange-crowned Warbler	*Vermivora celata*

Wakulla Springs Animal List

Chordata	Northern Parula	*Parula americana*
Chordata	Black-throated Blue Warbler	*Dendroica caerulescens*
Chordata	Chestnut-sided Warbler	*Dendroica pensylvanica*
Chordata	Magnolia Warbler	*Dendroica magnolia*
Chordata	Yellow-rumped Warbler	*Dendroica coronata*
Chordata	Yellow-throated Warbler	*Dendroica dominica*
Chordata	Pine Warbler	*Dendroica pinus*
Chordata	Palm Warbler	*Dendroica palmarum*
Chordata	Cerulean Warbler	*Dendroica cerulea1*
Chordata	Blackpoll Warbler	*Dendroica striata*
Chordata	Black-and-white Warbler	*Mniotilta varia*
Chordata	American Redstart	*Setophaga ruticilla*
Chordata	Prothonotary Warbler	*Protonotaria citrea*
Chordata	Worm-eating Warbler	*Helmitheros vermivorum*
Chordata	Ovenbird	*Seiurus aurocapilla*
Chordata	Northern Waterthrush	*Parkesia noveboracensis*
Chordata	Louisiana Waterthrush	*Parkesia motacilla*
Chordata	Kentucky Warbler	*Geothlypis formosa*
Chordata	Common Yellowthroat	*Geothlypis trichas*
Chordata	Hooded Warbler	*Setophaga citrina*
Chordata	Wilson's Warbler	*Cardellina pusilla*
Chordata	Blue-winged Warbler	*Vermivora cyanoptera*
Chordata	Summer Tanager	*Piranga rubra*
Chordata	Scarlet Tanager	*Piranga olivacea*
Chordata	Northern Cardinal	*Cardinalis cardinalis*
Chordata	Blue Grosbeak	*Passerina caerulea*
Chordata	Rose-breasted Grosbeak	*Pheucticus ludovicianus*
Chordata	Indigo Bunting	*Passerina cyanea*
Chordata	Rufous-sided Towhee	*Pipilo erythrophthalmus*
Chordata	Chipping Sparrow	*Spizella passerina*
Chordata	Field Sparrow	*Spizella pusilla*
Chordata	Fox Sparrow	*Passerella iliaca*
Chordata	Song Sparrow	*Melospiza melodia*
Chordata	Swamp Sparrow	*Melospiza georgiana*
Chordata	White-crowned Sparrow	*Zonotrichia leucophrys*
Chordata	White-throated Sparrow	*Zonotrichia albicollis*
Chordata	Dark-eyed Junco	*Junco hyemalis*
Chordata	Red-winged Blackbird	*Agelaius phoeniceus*
Chordata	Rusty Blackbird	*Euphagus carolinus*
Chordata	Boat-tailed Grackle	*Quiscalus major*
Chordata	Common Grackle	*Quiscalus quiscula*
Chordata	Brown-headed Cowbird	*Molothrus ater*
Chordata	Orchard Oriole	*Icterus spurius*
Chordata	Purple Finch	*Haemorhous purureus*
Chordata	Pine Siskin	*Spinus pinus*
Chordata	American Goldfinch	*Carduelis tristis*
Chordata	Nine-banded armadillo	*Dasypus novemcinctus*
Chordata	Opossum	*Didelphis marsupialis*
Chordata	Eastern mole	*Scalopus aquaticus*
Chordata	Marsh rabbit	*Sylvilagus palustris*
Chordata	Eastern cottontail	*Sylvilagus floridanus*
Chordata	Gray squirrel	*Sciurus carolinensis*
Chordata	Fox squirrel	*Sciurus niger*
Chordata	Southern flying squirrel	*Glaucomys volans*
Chordata	Cotton mouse	*Peromyscus gossypinus*

Wakulla Springs Animal List

Chordata	Golden mouse	*Ochrotomys nuttalli*
Chordata	Gray fox	*Urocyon cinereoargenteus*
Chordata	Florida black bear	*Ursus americanus floridanus*
Chordata	Raccoon	*Procyon lotor*
Chordata	North American River otter	*Lutra canadensis*
Chordata	Bobcat	*Felis rufus*
Chordata	West Indian manatee	*Trichechus manatus latirostris*
Chordata	White-tailed deer	*Odocoileus virginianus*
Chordata	Southeastern bat	*Myotis austroriparious*
Chordata	Tricolored Bat	*Perimyotis subflavus*
Chordata	Seminole bat	*Lasiurus seminolus*
Chordata	Red bat	*Lasiurus borealis*
Chordata	Eastern yellow bat	*Lasiurus intermedius*
Mollusca	Amnicola	*Amnicola*
Mollusca	Campeloma	*Campeloma*
Mollusca	Corbicula fluminea	*Corbicula fluminea*
Mollusca	Elliptio	*Elliptio*
Mollusca	Laevapex diaphanus	*Laevapex diaphanus*
Mollusca	Lymnaea columella	*Lymnaea columella*
Mollusca	Melanoides	*Melanoides*
Mollusca	Menetus	*Micromenetus*
Mollusca	Notogillia wetherbyi	*Notogillia wetherbyi*
Mollusca	Physa	*Physa*
Mollusca	Planorbella	*Planorbella*
Mollusca	Pleurocera	*Pleurocera*
Mollusca	Pomacea	*Pomacea*
Mollusca	Tarebia	*Tarebia*
Mollusca	Ancylidae	
Mollusca	Sphaeriidae(mollusca)	
Mollusca	Florida Floater Clam	*Anodonta peggyae*
Mollusca	Florida Elliptio Clam	*Elliptio jayensis*
Mollusca	Ram's-horn Snail	*Goniobasis floridense*
Mollusca	Seminole Rams-horn Snail	*Helisoma duryi*
Mollusca	Florida Applesnail	*Pomacea paludosa*
Nemertea	Prostoma	*Prostoma*
Platyhelminthes	Platyhelminthes	
Platyhelminthes	Tricladida	

Addendum 6—Imperiled Species Ranking Definitions

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

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

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

FNAI GLOBAL RANK DEFINITIONS

G1............ Critically imperiled globally because of extreme rarity (5 or fewer occurrences or less than 1000 individuals) or because of extreme vulnerability to extinction due to some natural or fabricated factor.
G2............ Imperiled globally because of rarity (6 to 20 occurrences or less than 3000 individuals) or because of vulnerability to extinction due to some natural or man-made factor.
G3............ Either very rare or local throughout its range (21-100 occurrences or less than 10,000 individuals) or found locally in a restricted range or vulnerable to extinction of other factors.
G4............ apparently secure globally (may be rare in parts of range)
G5............ demonstrably secure globally
GH .... of historical occurrence throughout its range may be rediscovered (e.g., ivory-billed woodpecker)
GX .... believed to be extinct throughout range
GXC.......... extirpated from the wild but still known from captivity or cultivation
G#?.......... Tentative rank (e.g.,G2?)
G#G# .... range of rank; insufficient data to assign specific global rank (e.g., G2G3)
G#T# .... rank of a taxonomic subgroup such as a subspecies or variety; the G portion of the rank refers to the entire species and the T portion refers to the specific subgroup; numbers have same definition as above (e.g., G3T1)
G#Q .... rank of questionable species - ranked as species but questionable whether it is species or subspecies; numbers have same definition as above (e.g., G2Q)
G#T#Q ...... same as above, but validity as subspecies or variety is questioned.
GU .... due to lack of information, no rank or range can be assigned (e.g., GUT2).
G?............ Not yet ranked (temporary)

Imperiled Species Ranking Definitions

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

LEGAL STATUS

FEDERAL

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

LE .... Listed as Endangered Species in the List of Endangered and Threatened Wildlife and Plants under the provisions of the Endangered Species Act. Defined as any species that is in danger of extinction throughout all or a significant portion of its range.
PE .... Proposed for addition to the List of Endangered and Threatened Wildlife and Plants as Endangered Species.
LT .... Listed as Threatened Species. Defined as any species that is likely to become an endangered species within the near future throughout all or a significant portion of its range.
PT .... Proposed for listing as Threatened Species.
C .... Candidate Species for addition to the list of Endangered and Threatened Wildlife and Plants. Defined as those species for which the USFWS currently has on file sufficient information on biological vulnerability and threats to support proposing to list the species as endangered or threatened.
E(S/A) .... Endangered due to similarity of appearance.
T(S/A) .... Threatened due to similarity of appearance.
EXPE, XE .... Experimental essential population. A species listed as experimental and essential.
EXPN, XN ... Experimental non-essential population. A species listed as experimental and non-essential. Experimental, nonessential populations of endangered species are treated as threatened species on public land, for consultation purposes.

STATE

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

FE .... Federally-designated Endangered

FT .... Federally-designated Threatened

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

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

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

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

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

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

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

Addendum 7—Cultural Information

Management Procedures for Archaeological and Historical Sites and Properties on State-Owned or Controlled Properties
(revised June 2021)

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

A. Historic Property Definition

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

B. Agency Responsibilities

Per Chapter 267, *F.S.* and state policy related to historic properties, state agencies of the executive branch must provide the Division of Historical Resources (Division) the opportunity to comment on any undertakings with the potential to affect historic properties that are listed, or eligible for listing, in the National Register of Historic Places, whether these undertakings directly involve the state agency, i.e., land management responsibilities, or the state agency has indirect jurisdiction, i.e. permitting authority, grants, etc. No state funds should be expended on the undertaking until the Division has the opportunity to review and comment on the undertaking. (267.061(2)(a))

State agencies must consult with the Division when, as a result of state action or assistance, a historic property will be demolished or substantially altered in a way that will adversely affect the property. State agencies must take timely steps to consider feasible and prudent alternatives to the adverse effect. If no feasible or prudent alternatives exist, the state agency must take timely steps to avoid or mitigate the adverse effect. (267.061(2)(b))

State agencies must consult with Division to establish a program to locate, inventory and evaluate all historic properties under ownership or controlled by the agency. (267.061(2)(c))

State agencies are responsible for preserving historic properties under their control. State agencies are directed to use historic properties available to the agency when that use is consistent with the historic property and the agency's mission. State agencies are also directed to pursue preservation of historic properties to support their continued use. (267.061(2)(d))

C. Statutory Authority

The full text of Chapter 267, F.S. and additional information related to the treatment of historic properties is available at:

https://dos.myflorida.com/historical/preservation/compliance-and-review/regulations-guidelines/

D. Management Implementation

Although the Division sits on the Acquisition and Restoration Council and approves land management plans, these plans are conceptual and do not include detailed project information. Specific information for individual projects must be submitted to the Division for review and comment.

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

Projects such as additions or alterations to historic structures as well as new construction must also be submitted to the Division for review. Projects involving structures fifty years of age or older must be submitted to the Division for a significance determination**.** In rare cases, structures under fifty years of age may be deemed historically significant.

Adverse effects to historic properties must be avoided when possible, and if avoidance is not possible, additional consultation with the Division is necessary to develop a mitigation plan. Furthermore, managers of state property should make preparations for locating and evaluating historic properties, both archaeological sites and historic structures.

E. Archaeological Resource Management (ARM) Training

The ARM Training Course introduces state land managers to the nature of archaeological resources, Florida archaeology, and the role of the Division in managing state-owned archaeological resources. Participants gain a better understanding of the requirements of state and federal laws with regard to protecting and managing archaeological sites on state managed lands. Participants also receive a certificate recognizing their ability to conduct limited monitoring activities in accordance with the Division's Review Procedure, thereby reducing the time and money spent to comply with state regulations. Additional information regarding the ARM Training Course is available at:

https://dos.myflorida.com/historical/archaeology/education/arm-training-courses/

F. Matrix for Ground Disturbance on State Lands

The matrix is a tool designed to help streamline the Division's Review Procedure. The matrix allows state land managers to make decisions about balancing ground disturbance and stewardship of historic resources. The matrix establishes types of undertakings that are either minor or major disturbances and then guides the land manager to consult the Division, conduct ARM-trained project monitoring, or proceed with the project. Additional information regarding the matrix is available at:

https://dos.myflorida.com/historical/archaeology/education/dhr-matrix-for-ground-disturbance-on-state-lands/

G. Human Remains Treatment

Chapter 872, *Florida Statutes* makes it illegal to willfully and knowingly disturb human remains. In the event human remains are discovered, cease all activity in the area that may disturb the remains. Leave the bones and nearby items in place. Immediately notify law enforcement or the local district medical examiner of the discovery and follow the provisions of Chapter 872, FS. Additional information regarding the treatment of human remains and cemeteries is available at:

https://dos.myflorida.com/historical/archaeology/human-remains/
https://dos.myflorida.com/historical/archaeology/human-remains/abandoned-cemeteries/what-are-the-applicable-laws-and-regulations/

H. Division of Historical Resources Review Procedure

Projects on state owned or controlled properties may submit projects to the Division for review using the streamlined State Lands Consultation Form. The form provides instructions to submit projects for review and outlines the necessary information for the Division to complete the review process. The State Lands Consultation Form and additional information about the Division's review process is available at:

https://dos.myflorida.com/historical/preservation/compliance-and-review/state-lands-review/

* * *

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

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

StateLandsCompliance@dos.myflorida.com

Phone: (850) 245-6333
Toll Free: (800) 847-7278
Fax: (850) 245-6435

Addendum 8—Timber Management Analysis

Addendum 8
Timber Management Analysis

1. *Management Context and Best Management Practices*

Timber management at Edward Ball Wakulla Springs State Park (Wakulla Springs) is based on the desired future condition (DFC) of a management zone or natural community (NatCom) as determined by the DRP Unit Management Plans (UMP), along with guidelines developed by the FNAI. In most cases, the DFC will be closely related to the historic NatCom. However, it is important to note, that in areas where the historic community has been severely altered by past land use practices, the DFC may not always be the same as the historic NatCom. All timber management activities undertaken will adhere to or exceed the current Florida Silvicultural Best Management Practices (BMPs) and Florida Forestry Wildlife BMPs for State Imperiled Species. DRP shall take all measures necessary to protect water quality and wildlife species of concern while conducting timber management activities. DRP has contracted with a private sector, professional forest management firm to complete this timber assessment: F4 Tech.

2. *Purpose of Timber Management Activities*

Timber management activities may be conducted to help improve or maintain current conditions to achieve the associated DFC. Timber management will primarily be conducted in upland NatCom types. Candidate upland NatCom types may include mesic flatwoods, wet flatwoods, sandhill, upland pine, and upland mixed woodland along with scrubby flatwoods, scrub, and altered landcover types such as successional hardwood forest and pine plantations. There will likely be no scheduled timber management activities in historically hardwood-dominated or wetland NatCom types, e.g., upland hardwood forest, hydric hammock, and slope forest. In some circumstances, timber management may include the harvesting and removal of overstory invasive/exotic trees. Descriptions of community types are detailed in the Resource Management Component.

3. *Potential Silvicultural Treatments*

Several silvicultural treatments may be considered and utilized over the next ten years. The various types of timber harvests may include pine thinning, targeted hardwood overstory removal, and clearcutting. Silvicultural treatments will be selectively implemented to minimize potential impacts to water and soil resources, non-target vegetation, and wildlife (see BMPs). Depending upon the condition and marketability of the timber being manipulated, it is possible to generate revenue from the harvest. It is also possible the timber removal could be a cost to DRP. In all decisions, the mission of preserving and restoring natural communities will be the guiding factor.

Thinning is conducted to reduce the basal area (BA) or density of trees/stems in a stand to improve forest health and growth conditions for residual trees. Allowing trees more room to grow has the potential to increase tree and forest vigor, which helps mitigate the potential for damaging insect and disease outbreaks. Most tree harvesting/removals also increase sunlight reaching the forest floor and fine fuels that facilitate consistent fire return intervals and responses, which can benefit groundcover vegetation abundance, species richness, and overall ecological diversity. The disruption of natural fire regimes and fire return intervals can often result in the need to remove undesirable or overstocked hardwood stems that currently occupy growing space in the canopy and sub-canopy. Clearcutting may be used to support restoration goals by removing off-site pine or hardwood species and is a precursor to establishing site-appropriate species. It can also be used to control insect infestations that are damaging or threatening forest resources and ecosystem conditions.

On occasion, salvage cuts may need to be conducted to remove small volumes of wood damaged by fire, windstorm, insects, or other natural causes. The decision whether or not to harvest the affected timber will depend on the threat to the surrounding stands, risk of collateral ecological damage, and the volume/value of the trees involved. For example, small, isolated lightning-strikes and beetle kills are a natural part of a healthy ecosystem and normally would not be cut. However, if a drought caused the insect infestation to spread, the affected trees and a buffer zone might have to be removed to prevent significant damage.

4. *Inventory Data and Potential Actions per Area of Interest or Management Zone*

Wakulla Springs comprises 6,787 acres in Wakulla County. A total of 4,718 acres are associated with four (4) upland NatCom types that are potential candidates for timber management. From March to May 2016, an inventory based on field plots was conducted across and within a large percentage of these areas to quantify overstory, midstory and understory conditions. A second inventory was conducted in the recently-acquired Ferrell Tract in August and September 2020. Various park-level and NatCom-level summary statistics can be found in the following tables.

This timber assessment was based on management zone and NatCom boundary GIS data provided by DRP in July and August 2020. It is not intended to be prescriptive. Stakeholders and DRP staff are encouraged to view this timber assessment and inventory data as supplemental information for future consideration. Given the dynamic nature of property ownership and land management activities at Wakulla Springs, together with the timeframe required to create or update a UMP, it is possible that some tabular data may be dated. Therefore, NatCom acreages and recent treatments that occurred after the August 2020 period may not be reflected in the following tables.

Table 1. General summary statistics for Edward Ball Wakulla Springs State Park

Number of Management Zones within the Park	71
Upland NatCom acres	5,953

Mesic Flatwoods (22.1 acres)

Longleaf pine (*Pinus palustris*) is the preferred overstory pine species in the region. The FNAI reference site in this region for mesic flatwoods contains longleaf pine at a basal area (BA) of 10 to 50 square feet per acre with non-pine at a density of 0 trees per acre (TPA). The following table shows the overstory condition for this natural community at Wakulla Springs and target overstory condition for mesic flatwoods in this region.

MZ ID	Mesic Flatwoods (Acres)	Current Average Overstory Conditions							Target Overstory Conditions	
		Pine BA (ft^2/ac)	Pine TPA	Pine Volume (tons/ac)	Non-Pine BA (ft^2/ac)	Non-Pine TPA	Non-Pine Volume (tons/ac)	Total Pine and Non-Pine Volume (tons/ac)	FNAI Reference Condition Pine BA Range (ft^2/ac)	FNAI Reference Condition Non-Pine TPA Range
WK-F6	22.1	--	--	--	--	--	--	--	--	--
Total	**22.1**									

Scrubby Flatwoods (8.9 acres)

Slash pine (*Pinus elliottii*) and longleaf pine (*Pinus palustris*) are the preferred overstory pine species in the region. The FNAI reference sites in this region for scrubby flatwoods contains slash pine and longleaf pine at a basal area (BA) of 10 to 60 square feet per acre with non-pine at a density of 0 to 26 trees per acre (TPA). The following table shows the overstory condition for this natural community at Wakulla Springs and target overstory condition for scrubby flatwoods in this region.

MZ ID	Scrubby Flatwoods (Acres)	Current Average Overstory Conditions							Target Overstory Conditions	
		Pine BA (ft^2/ac)	Pine TPA	Pine Volume (tons/ac)	Non-Pine BA (ft^2/ac)	Non-Pine TPA	Non-Pine Volume (tons/ac)	Total Pine and Non-Pine Volume (tons/ac)	FNAI Reference Condition Pine BA Range (ft^2/ac)	FNAI Reference Condition Non-Pine TPA Range
WK-20	0.9	--	--	--	--	--	--	--	--	--
WK-D	8.0	50.0	37.1	48.8	40.0	167.7	29.4	78.1	10 - 60	0 - 26
Total	**8.9**									

Upland Mixed Woodland (1,607.3)

Shortleaf pine (*Pinus echinata*), southern red oak (*Quercus falcata*), mockernut hickory (*Carya tomentosa*), and post oak (*Quercus stellata*) are the preferred overstory species in the region. The FNAI reference site in this region for upland mixed woodland contains shortleaf pine at a basal area (BA) of 10 to 50 square feet per acre with non-pine species between 26 to 132 trees per acre (TPA). The following table shows the overstory condition for this natural community at Wakulla Springs and target overstory condition for upland mixed woodland in this region.

MZ ID	Upland Mixed Woodland (Acres)	Current Average Overstory Conditions							Target Overstory Conditions	
		Pine BA (ft^2/ac)	Pine TPA	Pine Volume (tons/ac)	Non-Pine BA (ft^2/ac)	Non-Pine TPA	Non-Pine Volume (tons/ac)	Total Pine and Non-Pine Volume (tons/ac)	FNAI Reference Condition Pine BA Range (ft^2/ac)	FNAI Reference Condition Non-Pine TPA Range
WK-09	5.8	0.0	0.0	0.0	120.0	321.5	99.9	99.9	10 - 50	26 - 132
WK-10	185.4	7.2	6.3	6.4	45.6	226.8	21.8	28.3	10 - 50	26 - 132
WK-11	160.0	22.4	39.8	17.9	29.6	201.9	9.7	27.6	10 - 50	26 - 132
WK-12	88.1	0.0	0.0	0.0	53.0	348.9	18.6	18.6	10 - 50	26 - 132
WK-17	4.3	--	--	--	--	--	--	--	--	--
WK-20	9.5	33.3	29.4	30.3	80.0	172.2	65.4	95.6	10 - 50	26 - 132
WK-C	74.2	63.6	46.3	76.8	65.5	121.3	56.6	133.4	10 - 50	26 - 132
WK-E	128.5	14.1	13.8	15.4	109.4	207.5	109.4	124.7	10 - 50	26 - 132
WK-F1	4.3	10.0	6.2	9.3	30.0	24.5	28.0	37.3	10 - 50	26 - 132
WK-F3	9.3	0.0	0.0	0.0	100.0	141.6	65.5	65.5	10 - 50	26 - 132
WK-II	76.2	17.7	59.6	11.2	52.3	254.6	23.3	34.4	10 - 50	26 - 132
WK-O	247.3	2.9	4.4	2.4	58.0	291.7	29.8	32.2	10 - 50	26 - 132
WK-P	144.0	14.6	33.0	10.3	50.0	233.0	22.6	32.9	10 - 50	26 - 132
WK-Q	75.3	0.8	0.8	0.4	33.9	180.0	7.4	7.8	10 - 50	26 - 132
WK-S	357.4	12.4	47.7	6.1	46.0	185.5	26.5	32.6	10 - 50	26 - 132
WK-TT	28.8	80.0	109.9	69.3	46.7	182.8	29.8	99.0	10 - 50	26 - 132
WK-WW	8.9	--	--	--	--	--	--	--	--	--
Total	**1,607.3**									

Upland Pine (3,079.5 acres)

Longleaf pine (*Pinus palustris*) is the preferred overstory pine species in the region. The FNAI reference site in this region for upland pine contains longleaf pine at a basal area (BA) of 30 to 80 square feet per acre with non-pine species between 0 and 26 trees per acre (TPA). The following table shows the overstory condition for this natural community at Wakulla Springs and target overstory condition for upland pine in this region.

MZ ID	Upland Pine (Acres)	Current Average Overstory Conditions							Target Overstory Conditions	
		Pine BA (ft2/ac)	Pine TPA	Pine Volume (tons/ac)	Non-Pine BA (ft2/ac)	Non-Pine TPA	Non-Pine Volume (tons/ac)	Total Pine and Non-Pine Volume (tons/ac)	FNAI Reference Condition Pine BA Range (ft2/ac)	FNAI Reference Condition Non-Pine TPA Range
WK-01	19.9	120.0	172.6	101.9	25.7	125.7	8.1	110.0	30 - 80	0 - 26
WK-02	18.3	120.0	157.1	108.8	20.0	130.6	7.6	116.4	30 - 80	0 - 26
WK-03	47.9	145.7	157.8	136.0	14.3	43.6	11.8	147.8	30 - 80	0 - 26
WK-04	18.8	116.0	133.5	105.7	4.0	9.7	3.4	109.1	30 - 80	0 - 26

MZ ID	Upland Pine (Acres)	Current Average Overstory Conditions							Target Overstory Conditions	
		Pine BA (ft2/ac)	Pine TPA	Pine Volume (tons/ac)	Non-Pine BA (ft2/ac)	Non-Pine TPA	Non-Pine Volume (tons/ac)	Total Pine and Non-Pine Volume (tons/ac)	FNAI Reference Condition Pine BA Range (ft2/ac)	FNAI Reference Condition Non-Pine TPA Range
WK-05	6.2	133.3	189.8	117.8	20.0	96.7	0.0	117.8	30 - 80	0 - 26
WK-06	17.4	146.7	157.4	132.8	13.3	63.4	8.9	141.7	30 - 80	0 - 26
WK-07	4.2	--	--	--	--	--	--	--	--	--
WK-08	0.3	--	--	--	--	--	--	--	--	--
WK-14	13.5	86.7	38.0	99.5	60.0	208.8	34.2	133.7	30 - 80	0 - 26
WK-16	25.8	5.0	0.9	0.0	105.0	103.8	115.8	115.8	30 - 80	0 - 26
WK-17	38.7	51.4	19.7	47.0	48.6	81.6	51.4	98.4	30 - 80	0 - 26
WK-19	16.2	26.7	24.6	26.4	140.0	220.6	130.1	156.5	30 - 80	0 - 26
WK-20	14.2	0.0	0.0	0.0	166.7	273.0	61.5	61.5	30 - 80	0 - 26
WK-A	152.9	68.2	55.9	73.1	56.3	113.6	48.2	121.3	30 - 80	0 - 26
WK-AA	10.1	135.0	177.1	121.5	5.0	28.2	2.6	124.1	30 - 80	0 - 26
WK-B	80.6	101.3	171.9	87.3	33.8	46.9	28.0	115.3	30 - 80	0 - 26
WK-BB	41.7	68.6	127.0	60.2	5.7	28.6	1.2	61.4	30 - 80	0 - 26
WK-C	139.4	56.2	34.1	65.6	73.3	140.5	61.3	126.9	30 - 80	0 - 26
WK-CC	42.1	58.3	112.0	50.5	6.7	39.4	2.2	52.7	30 - 80	0 - 26
WK-D	129.8	31.4	19.1	34.7	94.3	219.1	79.5	114.2	30 - 80	0 - 26
WK-DD	47.7	137.5	196.7	122.7	20.0	58.9	11.0	133.7	30 - 80	0 - 26
WK-E	441.3	59.4	55.5	61.7	57.8	112.9	52.6	114.3	30 - 80	0 - 26
WK-EE	39.0	66.7	131.7	55.6	3.3	28.3	0.0	55.6	30 - 80	0 - 26
WK-F	61.5	58.3	30.0	61.3	58.3	59.5	62.7	124.0	30 - 80	0 - 26
WK-F1	12.7	40.0	31.4	33.5	55.0	131.7	45.1	78.6	30 - 80	0 - 26
WK-F2	75.9	11.5	96.0	3.7	0.0	0.0	0.0	3.7	30 - 80	0 - 26
WK-F3	102.8	43.3	136.4	30.0	18.7	32.5	15.4	45.3	30 - 80	0 - 26
WK-F4	67.7	27.3	110.5	15.2	10.0	17.6	7.8	23.0	30 - 80	0 - 26
WK-F6	77.7	18.7	146.9	4.4	9.0	34.9	4.9	9.3	30 - 80	0 - 26
WK-F7	91.9	33.6	181.5	9.9	16.0	18.9	10.1	20.1	30 - 80	0 - 26
WK-F8	189.7	33.5	99.4	22.1	40.4	116.7	23.7	45.8	30 - 80	0 - 26
WK-FF	49.9	64.0	119.8	46.0	9.0	32.0	2.1	48.1	30 - 80	0 - 26
WK-G	21.2	48.0	20.2	46.8	104.0	312.8	53.3	100.0	30 - 80	0 - 26
WK-H	12.8	90.0	35.3	96.0	45.0	104.6	15.8	111.8	30 - 80	0 - 26
WK-HH	7.3	15.0	10.7	15.1	105.0	136.3	39.7	54.8	30 - 80	0 - 26
WK-I	72.0	70.0	43.8	64.6	75.0	168.6	56.7	121.2	30 - 80	0 - 26
WK-J	80.1	69.2	53.3	67.9	29.2	49.4	24.3	92.1	30 - 80	0 - 26
WK-K	22.0	50.0	89.3	50.4	8.0	30.4	3.3	53.7	30 - 80	0 - 26
WK-KK	9.3	73.3	98.8	67.6	33.3	52.1	30.9	98.6	30 - 80	0 - 26
WK-LL	11.8	110.0	137.0	100.3	15.0	92.3	3.1	103.4	30 - 80	0 - 26
WK-N	5.5	--	--	--	--	--	--	--	--	--

MZ ID	Upland Pine (Acres)	Current Average Overstory Conditions							Target Overstory Conditions	
		Pine BA (ft2/ac)	Pine TPA	Pine Volume (tons/ac)	Non-Pine BA (ft2/ac)	Non-Pine TPA	Non-Pine Volume (tons/ac)	Total Pine and Non-Pine Volume (tons/ac)	FNAI Reference Condition Pine BA Range (ft2/ac)	FNAI Reference Condition Non-Pine TPA Range
WK-NN	27.0	90.0	94.0	84.4	5.0	9.0	4.1	88.5	30 - 80	0 - 26
WK-OO	61.9	102.0	98.5	95.6	36.0	74.4	23.1	118.8	30 - 80	0 - 26
WK-PP	31.4	86.7	140.2	74.4	1.1	4.2	0.6	75.0	30 - 80	0 - 26
WK-QQ	64.1	108.0	115.2	102.8	36.0	96.1	21.6	124.3	30 - 80	0 - 26
WK-R	22.6	21.4	25.1	18.1	71.4	274.8	35.6	53.7	30 - 80	0 - 26
WK-RR	40.1	94.0	92.2	89.8	48.0	147.6	27.8	117.5	30 - 80	0 - 26
WK-SS	40.1	133.3	144.8	122.1	13.3	32.4	10.9	133.0	30 - 80	0 - 26
WK-T	67.8	126.7	155.4	146.2	26.7	73.1	17.0	163.3	30 - 80	0 - 26
WK-U	92.6	101.1	122.6	116.5	40.5	129.4	26.9	143.4	30 - 80	0 - 26
WK-UU	164.4	104.4	128.0	113.3	12.6	49.1	7.4	120.7	30 - 80	0 - 26
WK-V	21.4	136.0	186.2	125.3	24.0	119.7	16.2	141.5	30 - 80	0 - 26
WK-VV	36.8	92.5	197.4	69.6	47.5	280.5	16.4	85.9	30 - 80	0 - 26
WK-W	11.8	115.0	141.4	109.8	20.0	52.0	7.9	117.7	30 - 80	0 - 26
WK-X	59.6	131.1	133.7	123.2	2.2	4.4	2.0	125.2	30 - 80	0 - 26
Total	**3,079.5**									

Addendum 9 —Land Management Review

2022 Land Management Review Team Report for Edward Ball Wakulla Springs State Park

Table of Contents

Introduction

Section 259.036, F.S. requires a periodic on-site review of conservation and recreation lands titled in the name of the Board of Trustees to determine (1) whether the lands are being managed for the purposes for which they were acquired and (2) whether they are being managed in accordance with their land management plan adopted pursuant to s. 259.032, F.S. In cases where the managed areas exceed 1,000 acres in size, such a review must be scheduled at least every five years. In conducting this review, a statutorily constructed review team "shall evaluate the extent to which the existing management plan provides sufficient protection to threatened or endangered species, unique or important natural or physical features, geological or hydrological functions or archaeological features. The review shall also evaluate the extent to which the land is being managed for the purposes for which it was acquired and the degree to which actual management practices, including public access, are in compliance with the adopted management plan."

The land management review teams are coordinated by the Division of State Lands and consist of representatives from the Division of Recreation and Parks (DEP), the Florida Forest Service (DACS), the Fish and Wildlife Conservation Commission, the local government in which the property is located, the DEP District in which the parcel is located, the local soil and water conservation district or jurisdictional water management district, a conservation organization member, and a local private land manager.

Each Land Management Review Report is divided into three sections. Section 1 provides the details of the property being reviewed as well as the overall results of the report. Section 2 provides details of the Field Review, in which the Review Team inspects the results of management actions on the site. Section 3 provides details of the Land Management Plan Review, in which the team determines the extent to which the Management Plan provides for and documents adequate natural and recreational resource protection.

Finally, each report may also contain an Appendix that lists individual team member comments. This is a compilation of feedback, concerns or other thoughts raised by individual team members, but not necessarily indicative of the final consensus reached by the Land Management Review Team.

Property Reviewed in this Report

Name of Site: Edward Ball Wakulla Springs State Park

Managed by: Department of Environmental Protection, Division of Recreation and Parks

Acres: 6,055.22 **County:** Wakulla

Purpose(s) for Acquisition: for the conservation and protection of natural and cultural resources and for resource-based public outdoor recreation that is compatible with the conservation and protection of the property.

Acquisition Program(s): CARL, P2000,Florida Forever **Original Acquisition Date:** 9/17/86

Area Reviewed: Entire Property **Last Management Plan Approval Date:** 12/14/07

Review Date: 1/12/22

Agency Manager and Key Staff:

- Amy Conyers, Manager

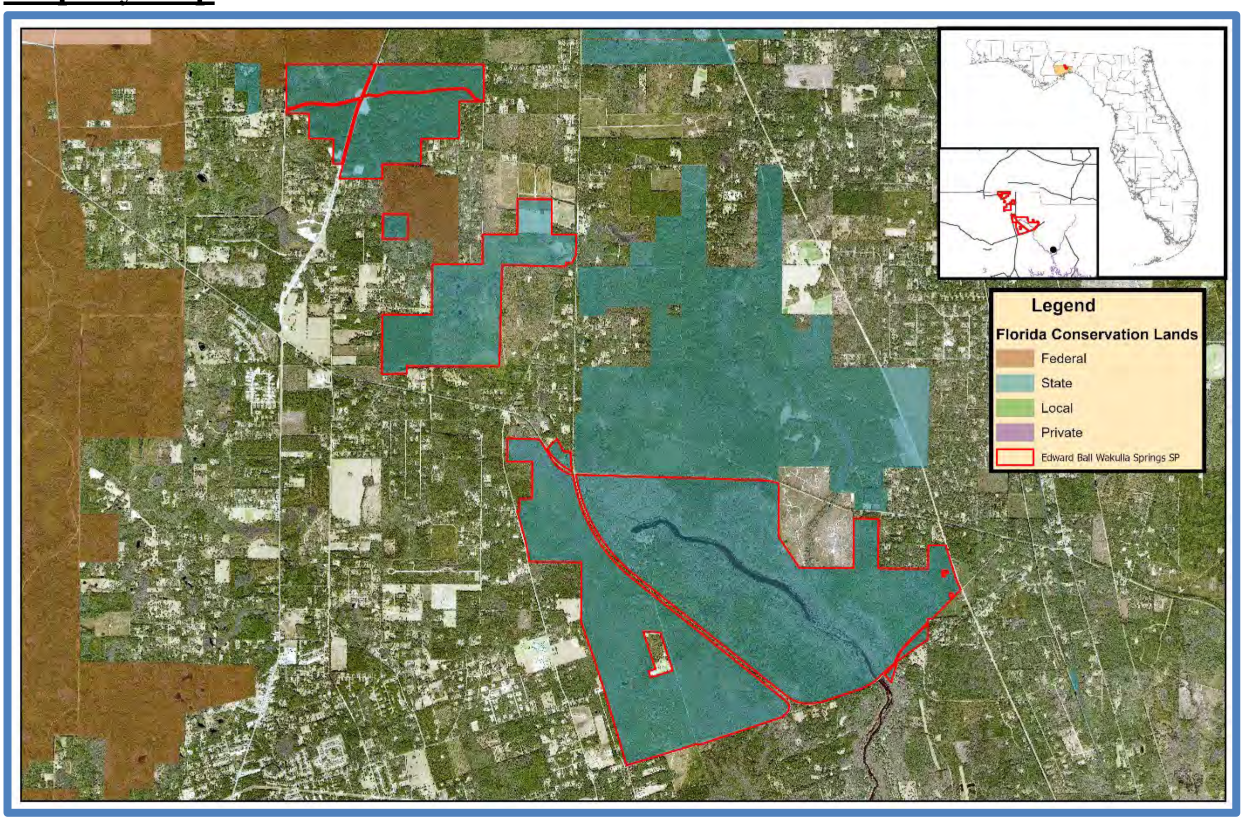
Review Team Members (voting)

- Chris Whittle, DRP District
- Local Gov't., None
- Mike Sisson, FWC
- Monica Hardin, DEP District
- Shelly Wayte, FFS
- Frank Powell, NWFWMD
- Chuck Hess, Conservation Org.
- Private Land Manager, None

Non-Team Members (attending)

- James Parker, DEP/DSL
- Cait Snyder

Property Map



Overview of Land Management Review Results

Is the property managed for purposes that are compatible with conservation, preservation, or recreation?

Yes = 5, No = 0

Are the management practices, including public access, in compliance with the management plan?

Yes = 5, No = 0

Table 1 shows the average scores received for each applicable category of review. *Field Review* scores refer to the adequacy of management actions in the field, while *Management Plan Review* scores refer to adequacy of discussion of these topics in the management plan. Scores range from 1 to 5 with 5 signifying excellence. For a more detailed key to the scores, please see *Appendix A.*

Table 1: Results at a glance.

Major Land Management Categories	Field Review	Management Plan Review
Natural Communities / Forest Management	4.25	4.08
Prescribed Fire / Habitat Restoration	4.18	4.50
Hydrology	4.91	4.68
Imperiled Species	4.46	4.49
Exotic / Invasive Species	4.73	4.27
Cultural Resources	4.80	4.80
Public Access / Education / Law Enforcement	4.69	4.54
Infrastructure / Equipment / Staffing	4.23	N/A

Color Code (See Appendix A for detail)

Excellent	Above Average	Below Average	Poor

Consensus Commendations for the Managing Agency

The following commendations resulted from discussion and vote of the review team members:

1. The team commends the Florida Park Service (FPS) staff for finding techniquies for new ways of restoration to occur in challenging situation. (6+, 0-)
2. The team commends FPS for promoting, enhancing, and maintaining sustainable public use and access throughout the park. (6+, 0-)
3. The team commends FPS for the continued use of prescribed fire uunder jincreasingly challenging conditions. (6+, 0-)
4. The team commends FPS for their volunteer and citizen science programs toward increasing capacity in the park and educational outreach within the community. (6+,0-)

Consensus Recommendations to the Managing Agency

The following recommendations resulted from a discussion and vote of review team members. The next management plan update should include information about how these recommendations have been addressed:

1. The team recommends FPS pursue strategies to increase buring in upland acres. (6+, 0-)
   Managing Agency Response:

2. The team recommends FPS continue the environmental education of nutrient reduction to the spring shed. This would increase park reductions of fertilizer use and providing contained systems for restrooms (Cherokee Sink recreational area). (6+, 0-)
   Managing Agency Response:

Field Review Details

Field Review Checklist Findings

The following items received high scores on the review team checklist, which indicates that management actions exceeded expectations.

1. **Natural Communities, specifically sinkhole, upland hardwood forest, upland mixed forest, scrubby flatwoods, hydric hammock, basin swamp, dome swamp, floodplain forest, floodplain swamp, sinkhole lake, spring-run stream, and aquatic cave:**
2. **Listed Species Protection and Preservation, for listed animal and plant species in general, and specifically for limpkin, gopher tortoise, manatee, Woodville karst crayfish, and all listed orchid species:**
3. **Natural Resources Survey/Monitoring, specifically listed species or their habitat monitoring, other non-game species or thei habitat monitoring, fire effects monitoring, other habitat management effects monitoring, and invasive species survey and monitoring:**
4. **Cultural Resources, specifically cultural resource survey, and protection and preservation:**
5. **Prescribed fire, specifically area being burned, frequency and quality.**
6. **Restoration, specifically the uplands restoration and Cherokee Sink:**
7. **Forest management, specifically timber inventory/assessment, timber harvesting, reforestation/afforestation, and site preperation:**
8. **Non-native, invasive and problem species, specifically the prevention and control of plants, animals, pests and pathogens:**
9. **Hydrologic/geologic function, specifically the management of roads/culverts, ditches, and silviculture bedding:**
10. **Groundwater monitoring, specifically for quality and quantity:**
11. **Surface water monitoring, specifically for quality and quantity:**
12. **Resource protection, specifically boundary survey, gates and fencing, signage, and law enforcement presence:**
13. **Public access, specifically roads and parking:**
14. **Adjacent property concerns, specifically expanding development and inholdings/additions:**
15. **Environmental education and outreach, specifically pertaining to wildlife, invasive species, habitat management activities, interpretive facilities and signs, recreational opportunities, and management of visitor impacts:**

16. **Management resources, specifically waste disposal, sanitary facilities, buildings, and equipment:**

Items Requiring Improvement Actions in the Field

The following items received low scores on the review team checklist, which indicates that management actions noted during the Field Review were not considered sufficient (less than 3.0 score on average). Please note that overall good scores do not preclude specific recommendations by the review team requiring remediation. The management plan update should include information on how these items have been addressed:

The review team scores did not identify items requiring improvement actions in the field.

Field Review Checklist and Scores

Plan Review Item	Reference #	Anonymous Team Members								Average
		1	2	3	4	5	6	7	8	
Natural Communities (I.A)										
Sinkhole	I.A.1	5	4	5	4	5				4.60
Upland hardwood forest	I.A.2	5	4	5	4	5				4.60
Upland mixed forest (1990 FNAI NC)	I.A.3	5	4	5	4	5				4.60
Upland Pine	I.A.4	4	4	5	4	5				4.40
Scrubby flatwoods	I.A.5	5	4	5	4	5				4.60
Hydric hammock	I.A.6	5	4	5	4	5				4.60
Basin swamp	I.A.7	5	4	5	3	5				4.40
Dome swamp	I.A.8	5	4	5	3	5				4.40
Floodplain forest (1990 FNAI NC)	I.A.9	5	4	5	4	5				4.60
Floodplain swamp	I.A.10	5	4	5	4	5				4.60
Sinkhole lake	I.A.11	5	4	5	4	5				4.60
Spring-run stream	I.A.12	5	4	5	4	5				4.60
Aquatic cave	I.A.13	5	4	5	5	5				4.80
Natural Communities Average Score										4.57
Listed species: Protection & Preservation (I.B)										
Animals	I.B.1	5	4	5	4	5				4.60
Limpkin	I.B.1.a	5	4	5	4	5				4.60
Gopher Tortoise	I.B.1.b	5	4	5	4	5				4.60
Manatee	I.B.1.c	5	4	5	4	5				4.60
Woodville Karst Crayfish	I.B.1.d	5	4	5	4	5				4.60
Plants	I.B.2	5	2	5	4	5				4.20
Listed orchid spp.	I.B.2.b	5	2	5	4	5				4.20
Listed Species Average Score										4.49
Natural Resources Survey/Management Resources (I.C)										
Listed species or their habitat monitoring	I.C.2	5	4	5	4	5				4.60
Other non-game species or their habitat monitoring	I.C.3	5	4	5	4	5				4.60
Fire effects monitoring	I.C.4	5	4	5	3	5				4.40
Other habitat management effects monitoring	I.C.5	5	4	5	3	5				4.40

Invasive species survey / monitoring	I.C.6	5	4	5	4	5			4.60
Cultural Resources (Archeological & Historic sites) (II.A, II.B)									
Cultural Res. Survey	II.A	5	4	5	5	5			4.80
Protection and preservation	II.B	5	4	5	5	5			4.80
Cultural Resources Average Score									4.80
Resource Management, Prescribed Fire (III.A)									
Area Being Burned (no. acres)	III.A.1	5	4	5	3	5			4.40
Frequency	III.A.2	5	4	5	3	5			4.40
Quality	III.A.3	5	4	5	3	5			4.40
Resource Management, Prescribed Fire Average Score									4.40
Restoration (III.B)									
Uplands restoration	III.B.1	5	4	5	4	5			4.60
Cherokee Sink	III.B.2	5	4	5	4	5			4.60
Restoration Average Score									4.60
Forest Management (III.C)									
Timber Inventory	III.C.1	5	3	5	4	5			4.40
Timber Harvesting	III.C.2		3	5	4	5			4.25
Reforestation/Afforestation	III.C.3		3	5	4	5			4.25
Site Preparation	III.C.4		2	5	4	5			4.00
Forest Management Average Score									4.23
Non-Native, Invasive & Problem Species (III.D)									
Prevention									
prevention - plants	III.D.1.a	5	3	5	4	5			4.40
prevention - animals	III.D.1.b	5	3	5	3	5			4.20
prevention - pests/pathogens	III.D.1.c	5	3	5	3	5			4.20
Control									
control - plants	III.D.2.a	5	3	5	4	5			4.40
control - animals	III.D.2.b	5	3	5	3	5			4.20
control - pests/pathogens	III.D.2.c	5	3	5	3	5			4.20
Non-Native, Invasive & Problem Species Average Score									4.27
Hydrologic/Geologic function, Hydro-Alteration (III.E.1)									
Roads/culverts	III.E.1.a	5	4	5	3	5			4.40
Ditches	III.E.1.b	5	4	5	3	5			4.40
Silviculture Bedding	III.E.1.f	5	X	5	3	5			4.50
Hydrologic/Geologic function, Hydro-Alteration Average Score									4.43
Ground Water Monitoring (III.E.2)									
Ground water quality	III.E.2.a	5	4	5	5	5			4.80
Ground water quantity	III.E.2.b	5	4	5	5	5			4.80
Ground Water Monitoring Average Score									4.80
Surface Water Monitoring (III.E.3)									
Surface water quality	III.E.3.a	5	4	5	5	5			4.80
Surface water quantity	III.E.3.b	5	4	5	5	5			4.80
Surface Water Monitoring Average Score									4.80

Resource Protection (III.F)										
Boundary survey	III.F.1	5	4	5	5	5				4.80
Gates & fencing	III.F.2	5	4	5	4	5				4.60
Signage	III.F.3	5	4	5	4	5				4.60
Law enforcement presence	III.F.4	5	4	5	4	5				4.60
									Resource Protection Average Score	4.65
Adjacent Property Concerns (III.G)										
Land Use										
Expanding development	III.G.1.a	5	3	5	3	5				4.20
Inholdings/additions	III.G.2	5			4	5				4.67
Discussion of Potential Surplus Land Determination	III.G.3	5	2	1	3	3				2.80
Surplus Lands Identified?	III.G.4	5	4	5	3	5				4.40
Public Access & Education (IV.1, IV.2, IV.3, IV.4, IV.5)										
Public Access										
Roads	IV.1.a	5	4	5	5	5				4.80
Parking	IV.1.b	5	4	5	5	4				4.60
Environmental Education & Outreach										
Wildlife	IV.2.a	5	4	3	4	4				4.00
Invasive Species	IV.2.b	5	4	3	4	4				4.00
Habitat Management Activities	IV.2.c	5	4	3	4	4				4.00
Interpretive facilities and signs	IV.3	5	4	5	4	5				4.60
Recreational Opportunities	IV.4	5	4	5	4	5				4.60
Management of Visitor Impacts	IV.5	5	4	5	5	5				4.80
									Public Access & Education Average Score	4.43
Managed Area Uses (VI.A, VI.B)										
Existing Uses										
Boat Tours	VI.A.1	5		5	5	5				5.00
Swimming	VI.A.2	5	4	5	5	5				4.80
Picnicking	VI.A.3	5	5	5	5	5				5.00
Nature Trails	VI.A.4	5	5	5	5	5				5.00
Environmental Education	VI.A.5	5	4	5	5	5				4.80
Equestrian Use	VI.A.6	5	4	5	3	4				4.20
Research	VI.A.7	5	5	5	5	5				5.00
Bicycling	VI.A.8	5	5	5	4	5				4.80
Proposed Uses										
Interpretive Center	VI.B.1	5	3	5	5	4				4.40
Primitive Camping	VI.B.2	4	3	5	4	4				4.00

Color Code:	Excellent	Above Average	Below Average	Poor	See Appendix A for detail
		Missing Vote	Insufficient Information		

Land Management Plan Review Details

Items Requiring Improvements in the Management Plan

The following items received low scores on the review team checklist, which indicates that the text noted in the Management Plan Review does not sufficiently address this issue (less than 3.0 score on average.). Please note that overall good scores do not preclude specific recommendations by the review team requiring remediation. The next management plan update should address the checklist items identified below:

1. **Adjacent property concerns, specifically discussion of potential surplus land determination, received a below average score. This is an indication that the management plan does not sufficiently address surplus land determination.**

Managing Agency Response:

Management Plan Review Checklist and Scores

Plan Review Item	Reference #	Anonymous Team Members								Average
		1	2	3	4	5	6	7	8	
Natural Communities (I.A)										
Sinkhole	I.A.1	5	4	5	4	5				4.60
Upland hardwood forest	I.A.2	5	4	5	4	5				4.60
Upland mixed forest (1990 FNAI NC)	I.A.3	5	4	5	4	5				4.60
Upland Pine	I.A.4	4	4	5	4	5				4.40
Scrubby flatwoods	I.A.5	5	4	5	4	5				4.60
Hydric hammock	I.A.6	5	4	5	4	5				4.60
Basin swamp	I.A.7	5	4	5	3	5				4.40
Dome swamp	I.A.8	5	4	5	3	5				4.40
Floodplain forest (1990 FNAI NC)	I.A.9	5	4	5	4	5				4.60
Floodplain swamp	I.A.10	5	4	5	4	5				4.60
Sinkhole lake	I.A.11	5	4	5	4	5				4.60
Spring-run stream	I.A.12	5	4	5	4	5				4.60
Aquatic cave	I.A.13	5	4	5	5	5				4.80
									Natural Communities Average Score	4.57
Listed species: Protection & Preservation (I.B)										
Animals	I.B.1	5	4	5	4	5				4.60
Limpkin	I.B.1.a	5	4	5	4	5				4.60
Gopher Tortoise	I.B.1.b	5	4	5	4	5				4.60
Manatee	I.B.1.c	5	4	5	4	5				4.60
Woodville Karst Crayfish	I.B.1.d	5	4	5	4	5				4.60
Plants	I.B.2	5	2	5	4	5				4.20
Listed orchid spp.	I.B.2.b	5	2	5	4	5				4.20
									Listed Species Average Score	4.49

Natural Resources Survey/Management Resources (I.C)										
Listed species or their habitat monitoring	I.C.2	5	4	5	4	5				4.60
Other non-game species or their habitat monitoring	I.C.3	5	4	5	4	5				4.60
Fire effects monitoring	I.C.4	5	4	5	3	5				4.40
Other habitat management effects monitoring	I.C.5	5	4	5	3	5				4.40
Invasive species survey / monitoring	I.C.6	5	4	5	4	5				4.60
Cultural Resources (Archeological & Historic sites) (II.A, II.B)										
Cultural Res. Survey	II.A	5	4	5	5	5				4.80
Protection and preservation	II.B	5	4	5	5	5				4.80
									Cultural Resources Average Score	4.80
Resource Management, Prescribed Fire (III.A)										
Area Being Burned (no. acres)	III.A.1	5	4	5	3	5				4.40
Frequency	III.A.2	5	4	5	3	5				4.40
Quality	III.A.3	5	4	5	3	5				4.40
									Resource Management, Prescribed Fire Average Score	4.40
Restoration (III.B)										
Uplands restoration	III.B.1	5	4	5	4	5				4.60
Cherokee Sink	III.B.2	5	4	5	4	5				4.60
									Restoration Average Score	4.60
Forest Management (III.C)										
Timber Inventory	III.C.1	5	3	5	4	5				4.40
Timber Harvesting	III.C.2	0	3	5	4	5				3.40
Reforestation/Afforestation	III.C.3	0	3	5	4	5				3.40
Site Preparation	III.C.4	0	2	5	4	5				3.20
									Forest Management Average Score	3.60
Non-Native, Invasive & Problem Species (III.D)										
Prevention										
prevention - plants	III.D.1.a	5	3	5	4	5				4.40
prevention - animals	III.D.1.b	5	3	5	3	5				4.20
prevention - pests/pathogens	III.D.1.c	5	3	5	3	5				4.20
Control										
control - plants	III.D.2.a	5	3	5	4	5				4.40
control - animals	III.D.2.b	5	3	5	3	5				4.20
control - pests/pathogens	III.D.2.c	5	3	5	3	5				4.20
									Non-Native, Invasive & Problem Species Average Score	4.27
Hydrologic/Geologic function, Hydro-Alteration (III.E.1)										
Roads/culverts	III.E.1.a	5	4	5	3	5				4.40
Ditches	III.E.1.b	5	4	5	3	5				4.40
Silviculture Bedding	III.E.1.f	5	X	5	3	5				4.50
									Hydrologic/Geologic function, Hydro-Alteration Average Score	4.43
Ground Water Monitoring (III.E.2)										
Ground water quality	III.E.2.a	5	4	5	5	5				4.80
Ground water quantity	III.E.2.b	5	4	5	5	5				4.80

Ground Water Monitoring Average Score										4.80
Surface Water Monitoring (III.E.3)										
Surface water quality	III.E.3.a	5	4	5	5	5				4.80
Surface water quantity	III.E.3.b	5	4	5	5	5				4.80
Surface Water Monitoring Average Score										4.80
Resource Protection (III.F)										
Boundary survey	III.F.1	5	4	5	5	5				4.80
Gates & fencing	III.F.2	5	4	5	4	5				4.60
Signage	III.F.3	5	4	5	4	5				4.60
Law enforcement presence	III.F.4	5	4	5	4	5				4.60
Resource Protection Average Score										4.65
Adjacent Property Concerns (III.G)										
Land Use										
Expanding development	III.G.1.a	5	3	5	3	5				4.20
Inholdings/additions	III.G.2	5			4	5				4.67
Discussion of Potential Surplus Land Determination	III.G.3	5	2	1	3	3				2.80
Surplus Lands Identified?	III.G.4	5	4	5	3	5				4.40
Public Access & Education (IV.1, IV.2, IV.3, IV.4, IV.5)										
Public Access										
Roads	IV.1.a	5	4	5	5	5				4.80
Parking	IV.1.b	5	4	5	5	4				4.60
Environmental Education & Outreach										
Wildlife	IV.2.a	5	4	3	4	4				4.00
Invasive Species	IV.2.b	5	4	3	4	4				4.00
Habitat Management Activities	IV.2.c	5	4	3	4	4				4.00
Interpretive facilities and signs	IV.3	5	4	5	4	5				4.60
Recreational Opportunities	IV.4	5	4	5	4	5				4.60
Management of Visitor Impacts	IV.5	5	4	5	5	5				4.80
Public Access & Education Average Score										4.43
Managed Area Uses (VI.A, VI.B)										
Existing Uses										
Boat Tours	VI.A.1	5		5	5	5				5.00
Swimming	VI.A.2	5	4	5	5	5				4.80
Picnicking	VI.A.3	5	5	5	5	5				5.00
Nature Trails	VI.A.4	5	5	5	5	5				5.00
Environmental Education	VI.A.5	5	4	5	5	5				4.80
Equestrian Use	VI.A.6	5	4	5	3	4				4.20
Research	VI.A.7	5	5	5	5	5				5.00
Bicycling	VI.A.8	5	5	5	4	5				4.80
Proposed Uses										
Interpretive Center	VI.B.1	5	3	5	5	4				4.40
Primitive Camping	VI.B.2	4	3	5	4	4				4.00

Color Code:	Excellent	Above Average	Below Average	Poor

Missing Vote	Insufficient Information	See Appendix A for detail

Appendix A: Scoring System Detail

Explanation of Consensus Commendations:

Often, the exceptional condition of some of the property's attributes impress review team members. In those instances, team members are encouraged to offer positive feedback to the managing agency in the form of a commendation. The teams develop commendations generally by standard consensus processes or by majority vote if they cannot obtain a true consensus.

Explanation of Consensus Recommendations:

Subsection 259.036(2), F.S., specifically states that the managing entity shall consider the findings and recommendations of the land management review. We ask team members to provide general recommendations for improving the management or public access and use of the property. The teams discuss these recommendations and develop consensus recommendations as described above. We provide these recommendations to the managing agency to consider when finalizing the required ten-year management plan update. We encourage the manager to respond directly to these recommendations and include their responses in the final report when received in a timely manner.

Explanation of Field Review Checklist and Scores, and Management Plan Review Checklist and Scores:

We provide team members with a checklist to fill out during the evaluation workshop phase of the Land Management Review. The checklist is the uniform tool used to evaluate both the management actions and condition of the managed area, and the sufficiency of the management plan elements. During the evaluation workshop, team members individually provide scores on each issue on the checklist, from their individual perspective. Team members also base their evaluations on information provided by the managing agency staff as well as other team member discussions. Staff averages these scores to evaluate the overall conditions on the ground, and how the management plan addresses the issues. Team members must score each management issue 1 to 5: 1 being the management practices are clearly insufficient, and 5 being that the management practices are excellent. Members may choose to abstain if they have inadequate expertise or information to make a cardinal numeric choice, as indicated by an "X" on the checklist scores, or they may not provide a vote for other unknown reasons, as indicated by a blank. If a majority of members failed to vote on any issue, that issue is determined to be irrelevant to management of that property or it was inadequately reviewed by the team to make an intelligent choice. In either case staff eliminated the issue from the report to the manager.

Average scores are interpreted as follows:

Scores 4.0 to 5.0 are *Excellent*

Scores 3.0 to 3.99 are *Above Average*

Scores 2.0 to 2.99 are *Below Average*

Scores 1.0 to 1.99 are considered *Poor*

Addendum 10—Local Government Comprehensive Plan Compliance

From:	Allbritton, Joel
To:	Somer Pell; Degagne, Demi
Cc:	Alsentzer, Daniel; Fugate, Brian
Subject:	RE: Request for County Review RE FL State Park Unit Management Plan Compliance w/Co. Comprehensive Plan
Date:	Wednesday, August 3, 2022 10:56:00 AM
Attachments:	image003.png

Good morning Somer,

Thank you for reviewing the plan and the zoning and for providing comments and recommendations. We will take these comments under advisement as we move forward with the management plan for Wakulla Springs State Park.

Thanks and have a great day,

Joel Allbritton
Florida Department of Environmental Protection
Division of Recreation and Parks/Office of Park Planning
Planning Consultant
Joel.Allbritton@FloridaDEP.gov
Office: 850-245-3063

From: Somer Pell <spell@mywakulla.com>
Sent: Friday, July 8, 2022 9:51 AM
To: Degagne, Demi <Demi.Degagne@dep.state.fl.us>
Cc: Allbritton, Joel <Joel.Allbritton@dep.state.fl.us>; Alsentzer, Daniel <Daniel.Alsentzer@dep.state.fl.us>; Fugate, Brian <Brian.Fugate@dep.state.fl.us>
Subject: RE: Request for County Review RE FL State Park Unit Management Plan Compliance w/Co. Comprehensive Plan

Good morning,

I have reviewed the Management Plan for Wakulla Spring State Park, and generally find it to be consistent with the Wakulla County Comprehensive Plan. I do offer the following comments and recommend related to the Plan:

1. Although the majority of the identified Park Boundaries are designated Conservation under the Comprehensive Plan; other areas noted within the Park Boundary also contain lands designated as Agriculture and Rural 1. Specifically, these areas include the Ferrell Tract and approximately 190+/- acres located at the intersection of Wakulla Springs Road and Shadeville Road. It is recommended that a Future Land Use Map amendment be submitted seeking an amendment to the Future Land Use Map to Conservation land use for these areas.
2. It is further recommended that any future areas acquired for the Park and/or State Forest also

seek amendments to the Conservation Future Land Use designation.

3. It should be also be noted that the Comprehensive Plan, Conservation Element, Policy 13.1 provides buffers from various karst features for new development activities. It is recommended that these buffers be incorporated into the Plan and implemented during future activities in these areas.

Please feel free to contact me if you have any questions.

Somer Pell, CFM
Director
Wakulla County
Planning and Community Development
3093 Crawfordville Highway
Crawfordville, FL 32327
850.926.3695
spell@mywakulla.com

From: Degagne, Demi <Demi.Degagne@dep.state.fl.us>
Sent: Friday, July 1, 2022 11:45 AM
To: Somer Pell <spell@mywakulla.com>
Cc: Allbritton, Joel <Joel.Allbritton@dep.state.fl.us>; Alsentzer, Daniel <Daniel.Alsentzer@dep.state.fl.us>; Fugate, Brian <Brian.Fugate@dep.state.fl.us>
Subject: Request for County Review RE FL State Park Unit Management Plan Compliance w/Co. Comprehensive Plan

Good Morning Ms. Pell,

The Florida Department of Environmental Protection, Division of Recreation and Parks, Office of Park Planning is responsible for the unit management planning of all Florida State Parks. As part of this planning process, prior to the unit management plan being presented to its Acquisition and Restoration Council for consideration, the Office of Park Planning is now required to connect and communicate with the area's agency that is responsible for the local comprehensive plan to determine if the park unit management plan is in compliance with the comprehensive plan. Specifically, we want to make sure we are accurately citing the future land use and zoning designations for the park and would like to confirm that our proposed developments in the conceptual land use section comply with those designations. The existing facilities section will also need to be reviewed.

We would like to have the Edward Ball Wakulla Springs State Park draft unit management plan reviewed. The document can be found at the following link: https://floridadep.gov/parks/parks-office-park-planning/documents/edward-ball-wakulla-springs-state-park-advisory-group-1.

Please acknowledge receipt and provide an approximate turn-around time for the review. If this request should be redirected to another person or section, please let us know. In the meantime, if you need any clarification regarding this request, the draft document or its contents, please contact Joel Allbritton at Joel.Allbritton@floridadep.gov or by phone at 850-245-3051. Mr. Allbritton, who has been copied with this communication, is the Planner assigned to handle this park's management planning and will be able to answer any questions regarding the plan.

Thank you for your time, help and direction.

Have a good rest of the day!

Demi P. Degagne
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Government Operations Consultant and
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Addendum 11—Gopher Tortoise Survey Results

From: Kalfin, Alex <Alexandre.Kalfin@MyFWC.com>
Sent: Thursday, September 1, 2022 5:15 PM
To: Gerlock, Leah <Leah.Gerlock@dep.state.fl.us>
Cc: Richardson, Katherine <Katherine.Richardson@MyFWC.com>; Sunquist, Claire <Claire.Blunden@MyFWC.com>; Goff, Jennifer <jennifer.goff@MyFWC.com>; Ferry, Larame <Larame.Ferry@MyFWC.com>; Bucheck, Jacqueline <Jacqueline.Bucheck@MyFWC.com>
Subject: RE: Edward Ball Wakulla Springs State Park - Gopher Tortoise Feasibility

Good afternoon Leah,

The feasibility of using a portion of Edward Ball Wakulla Springs State Park, or any other state lands, as a gopher tortoise recipient site in accordance with 259.032 F.S. is dependent upon the following criteria:

- The site contains a minimum of 40 acres of contiguous suitable upland tortoise habitat that meet the criteria for soil and vegetation listed below:
    - Soil criteria: An area on site of at least 40 contiguous acres must meet *acceptable* criteria per the Gopher Tortoise Permitting Guidelines (July 2020, subsequent revisions). *Acceptable* soils include those moderately well-drained to excessively drained, with a midpoint of the upper limit of the water table (DWT) value of 45 centimeters (18 inches) or greater.
    - Vegetation criteria: An area on site of at least 40 contiguous acres must meet *acceptable* habitat features, including average herbaceous cover of at least 30% and average canopy cover of 60% or less. Improved pasture cannot exceed 40% of the total expected recipient site unit and must include a minimum of 10% patchy shrub cover if improved pasture is present.

Should a portion of Wakulla Springs State Park, or any other state lands in question, meet the above criteria in its current state, the FWC would consider those areas to be feasible as a potential gopher tortoise recipient site. Should a portion of state lands have the potential to meet the above listed criteria with appropriate habitat management, the FWC would consider those areas to be potentially feasible in the future as a gopher tortoise recipient site. Public lands managers for sites that have future potential for feasibility as a gopher tortoise recipient site could coordinate with the FWC on site suitability, should habitat conditions improve to meet the *acceptable* criteria listed above. The managing agency would need to make the determination that gopher tortoise recipient site management does not conflict with the primary management objectives of the lands under review.

For further details regarding these criteria, please see pages 30-36 of the FWC's Gopher Tortoise Permitting Guidelines. Please let me know if you have any questions.

Thank you,

Alex Kalfin
Program Planning & Monitoring Administrator
Wildlife Diversity Conservation Section
Florida Fish and Wildlife Conservation Commission
(850) 921 – 1145
Florida Fish and Wildlife Conservation Commission
MyFWC.com

State Wildlife Action Plan
Imperiled Species Management Plan
Gopher Tortoise Management Plan

~~**GOPHER TORTOISE (*GOPHERUS POLYPHEMUS*) SURVEYS AND POPULATION EVALUATIONS**~~

FINAL REPORT

Lora L. Smith and Jennifer M. Howze
Joseph W. Jones Ecological Research Center
Contract #13161

To

Florida Fish and Wildlife Conservation Commission

24 June 2016

Abstract

We conducted pilot surveys for gopher tortoises at 35 Florida state conservation lands and used line transect distance sampling (LTDS) to estimate population size and density at 26 of these sites. Gopher tortoise populations at 19 sites clearly met the criteria for minimum viable populations [MVP; ≥250 adult tortoises (within 95% confidence intervals) and >0.40 tortoises/ha; Gopher Tortoise Council 2013] and occurred in high to medium quality habitat. Upper confidence intervals of estimates at four additional sites overlapped the MVP standards and these sites may also support minimum viable populations. Population estimates ranged from 66 (34-125 95% CI) at Joe Budd Wildlife Management Area to 8221 (6308-10,714 95% CI) tortoises at the Withlacoochee State Forest, Croom tract. We trained a total of 58 individuals from the Florida Fish and Wildlife Conservation Commission (FFWCC), Florida Park Service (FPS), Florida Forest Service (FFS), Florida Department of Environmental Protection, Florida Natural Areas Inventory, St. Johns River Water Management District, Hillsborough County, Polk County, and private consultants in LTDS methodology for gopher tortoises.

Introduction

The objective of this project was to provide gopher tortoise population estimates for 35 priority Florida state conservation lands using the standard survey methodology recommended in the Candidate Conservation Agreement for the Gopher Tortoise (2012). In the first phase of the project we conducted site assessments and pilot surveys (March-August 2014). In the second phase, we implemented LTDS on 26 of the sites (August 2014-April 2016). We initiated, but were unable to complete LTDS survey at Platt

Branch Wildlife Environmental Area because of flooding in burrows. We used a rapid assessment method to evaluate habitat structure at the sites during LTDS surveys and used this information, along with tortoise survey results, to rank the sites by habitat quality and to provide recommendations for management of the sites, where appropriate. We trained FFWCC, Florida Park Service, and other staff in LTDS methods for gopher tortoises through training workshops.

Methods

PHASE I- Site Assessments, Pilot Surveys, and Full Survey Designs.

We created ArcGIS (ESRI, Redlands, CA) shape files of potentially suitable gopher tortoise habitat for 35 Florida conservation lands using the following information provided by FFWCC: a potential habitat model, Florida cooperative land cover (CLC) data, and natural community data (Fig.1). We considered the following land cover types as potentially suitable for gopher tortoises: upland pine, sandhill, scrub, scrubby flatwoods, beach dune/coastal grassland, some mesic flatwoods, and pine plantations. Wetlands, rural lands, pasture, hardwood forest, wet flatwoods, and urban land cover types generally were not considered suitable habitat. Mesic flatwoods were excluded from the suitable habitat shape files when signs of inundation were present.

We visited each site to meet area staff, assess the accuracy of the potential habitat maps (hereafter referred to as sampling frames), and to conduct pilot surveys. Pilot surveys were used to determine the overall transect length required to derive a population estimate of a predetermined level of precision (Buckland et al. 1993). During pilot surveys, we sampled transects at points that were randomly distributed across the sampling frame to capture variability in habitat quality and tortoise occurrence across each site. Transects were generally 200-500 m in length and were distributed across 10-15 random points for a minimum of 2000-3000 m of transect at each site. Additional transects were surveyed at sites with low tortoise densities or at very large sites.

Pilot surveys were conducted with three observers and burrows were searched with a burrow camera scope (Environmental Management Services, Canton, GA) to determine whether or not a tortoise was present (Smith et al. 2009, Stober and Smith 2010). The tortoise encounter rate (length of transect sampled per tortoise observed; L_o/n_o) for each site was calculated based on observations during pilot surveys and was used to estimate the total length of transect (L) needed to obtain a population estimate with a targeted coefficient of variation (< 20% CV). The formula used to calculate L was:

$$\mathbf{L = (b/cv(D)^2) \times (L_o/n_o)}$$

Where L_o is the total length of transects, and n_o is the number of tortoises encountered, D = density, and cv(D) is the desired cv for the density estimate. b is the dispersion parameter (b=3); Buckland et al. 1993.

Following pilot surveys we revised the sampling frames if needed and created survey designs for each site in Program Distance v. 6.2 (http://www.ruwpa.st-and.ac.uk/distance/). We used a systematic-random transect design, which generated evenly spaced parallel transects with a total length that targeted a 15 or 17% CV for each site. In the case of the Citrus and Croom tracts in Withlacoochee State Forest, we designed surveys using a systematic pseudo-circuit design in Program Distance to capture potential spatial variation in tortoise distribution across the very large sampling frames (17899 and 5164 ha, respectively). Because of low encounter rates, several sites (e.g., Joe Budd Wildlife Management Area, Watermelon Pond Wildlife Environmental Area) required repeated sampling with two sets of transects oriented perpendicular to one another (Stober and Smith 2010). We were unable to generate LTDS survey designs for sites where no tortoises were observed during pilot surveys: Blackwater River State Forest (Bone Creek, Horse Creek Sweetwater, and Yellow River units), Deer Lake State Park, Grayton Beach State Park, and St. Sebastian River State Park, SW tract. We recommend additional pilot surveys be conducted at these sites to verify low encounter rates.

***PHASE II- LTDS Sampling*:** Line transect distance sampling was initiated in August 2014 following completion of the pilot surveys. We used LTDS methods for gopher tortoises as outlined in the Gopher Tortoise Survey Handbook (Smith et al., 2009) and Stober and Smith (2010). We used three observers and all burrows were scoped using a burrow camera to determine occupancy. Data were collected using a Nomad 900B Hand Held Computer (Trimble Navigation, Ltd., Sunnyvale, CA) with a Hemisphere Crescent A101 smart GPS antenna (CSI Wireless, Calgary, Alberta), which had sub-meter accuracy and real-time data collection.

During surveys, the crew leader navigated the transect center line with the Nomad, which had an ArcPad™ (ESRI, Redland, CA) project containing CLC land cover data, the sample frame, and transects as well as shape files for data collection that included transect start and end points, burrow observations, habitat assessments and field notes. During field surveys, the primary responsibility of the person on the center-line was to navigate with the Nomad and detect all burrows on or close to the center-line; the second and third observers thoroughly surveyed the area on each side of the centerline, taking care to observe all burrows between themselves and the centerline. GPS locations were taken at the start and endpoints of each transect, which allowed us to calculate the actual transect length surveyed and to correct for minor discrepancies in transect placement in the field. GPS locations were collected for any tortoises observed above ground and at the entrance of all burrows. Burrows were searched for tortoises with a camera equipped with a 6.4 cm diameter head for adult burrows and 2.5 cm diameter camera head for juvenile burrows (Environmental Management Systems, Canton, GA). We categorized each burrow as either: 1) scoped, tortoise observed; 2) scoped, no tortoise observed for entire length of burrow; or 3) scoped, unable to determine if occupied (e.g., burrow was flooded, washed in with sand, or an obstruction was present). Thus, we had a record of the burrow occupancy rate and the number of burrows for which occupancy could not be determined. To minimize risk of spreading pathogens, the burrow camera head and cables were disinfected using Clorox Disinfecting Wipes™ at the end of each day and between sites.

Burrow width was measured (to the nearest 1 cm) 50 cm inside the opening using burrow calipers. We measured straight-line carapace length of tortoises observed above ground and these data, along with the width of occupied tortoise burrows, were used to describe the demographic structure of the populations (adults versus juveniles; Alford, 1980). We also used burrow width and carapace length measurements as a covariate in one set of models to estimate population size because detection probability of burrows/tortoises decreases with size (Ballou, 2013). Distance sampling relies on the assumption that all objects on the transect are detected. However, because of the extreme difficulty in detecting very small burrows (Ballou, 2013) abundance estimates derived with this survey method should be considered to underestimate juveniles in the populations.

We recorded vertebrate commensal species observed with the camera scope in the “burrow observation” shape file in the Nomad GPS/PDA. Other noteworthy species encountered above ground during surveys including rare vertebrate species, sick, or dead tortoises, were recorded in a “field notes” shape file on the Nomad GPS/PDA.

For the analyses, transect end points and burrow/tortoise observation shape files were downloaded from the Nomad into ArcGIS projects for each site. Transects were created by converting start and end points from a point shape file to a line in ArcGIS and perpendicular distances from the line to burrow openings or tortoises above ground were determined using the NEAR tool in ArcGIS. Final transect lengths, perpendicular distances to occupied burrows and tortoises above ground, and burrow width data for occupied burrows were uploaded into Program Distance ver. 6.2. We ran a series of models to estimate population size and density using both the conventional distance sampling engine (CDS) and the multiple covariate distance sampling engine (MCDS) in Program Distance (Buckland et al., 2001 and 2004). Burrow width was included as a covariate in the MCDS engine (Buckland et al., 2001; Marques et al., 2007). For Blackwater River SF West Boundary Unit, which had an extremely low tortoise density and burrow occupancy rate and Bullfrog Creek WMA, which had a similarly low occupancy rate, we ran CDS models in Distance with a cluster size analysis (Thomas et al. 2010). Cluster size analysis incorporated all “usable” tortoise burrows (occupied, unoccupied, and undetermined) into the models (Stober et al., in review). Usable burrows (those with a clear opening, i.e., not heavily modified by an armadillo or collapsed) are the primary search objects in surveys and by including all usable burrows in the models, we increased the number of observations used to derive the detection function and encounter rate, thus potentially increasing the precision of our estimates. Occupied burrows were coded as a cluster size of 1, unoccupied burrows had a cluster size of 0, and burrows for which we could not determine occupancy were coded as a -1. An additional benefit of using cluster analysis is that the mean cluster size is used to estimate occupancy of undetermined burrows, thus adjusting for the potential bias associated with scoping (Stober et al. *In review*).

We ran both CDS and MCDS analysis engines for all sites, but report output of the analysis engine that produced estimates with the lowest coefficient of variation [D(CV)]. Within a candidate set of models we used Akaike's Information Criteria (AIC; Akaike, 1974) for model selection (Burnham and Anderson, 2010). When AIC values of two or more models were within <2 AIC units, we selected the model with the lowest coefficient of variation (D CV).

Habitat Assessments: We collected data on habitat structure at randomly selected points (generated in ArcGIS) along transects at each site during full LTDS surveys. Data collected at habitat points included: basal area measured with a 10 factor prism (Forestry Suppliers, Inc., Jackson, MS) held at a height of 4.5 ft and percent canopy cover measured with a concave spherical densiometer (Forestry Suppliers, Inc., Jackson, MS). We estimated percent cover of perennial woody vegetation 1-3 m in height within a 5 m radius of the point. We also categorized the major components of the overstory, midstory and ground cover and recorded the dominant ground cover type within a 1 m radius of the point (Appendix 1). We summarized data for each of the three strata as the percent of all habitat points for each component. Digital photographs were taken in four cardinal directions at each habitat point. A more detailed description of the habitat assessment methods is included in Appendix 1.

Upon completion of full surveys, we categorized sites as high, medium, or low quality as described below:

1) **High quality**: Likely a viable population in suitable habitat. Site requires continued management, but no population manipulation/augmentation is necessary.
2) **Medium quality- viable:** Likely a viable population, but habitat needs management/restoration of natural vegetation. No population manipulation necessary.
3) **Medium quality- not viable**: Population likely not viable at current size and demographic conditions, but habitat is suitable without need of extensive restoration. Augmentation with translocated tortoises should be considered.
4) **Low quality**- Population likely not viable at current size or demographic conditions and habitat is in need of extensive restoration to support more tortoises. Site should be considered for future augmentation with translocated tortoises.

Results

PHASE I: Pilot survey results including tortoise encounter rates and projected full survey effort data for Florida state conservation lands are presented in Table 1. We created survey designs targeting a CV<20% at all sites where tortoises were observed on pilot surveys. For large sites, e.g., Goethe State Forest, Lake Wales Ridge State Forest, Lake Wales Ridge Wildlife Environmental Area, St. Sebastian River State Park, and Withlacoochee State Forest, following pilot surveys, we were asked to design surveys for individual tracts of habitat separated by major roads or > 3 km. Because of the patchy distribution of tortoises and low overall encounter rate (2081 m/tortoise) at Blackwater River State Forest, we were asked to provide separate survey designs for individual management units. We did not observe tortoises on pilot surveys at the Sweetwater, Bone Creek, or Horse Creek Units of Blackwater River State Forest, and no pilot surveys were run at the Yellow Creek Unit. We did not observe tortoises at Deer Lake State Park or Grayton Beach State Park despite sampling 3075 m and 5080 m of pilot survey transects, respectively.

PHASE II: We completed LTDS at 26 Florida state conservation lands between August 2014 and February 2016 (Table 2). Population size and density estimates are presented in Table 3; output for all candidate models is included in Appendix 2. Little Talbot Island State Park had the highest population density (4.36 tortoises/ha, 95% CI= 3.80-5.00, CV= 0.07). The lowest density population occurred at Blackwater River State Forest West Boundary Unity (0.10 tortoises/ha, 95% CI= 0.06-0.18, CV= 0.31). Withlacoochee State Forest Croom tract had the largest population size of the sites surveyed (N= 8221 tortoises, 95% CI= 6308-10714, CV= 0.14). Nineteen sites clearly met the criteria for a minimum viable population (Gopher Tortoise Council 2013, Table 3). The upper confidence limits of four sites, Guana River Wildlife Management Area, Hilochee Wildlife Management Area, Lake Wales Ridge Wildlife Environmental Area, and Perry Oldenberg Wildlife Environmental Area, overlapped the density and/or population size of a minimum viable population and may meet the standards, particularly with additional habitat management.

Burrow occupancy ranged from 20% at Blackwater River State Forest West Boundary Unit to 71% at Hilochee Wildlife Management Area (Table 4). Low burrow occupancy also was observed at Bullfrog Creek Wildlife Environmental Area (21%) and St. Sebastian River State Park- NE tract (24%); we were unable to confirm occupancy at 6.9 and 7.1% of burrows at the two sites, respectively, due to flooding. We were unable to complete full surveys at Platt Branch Wildlife Environmental Area due to flooding in burrows.

Burrow size class histograms indicated a predominance of adult burrows (>23 cm in width) detected in most populations (Figure 2a-y). However, juvenile tortoises (<23 cm burrow width) were observed at all sites except for Joe Budd Wildlife Management Area and Hilochee Wildlife Management Area. Perry Oldenberg Wildlife Environmental Area had very low numbers of juvenile tortoises (3.8% of occupied burrows were ≤23 cm in width). The majority (57%, 8 of 14) of occupied burrows at Blackwater River State Forest West Boundary Unit were between 12 and 23 cm in width.

Habitat assessments revealed that basal area (BA) ranged from as low as 4 ft^2/ac at Lake Wales Ridge Wildlife Environmental Area- Silver Lake tract to as high as 91.1 ft^2/ac at Joe Budd Wildlife Management Area (Table 5). Canopy cover was lowest at Guana River Wildlife Management Area (8%) and highest at Joe Budd Wildlife Management Area (71.8%). Preliminary population evaluations and habitat suitability rankings are presented in Table 6. Based on estimates of population size, density, demographic structure and habitat characteristics, the following sites could be categorized as of high quality (Ranking 1): Bell Ridge Wildlife Environmental Area, Bullfrog Creek Wildlife Environmental Area, Cayo Costa State Park, Etoniah Creek State Forest, Ft. White Wildlife Environmental Area, Gold Head Branch State Park, Ichetucknee Springs State Park, Little Talbot Island State Park, Moody Branch Wildlife Environmental Area, St. Sebastian River State Park (NE tract), and Withlacoochee State Forest- Citrus and Croom tracts.

An unusually large number of tortoise shells and shell fragments were found during surveys at Lake Louisa State Park the week of 17 August 2015. All shells/shell fragment locations (N= 38) were recorded as field notes in the GPS. Intact shells were from adult tortoises (25-32 cm). Florida Fish and Wildlife Conservation Commission and Florida Park Service staff were notified and followed up with additional surveys the week of August 24th.

Amphibians, reptiles, and mammal species observed in burrows and other noteworthy observations of vertebrate species observed during surveys are listed in Tables 7 and 8. An eastern indigo snake (*Drymarchon corais*) was observed during the pilot survey at Beker State Park. Gopher frogs (*Lithobates capito*) were observed in tortoise burrows at 16 sites and were particularly abundant at Ft. White Wildlife Environmental Area (n = 80), Etoniah Creek State Forest (63), Gold Head Branch State Park (n = 55), Watermelon Pond Wildlife Environmental Area (n = 78), Jonathan Dickinson State Park (n = 23), and St. Sebastian River State Park (NE) (n = 19). Eastern diamond-back rattlesnakes (*Crotalus adamanteus*) were observed at 10 sites: Blackwater River State Forest West Boundary Unit, Bullfrog Creek Wildlife Environmental Area, EB Wakulla Springs State Park, Guana River WMA, Joe Budd Wildlife Management Area, Jonathan Dickinson

State Park, Little Talbot Island State Park, O'Leno SP/River Rise Preserve State Park, Watermelon Pond Wildlife Environmental Area, and Wingate Creek State Park. Florida pine snakes (*Pituophis melanoleucus*) were observed at four sites: Blackwater River State Forest West Boundary Unit, Jonathan Dickinson State Park, Lake Louisa State Park and St. Sebastian River State Park (NE tract).

Three training workshops on the LTDS method for gopher tortoises were completed, the first took place at Goldhead Branch State Park (June 2014), the second was held at Withlacoochee State Forest (May 2015), and the third and final workshop took place on 3-5 May 2016 at Archbold Biological Station in Lake Placid, Florida. Florida. Workshop participants included 58 individuals from the Florida Fish and Wildlife Conservation Commission, Florida Park Service, Florida Forest Service, Florida Department of Environmental Protection, Florida Natural Areas Inventory, St. Johns River Water Management District, Hillsborough County, Polk County, and private consultants. The roster of participants in the May 2016 workshop is included in Appendix 3.

Acknowledgments

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Table 1. Gopher tortoise pilot survey results for Florida state conservation lands (March –August 2014). Full surveys were conducted at sites in bold.

	Final Sampling Frame	**No. Transects**	**Tortoises Observed**	**Total Length (m)**	**Encounter Rate**	**Estimated Transect Length (km)**			**Comments**
Site	**(ha)**		n_o	L_o	L_o/n_o	**L for 15% CV**	**L for 17% CV**	**L for 20% CV**	
ADB Catfish Creek Preserve SP	998	13	1	2580	2580	344.0	267.8	193.5	
Beker SP	138	4	3	1950	650	86.7	67.5	48.8	Repeated survey design necessary
Bell Ridge WEA	292	10	30	2000	67	8.9	6.9	5.0	
Blackwater River SF:									
Coldwater Unit	3542.7	4	1	1700	1700	226.7	176.5	127.5	
Sweetwater Unit	8660.2	2	0	1000	--	--	--	--	No survey design
Bone Creek Unit	3782.5	3	0	1170	--	--	--	--	No survey design
Rock Creek Unit	7772.0	3	1	1500	1500	200.0	155.7	112.5	
Horse Creek Unit	1964	1	0	500	--	--	--	--	No survey design
West Boundary Unit	2826.5	5	2	1900	950	126.7	98.6	71.3	
Floridale Unit	6399.9	5	2	2500	1250	166.7	129.8	93.8	
Juniper Creek (+ state park) Unit	5799.6	12	5	5185	1037	138.3	107.6	77.8	
Yellow River Unit	90.4	0	0	--	--	--	--	--	No pilot surveys done in this unit
Blackwater River SP	53	3	4	900	225	30.0	23.4	16.9	Design included in Juniper Creek Unit
Bullfrog Creek WEA	185.1	5	6	2500	417	55.6	43.3	31.3	
Cayo Costa SP	163.5	6	9	2400	267	35.6	27.7	20.0	
Deer Lake SP	223.7	16	0	3075	--	--	--	--	Additional pilot surveys needed

Site	Final Sampling Frame (ha)	No. Transects	Tortoises Observed n_o	Total Length (m) L_o	Encounter Rate L_o/n_o	Estimated Transect Length (km) Comments L for 15% CV	L for 17% CV	L for 20% CV	Comments
E.B. Wakulla Springs SP	449.9	11	4	2210	553	73.7	57.4	41.4	
Etoniah Creek SF	1496.1	15	4	2900	725	96.7	75.3	54.4	
Ft. White WEA	327.9	10	11	2000	182	24.2	18.9	13.6	
Goethe SF:									
Watermelon Pond-1 (N 24)	877	2	2	400	200	26.7	20.8	15.0	
Watermelon Pond-2 (S 24)	546	3	0	600	--	--	--	--	No pilot surveys done in this unit
Levy County- Main tract	1912	12	8	2100	262.5	35.0	27.2	19.7	
Goldhead Branch SP	754.8	13	13	2600	200	26.7	20.8	15.0	
Grayton Beach SP	368.1	29	0	5080	--	--	--	--	No survey design
Guana River WMA	381.2	15	3	2585	862	114.9	89.4	64.6	
Hilochee WMA (non-Osprey unit)	526.5	10	14	3450	246	32.9	25.6	18.5	
Ichetucknee Springs SP	319.8	14	37	2800	76	10.1	7.9	5.7	
Joe Budd WMA	258.2	6	8	1100	138	18.3	14.3	10.3	Repeated survey design necessary
Jonathan Dickinson SP	1130.7	14	8	6470	809	107.8	84.0	60.7	
Lake Louisa SP	750.1	9	8	3600	450	60.0	46.7	33.8	
Lake Talquin SF	2273.5	17	2	3370	1685	224.7	174.9	126.4	

Site	Final Sampling Frame (ha)	No. Transects	Tortoises Observed n_o	Total Length (m) L_o	Encounter Rate L_o/n_o	Estimated Transect Length (km) Comments L for 15% CV	L for 17% CV	L for 20% CV	Comments
Lake Wales Ridge WEA:									
Carter Creek Tract	784.8	3	3	600	200	26.7	20.8	15.0	
Clements Tract	No data	2	1	900	900	120.0	93.4	67.5	Too fragmented to delineate sample frame
Lake Placid Scrub & McJunkin Tract	810	6	1	2100	2100	280.0	218.0	157.5	Too fragmented to delineate sample frame
Royce Tract	319	2	1	700	700	93.3	72.7	52.5	Too fragmented to delineate sample frame
Silver Lake Tract	143	2	3	700	233.3	31.1	24.2	17.5	
Lake Wales Ridge SF:									
Arbuckle Tract	986	9	3	3880	1293.3	172.4	134.3	97.0	
Babson Tract	132.2	2	3	1000	333.3	44.4	34.6	25.0	Repeated survey necessary
Boy Scout Tract	65.8	2	2	400	200	26.7	20.8	15.0	Repeated survey necessary
Walk-in-Water Tract	300.6	5	8	1300	162.5	21.7	16.9	12.2	
Little Talbot Island SP	173	12	10	2400	240	32.0	24.9	18.0	
Moody Branch WEA	181.5	4	8	2000	250	33.3	26.0	18.8	
O'Leno/River Rise SP	464.2	23	28	4380	156	20.9	16.2	11.7	
Perry Oldenburg WEA	134.8	4	12	2000	167	22.2	17.3	12.5	

	Final Sampling Frame	No. Transects	Tortoises Observed	Total Length (m)	Encounter Rate	Estimated Transect Length (km) Comments			Comments
Site	**(ha)**		n_o	L_o	L_o/n_o	**L for 15% CV**	**L for 17% CV**	**L for 20% CV**	
Platt Branch WEA	308.5	9	17	3300	194	25.9	20.2	14.6	
Point Washington SF	1785.2	13	1	4300	4300	573.3	446.4	322.5	Repeated survey design necessary
Pumpkin Hill Preserve SP	646.4	16	2	2900	1450	193.3	150.5	108.8	Repeated survey design necessary
Split Oak Forest WEA	194.7	9	2	4500	2250	300.0	233.6	168.8	20%CV design
St. Sebastian River SP:									
NE Tract	1140	4	9	2500	277.8	83.3	37.0	28.8	
SE Tract	1447	4	1	2000	2000.0	266.67	207.61	150.00	
NW Tract	1088	3	1	1500	1500.0	200.0	155.7	112.5	
SW Tract	1273	6	0	2940	--	--	--	--	More pilot surveys needed
Watermelon Pond WEA	133.4	12	7	2400	343	45.7	35.6	25.7	Repeated survey design necessary
Wingate Creek SP	152.2	3	6	1500	250	33.3	26.0	18.8	
Withlacoochee SF:									
Headquarters Tract	350	1	3	200	66.7	8.9	6.9	5.0	Additional pilot surveys needed
Citrus Tract	17899	13	13	4400	338.5	45.1	35.1	25.4	
Croom Tract	5164.4	8	6	1600	266.7	35.6	27.7	20.0	Habitat east of Croom- Nobleton Rd. not included
Two-mile Prairie Tract	758	3	7	1500	214.3	28.6	22.2	16.1	
Richloam Tract	No data	--	--	--	--	--	--	--	Too wet to sample

Table 2. Status of line transect distance sampling (LTDS) surveys at priority Florida state conservation lands as of June 2016.

	Site	Final Sampling Frame (ha)	Date of completion of Full survey
1	Bell Ridge Wildlife Environmental Area	292.0	8/29/14
2	Blackwater River State Forest, West Boundary Unit	2826.5	2/12/16
3	Bullfrog Creek Wildlife Environmental Area	185.1	1/12/16
4	Cayo Costa State Park	163.5	5/8/15
5	Edward Ball Wakulla Springs State Park	449.9	5/19/15
6	Etoniah Creek State Forest	1496.1	11/6/15
7	Ft. White Wildlife Environmental Area	327.9	9/10/14
8	Goethe SF Levy County, Main tract	1912.0	12/31/14
9	Goldhead Branch State Park	754.8	10/2/14
10	Guana River Wildlife Management Area	381.2	5/12/15
11	Hilochee Wildlife Management Area (non-Osprey unit)	526.5	6/23/15
12	Ichetucknee Springs State Park	319.8	9/22/14
13	Joe Budd Wildlife Management Area	258.2	11/21/14
14	Jonathan Dickinson State Park	1130.7	8/13/15
15	Lake Louisa State Park	750.1	8/28/15
16	Lake Wales Ridge Wildlife Environmental Area, Carter Creek	784.8	6/9/15
17	Lake Wales Ridge Wildlife Environmental Are, Silver Lake	143.0	3/27/15
18	Little Talbot Island State Park	173.0	11/14/14
19	Moody Branch Wildlife Environmental Area	181.5	4/23/15
20	O'Leno/River Rise State Park	464.2	12/15/14
21	Perry Oldenburg Wildlife Environmental Area	134.8	2/25/15
22	St. Sebastian River State Park, NE tract	1140.0	7/17/15
23	Watermelon Pond Wildlife Environmental Area	133.4	12/5/14
24	Wingate Creek State Park	152.2	7/29/15
25	Withlacoochee State Forest, Citrus tract	17,899.0	4/24/15
26	Withlacoochee State Forest, Croom tract	5164.4	4/7/16
	Total area surveyed	**38,144.6**	

Table 3. Summary of line transect distance sampling (LTDS) results for gopher tortoise populations on state conservation lands in Florida, August 2014 – April 2016. Analyses were run using Distance software v 6.2 (Buckland et al. 2001). Best fitted models were selected using Akaike's Information Criteria (AIC; Akaike 1974) and consideration of the coefficient of variation (D CV) and detection probability (P). # obs= number of tortoises in burrows or above ground and observed from transects, Effort= total length of transect surveyed, D= Density (tortoises/hectare), N= abundance, LCL= lower confidence limit for D and N, UCL= upper confidence limit for density and abundance estimate. Output for all models is presented in Appendix I. *Cluster analysis was used; number of tortoise burrows observed is indicated parenthetically. †Site meets criteria for a minimum viable population (MVP) based on estimates of density (>0.4 tortoises/ha) and population size (N>250 adult tortoises) (Gopher Tortoise Council 2013). §Sites have D UCL and/or N UCL overlapping MVP thresholds.

Site	Model	# obs	Effort (m)	AIC	D	D LCL	D UCL	D CV	N	N LCL	N UCL	P
Bell Ridge WEA†	HN 5%	118	9516.1	729.499	**4.101**	2.578	6.523	0.182	**1197**	753	1905	0.626
Blackwater River SF West Boundary Unit*	UN cos 5%	14(67)	82516.2	332.52	**0.100**	0.055	0.182	0.308	**284**	156	514	0.577
Bullfrog Creek WEA*†	UN simp 5%	73(323)	21033.5	1529.91	**2.042**	1.584	2.633	0.130	**378**	293	487	0.683
Cayo Costa SP†	HR cos 5%	107	20597.0	637.185	**2.095**	1.597	2.750	0.139	**343**	261	450	0.592
E.B. Wakulla Spring SP	UN 5%	28	50914.9	158.250	**0.163**	0.101	0.264	0.247	**73**	45	119	1.000
Etoniah Creek SF†	HN 5%	127	50591.4	751.134	**1.028**	0.733	1.442	0.173	**1538**	1096	2157	0.521
Ft. White WEA†	HN 5%	142	18444.9	840.957	**2.969**	2.361	3.734	0.116	**974**	774	1224	0.587
Goethe SF Levy Co. Main Tract†	UN cos 5%	99	23393.7	670.292	**1.067**	0.721	1.579	0.198	**2039**	1378	3017	0.607
Goldhead Branch SP†	HN 5%	88	19907.1	565.391	**1.116**	0.783	1.591	0.176	**843**	591	1201	0.769
Guana River§	HN 5%	52	53557.9	261.816	**0.575**	0.403	0.822	0.183	**219**	154	313	0.617
Hilochee WMA§	HN 5%	27	22829.8	182.456	**0.333**	0.191	0.581	0.285	**176**	101	306	0.474
Ichetucknee Springs SP†	HN 5%	121	13561.7	665.481	**3.970**	3.008	5.240	0.138	**1269**	962	1675	0.658
Joe Budd WMA	UN 5%	28	27478.2	167.930	**0.254**	0.133	0.486	0.336	**66**	34	125	1.000
Jonathan Dickinson SP†	HR 5%	141	60288.2	855.485	**0.769**	0.580	1.021	0.144	**870**	656	1154	0.553
Lake Louisa SP†	UN 5%	226	42393.6	1342.853	**2.168**	1.580	2.975	0.161	**1626**	1185	2232	0.497
Lake Wales Ridge WEA Carter Crk§	UN 5%	13	9685.2	80.032	**0.309**	0.173	0.551	0.294	**243**	136	433	1.000
Lake Wales Ridge WEA Silver Lake†	HR 5%	38	21614.6	163.210	**2.068**	1.314	3.255	0.231	**296**	188	465	0.380
Little Talbot Island SP†	HR 5%	301	22252.7	1844.606	**4.356**	3.796	4.999	0.070	**754**	657	865	0.654
Moody Branch WEA†	HN 5%	104	23906.8	517.640	**2.636**	2.030	3.422	0.132	**478**	369	621	0.620
O'Leno River Rise SP†	HN 5%	190	21486.9	1308.974	**2.178**	1.603	2.960	0.155	**1011**	744	1374	0.546
Perry Oldenberg WEA§	HN 5%	75	17370.3	466.449	**1.579**	1.173	2.127	0.149	**213**	158	287	0.469
St. Sebastian River SP NE†	HN 5%	64	33284.0	362.806	**0.857**	0.564	1.301	0.213	**977**	644	1483	0.588
Watermelon Pond WEA†	HN 5%	173	36421.1	1090.596	**1.378**	1.118	1.697	0.106	**184**	149	226	0.706
Wingate Creek SP†	HN 5%	89	21955.9	477.390	**1.994**	1.537	2.586	0.132	**303**	234	394	0.648
Withlacoochee SF- Citrus Tract†	HN 5%	51	29667.6	350.785	**0.401**	0.268	0.601	0.205	**7179**	4789	10761	0.654
Withlacoochee SF- Croom Tract†	HN 5%	125	35083.7	720.950	**1.592**	1.221	2.075	0.135	**8221**	6308	10714	0.498

Table 4. Burrow scoping results during line transect distance sampling surveys (LTDS) at gopher tortoise populations on state conservation lands in Florida, August 2014 – April 2016. Counts do not include collapsed burrows or tortoises observed above ground.

Site	Burrows scoped	Tortoises in burrows	% occupied	No. unknown occupancy	% unknown occupancy
Bell Ridge Wildlife Environmental Area	358	124	35	11	3.1
Blackwater River State Forest West Boundary Unit	70	14	20	1	1.4
Bullfrog Creek Wildlife Environmental Area	340	73	21	24	7.1
Cayo Costa State Park	392	113	29	5	1.3
Edward Ball Wakulla Springs State Park	89	28	31	6	6.7
Etoniah Creek State Forest	368	134	36	18	4.9
Ft. White Wildlife Environmental Area	79	53	67	0	0.0
Goethe State Forest - Levy Co. Main Tract	236	104	44	9	3.8
Goldhead Branch State Park	61	38	62	0	0.0
Guana River Wildlife Management Area	81	55	68	5	6.2
Hilochee Wildlife Management Area	45	32	71	3	6.7
Ichetucknee Springs State Park	291	129	44	2	0.7
Joe Budd Wildlife Management Area	49	17	35	2	4.1
Jonathan Dickinson State Park	367	146	40	10	2.7
Lake Louisa State Park	509	240	47	13	2.6
Lake Wales Ridge Wildlife Environmental Area - Carter Creek Tract	35	13	37	2	5.7
Lake Wales Ridge Wildlife Environmental Area - Silver Lake Tract	98	39	40	3	3.1
Little Talbot Island State Park	502	345	69	7	1.4
Moody Branch Wildlife Environmental Area	275	108	39	11	4.0
Oleno River Rise State Park	354	198	56	9	2.5
Perry Oldenberg Wildlife Environmental Area	120	80	67	3	2.5
St. Sebastian River State Park, NE tract	277	66	24	19	6.9
Watermelon Pond Wildlife Environmental Area	145	76	52	5	3.4
Wingate Creek State Park	331	93	28	6	1.8
Withlacoochee State Forest - Citrus Tract	117	56	48	2	1.7
Withlacoochee State Forest- Croom Tract	268	132	49	2	0.7
Total	**5857**	**2506**			

Table 5. Habitat data for 26 state conservation lands in Florida collected in conjunction with line transect distance surveys (LTDS) for gopher tortoises, August 2014- April 2016.

	Bell Ridge WEA	Blackwater River SF West Boundary Unit	Bullfrog Creek WEA	Cayo Costa SP	EB Wakulla Springs SP
# of Habitat points	5	33	18	48	17
Mean basal area (ft2/ac)	22	44	25	69	63
Canopy cover (%)	33	58	40	13	47
Overstory composition (% of all habitat points)					
pine	60	61	61	0	59
oak	40	0	6	0	6
mixed	0	33	22	0	29
other	0	0	0	6	0
none	0	6	11	94	6
Midstory (%)	19	28	28	23	30
Midstory composition (% of all habitat points)					
pine	0	12	0	0	18
oak	100	21	11	0	18
shrubs	0	30	0	44	24
palmetto	0	0	78	29	0
mixed	0	21	0	2	35
other	0	15	0	4	0
none	0	0	11	21	6
Ground cover composition (% of all habitat points)					
bare ground	0	0	0	58	6
litter	0	33	17	8	71
grass	60	33	44	8	0
woody	0	0	17	4	0
vines	0	0	0	0	0
mixed	40	33	22	21	24

	Etoniah Creek SF	Ft. White WEA	Goethe SF	Goldhead Branch SP	Guana River WMA
# of Habitat points	36	19	28	10	24
Mean basal area (ft2/ac)	51	40	51	47	5
Canopy cover (%)	57	56	57	51	8.0
Overstory composition (% of all habitat points)					
pine	44	63	71	20	4
oak	8	16	7	40	0
mixed	25	16	18	40	0
other	0	0	0	0	0
none	22	5	4	0	96
Midstory (%)	30	26	63	47	22
Midstory composition (% of all habitat points)					
pine	0	0	0	0	0
oak	19	47	25	80	0
shrubs	25	11	0	10	50
palmetto	8	11	4	0	0
mixed	42	26	71	10	8
other	3	5	0	0	8
none	3	0	0	0	33
Ground cover composition (% of all habitat points)					
bare ground	6	16	4	10	8
litter	61	42	75	30	13
grass	14	11	4	10	17
woody	3	0	0	0	17
vines	0	0	0	0	0
mixed	17	32	18	50	46

	Hilochee WMA	Ichetucknee Springs SP	Joe Budd WMA	Jonathan Dickinson SP	Lake Louisa SP
# of Habitat points	34	17	14	47	33
Mean basal area (ft2/ac)	41	41	91	17	25
Canopy cover (%)	31.0	49	72	15	22
Overstory composition (% of all habitat points)					
pine	21	24	64	9	18
oak	3	29	0	0	6
mixed	0	47	36	0	0
other	3	0	0	0	0
none	74	0	0	91	76
Midstory (%)	32	33	34	26	14
Midstory composition (% of all habitat points)					
pine	0	6	0	2	9
oak	0	29	14	2	0
shrubs	41	6	7	51	30
palmetto	21	0	7	19	0
mixed	15	47	64	4	12
other	6	6	0	0	15
none	18	6	7	21	33
Ground cover composition (% of all habitat points)					
bare ground	6	0	0	26	6
litter	35	24	50	21	15
grass	35	53	7	26	39
woody	9	0	0	2	0
vines	0	0	0	0	6
mixed	15	24	43	26	33

	Lake Wales Ridge WEA Carter Creek Tract	Lake Wales Ridge WEA-Silver Lake Tract	Little Talbot Island SP	Moody Branch WEA	O'Leno River Rise SP
# of Habitat points	13	36	84	32	36
Mean basal area (ft2/ac)	6	4	17	8	84
Canopy cover (%)	24	10	22	14	69
Overstory composition (% of all habitat points)					
pine	0	3	1	0	28
oak	8	0	0	6	11
mixed	0	0	19	0	61
other	0	6	24	0	0
none	92	92	56	94	0
Midstory (%)	51	24	30	26	42
Midstory composition (% of all habitat points)					
pine	0	0	0	3	3
oak	0	8	0	0	8
shrubs	77	50	21	44	3
palmetto	0	8	1	19	8
mixed	15	6	48	13	53
other	0	6	11	3	14
none	8	22	19	19	11
Ground cover composition (% of all habitat points)					
bare ground	15	25	42	25	8
litter	54	50	23	44	64
grass	0	11	11	3	17
woody	0	0	0	3	0
vines	0	0	1	0	0
mixed	31	14	24	25	14

	Perry Oldenberg WEA	St. Sebastian SP NE	Watermelon Pond WEA	Wingate Creek SP	Withlacoochee SF Citrus Tract
# of Habitat points	21	14	71	27	24
Mean basal area (ft2/ac)	69	44	41	33	66
Canopy cover (%)	61	22	47	36	56
Overstory composition (% of all habitat points)					
pine	19	21	21	11	42
oak	29	0	37	19	25
mixed	14	0	30	0	4
other	5	0	1	0	0
none	33	79	11	70	29
Midstory (%)	25	15	32	36	15
Midstory composition (% of all habitat points)					
pine	0	14	0	0	4
oak	5	0	61	11	38
shrubs	29	0	0	15	8
palmetto	0	43	0	22	4
mixed	14	0	28	41	8
other	29	0	1	0	0
none	24	43	10	11	38
Ground cover composition (% of all habitat points)					
bare ground	10	0	11	19	13
litter	71	21	59	56	42
grass	14	36	7	11	13
woody	0	0	0	0	0
vines	0	0	0	0	0
mixed	5	43	22	15	33

	Withlacoochee SF Croom Tract
# of Habitat points	40
Mean basal area (ft2/ac)	65
Canopy cover (%)	80
Overstory composition (% of all habitat points)	
pine	30
oak	12
mixed	58
other	0
none	0
Midstory (%)	17
Midstory composition (% of all habitat points)	
pine	0
oak	65
shrubs	10
palmetto	5
mixed	5
other	2
none	12
Ground cover composition (% of all habitat points)	
bare ground	10
litter	68
grass	15
woody	2
vines	0
mixed	5

Table 6. Population evaluation and habitat suitability rankings for gopher tortoise surveys sites in Florida August 2014-April 2016. (1) High quality: Likely a viable population in suitable habitat. Site requires continued management, but no population manipulation/augmentation is necessary; (2) Medium quality- viable: Likely a viable population, but habitat needs management/restoration of natural vegetation. No population manipulation necessary; (3) Medium quality- not viable: Population likely not viable at current size and demographic conditions, but habitat is suitable without need for extensive restoration. Augmentation with translocated tortoises should be considered; (4) Low quality: Population likely not viable at current size or demographic conditions and habitat is in need of extensive restoration to support more tortoises. Site should be considered for future augmentation with translocated tortoises. †Meets MVP criteria (Gopher Tortoise Council 2013). §Sites have D UCL and/or N UCL overlapping MVP thresholds.

Site	Ranking	Comments
Bell Ridge WEA†	1	Open canopy pine habitat with native ground cover dominated by grasses; habitat condition is excellent (Fig. 3a).
Blackwater River SF- West Boundary Unit	3	The low density (0.1 tortoises/ha) and high proportion of subadult tortoises (57%) suggests slow recovery from loss of adults in the population from harvest or another unidentified source of mortality. Habitat includes some open canopy pine with herbaceous understory but few tortoises. Despite the apparently suitable vegetation structure in some areas, soils in some areas may be inappropriate for tortoises. The northwestern and southwestern portions of the unit have a dense midstory. Habitat could be improved in these parcels with increased frequency of prescribed fire.
Bullfrog Creek WEA†	1	Open canopy mesic flatwoods with ground cover dominated by saw palmetto and grasses provide highly suitable tortoise habitat.
Cayo Costa SP†	1	Cabbage palm savanna with patchy shrub cover including sea grapes and abundant grasses. Likely a viable population and juvenile size class burrows were detected.
Edward Ball Wakulla Springs SP	4	Much of the habitat (upland pine and mixed hardwood coniferous land cover) is unsuitable for tortoises in its current condition (Fig. 3b). The habitat will require restoration to reduce the canopy and midstory cover to support a viable population. Additionally, extant tortoises are concentrated in three disparate areas in the park and it is unlikely they can move among these habitat patches.
Etoniah Creek SF†	1	The sandhill habitat is in good condition with an open canopy, and supports a large tortoise population with evidence of recruitment. Tortoise densities are lower in the unburned scrub and mesic pine flatwoods, particularly in the Manning tract.
Ft. White WEA†	1	Open canopy pine habitat with patches of native ground cover dominated by grasses. Habitat is in excellent condition.
Goethe SF Levy Co. Main Tract†		Northeastern parcels within tract contain highly suitable open canopy pine habitat and ground cover dominated by grasses. Parcels in the south and western portion of

	1-2	the site occur on less well-drained soils with greater midstory shrub cover.
Gold Head Branch SP †	1	Open canopy pine habitat with patches of native ground cover dominated by grasses. Habitat is in excellent condition.
Guana River WMA§	3	Observations of tortoises were largely confined to the scrub habitat because the mesic flatwoods are too wet to support tortoises. Increased frequency of prescribed fire or mechanical reduction of scrub canopy would improve habitat for tortoises. The tortoise density at the site (0.575 tortoises/ha) meets the criteria for a minimum viable population, and although the population estimate of 219 tortoises the 95% CI overlapped 250 so this population may be viable. We also saw evidence of recruitment in this population.
Hilochee WMA§	3	Survey area includes thinned pine plantations and mesic flatwoods. Most tortoises were observed in pine plantations, likely as a result of the more appropriate (well drained) soils, herbaceous cover and an open canopy. Continued management with prescribed fire is needed to maintain the habitat. The adult-biased burrow size class distribution suggests recruitment may be low.
Ichetucknee Springs SP†	1	Open canopy pine habitat with patches of native ground cover dominated by grasses. Isolated parcels to the north contain greater midstory hardwood cover.
Joe Budd WMA	3	Habitat varies from open canopy with dense herbaceous ground cover to more closed canopy pine stands with an understory of woody forbs and vines. Portions of the site on more well drained soil types could likely support more tortoises. The population is skewed toward adults (Figure 1m). Given the overall low tortoise density and lack of juveniles this population might benefit from augmentation.
Jonathan Dickinson SP†	1-2	The site is actively managed with prescribed fire, which is reflected in the low basal area (17 ft^2/ac) and abundance of grasses and other herbaceous plants in the understory. While this site supports a large population of tortoises, the overall density is relatively low (0.77 tortoises/ha). Tortoises are clustered in the scrub habitat in the east and the mesic flatwoods in the southwestern part of the Park (Figure 2). These two populations are separated by natural features including distance (5 km), unsuitable habitat (i.e. wetlands and a river) and the railroad tracks.
Lake Louisa SP†	2	Site supports a large, high density tortoise population. However, much of the habitat is in old field with some areas in planted pine and the site would benefit from restoration of native vegetation. A large number of tortoise carcasses were observed during the survey; cause of mortality could not be determined based in remains, which were in various decay states.
Lake Wales Ridge WEA- Carter Creek Tract§		The scrub and scrubby flatwoods habitat will require more frequent prescribed fire to create openings for gopher tortoises to burrow. Very few tortoises were detected

	3	on transects in the interior of the survey area; however, additional tortoises were observed along roadsides and were not represented in the survey. Low density suggests this population may not reach MVP standards, but the upper confidence intervals overlap the MVP standards.
Lake Wales Ridge WEA- Silver Lake Tract†	2	Open canopy scrubby flatwoods and sandhill habitat. Dense patches of shrubs and palmetto in some areas. Tortoise density and population estimate indicates this is a small, but likely viable population.
Little Talbot Island SP†	1	Coastal scrub with numerous openings with bare sand and sparse ground cover vegetation (Fig .3b)
Moody Branch WEA†	1	Open canopy scrub, scrubby flatwoods and mesic flatwoods provide highly suitable tortoise habitat.
O'Leno SP/River Rise Preserve SP†	1-2	Mostly open canopy pine habitat with patches of dense herbaceous ground cover, but many areas have a more closed hardwood canopy and dense midstory of oaks and holly (*Ilex sp.*). Areas with hardwood encroachment could benefit from mechanical removal and more frequent prescribed fire.
Perry Oldenberg WEA§	3	Oak forests and pine stands with relatively open canopy managed with both prescribed fire and mechanical hardwood reduction. The upper confidence interval of the population estimate exceeds the threshold for a minimum viable population of 250 adults and the site has a reasonable tortoise density (1.5 tortoises/ha). However, the very low numbers of juveniles indicate potentially low recruitment. Given the documentation of a mortality event at this site (Gates et al., 2002), translocation is not recommended. Methods to increase recruitment should be explored.
St. Sebastian River SP NE†	1	Open canopy pine flatwoods; frequently burned. Site supports a large tortoise population on suitable to marginally suitable soils.
Watermelon Pond WEA	3	Some open canopy pine with native ground cover vegetation dominated by grasses. But much of the site is under restoration and has an open canopy with dense midstory of oaks. Although the population estimate falls slightly below the MVP threshold (Gopher Tortoise Council 2013), the population density meets the MVP criteria and habitat restoration could enable this population to increase.
Wingate Creek SP†	2	Small site with relatively high tortoise density. Portions of the site are in sand pine and dense palmetto, could benefit from more frequent prescribed fire.
Withlacoochee SF- Citrus tract†	1	Open canopy pine habitat (mostly sandhill) with a hardwood component. The site supports a very large, but low density population.
Withlacoochee SF- Croom Tract†	1	Open canopy pine habitat (mostly sandhill) with a lesser hardwood component. The site supports a very large, robust population.

Table 7. Amphibians and reptiles observed during pilot and full line transect distance sampling (LTDS) surveys for gopher tortoises on Florida state conservation lands from March 2014 –February 2016. Most observations occurred using a burrow camera scope; counts in parentheses indicate individuals observed outside of tortoise burrows.

	Beker SP	Bell Ridge WEA	Blackwater SF WBU	Bullfrog Creek WEA	Cayo Costa SP	EB Wakulla Springs SP	Etoniah Creek SF	Ft. White WEA	Goethe SF Levy Co.	Goldhead Branch SP	Guana River WMA	Hilochee WMA	Ichetucknee Springs SP	Joe Budd WMA	Jonathan Dickinson SP
Acris gryllus												(1)			
Agkistrodon contortrix			(1)												
Agkistrodon piscivorus											(3)				
Anaxyrus quercicus											1				1
Anaxyrus terrestris		5	1				1	6	1	2					1
Anolis carolinensis															
Anolis sagrei					4										
Apalone ferox															
Aspidoscelis sexlineatus		1		(1)	(1)										
Coluber constrictor			(1)		(1)		(3)				(2)	(2)			1(2)
Coluber flagellum					8(3)		(1)								1(2)
Crotalus adamanteus			1	1		3(3)					(1)			3	(1)
Ctenosaura similis					(5)										
Drymarchon corais	1														
Eleutherodactylus planirostris		3		1	4		1	2	1	4			7		
Gastrophryne carolinensis							(1)								
Hyla cinerea											(1)				
Hyla femoralis			(1)	(4)			(3)				(3)				(3)
Lithobates capito							63	80	12	55		1			23
Lithobates sphenocephalus		2										(1)			
Micrurus fulvius															
Opheodrys aestivalis							(2)								
Osteopilus septentrionalis															
Pantherophis alleghaniensis															
Pantherophis guttatus						(1)									
Pituophis melanoleucus			(2)												1
Plestiodon laticeps											(1)				
Pseudacris nigrita															
Sceloporus undulatus												2			
Sceloporus woodi															(1)
Scincella lateralis							(1)								
Sistrurus miliarius							(2)		1		(6)				
Storeria occipitomaculata											(1)				
Terrapene carolina						(1)	(2)								1(1)
Thamnophis sauritus											(1)				
Thamnophis sirtalis											(2)				

	Lake Louisa SP	Lake Wales Ridge SF	LWR WEA Carter Creek	LWR WEA Silver Lake	Little Talbot Island SP	Moody Branch WEA	O'Leno River Rise SP	Perry Oldenberg WEA	St. Sebastian River SP	Watermelon Pond WEA	Wingate Creek SP	Withlacoochee SF	Withlacoochee SF Citrus	Withlacoochee SF Croom
Acris gryllus														
Agkistrodon contortrix														
Agkistrodon piscivorus														
Anaxyrus quercicus													1	
Anaxyrus terrestris	13		(1)											
Anolis carolinensis														(2)
Anolis sagrei														
Apalone ferox	(1)													
Aspidoscelis sexlineatus			(1)	(1)					1					(1)
Coluber constrictor	(1)			(5)					(1)					(1)
Coluber flagellum	(2)			(1)	2	(1)	1 (1)		1					
Crotalus adamanteus					1(2)		11(1)			1	(1)			
Ctenosaura similis														
Drymarchon corais														
Eleutherodactylus planirostris										1				
Gastrophryne carolinensis														
Hyla cinerea	(1)													
Hyla femoralis											(1)			
Lithobates capito		3	4			3		3	19	78	3	1	1	4
Lithobates sphenocephalus														
Micrurus fulvius							(1)				(1)			
Opheodrys aestivalis	(1)													
Osteopilus septentrionalis											(1)			
Pantherophis alleghaniensis				(1)							(1)			
Pantherophis guttatus										(1)				
Pituophis melanoleucus	1								1					
Plestiodon laticeps														
Pseudacris nigrita												2		
Sceloporus undulatus														
Sceloporus woodi			(2)											
Scincella lateralis														
Sistrurus miliarius										(1)				
Storeria occipitomaculata														
Terrapene carolina					(1)									(1)
Thamnophis sauritus														
Thamnophis sirtalis														(1)

Table 8. Mammals observed during pilot and full line transect distance sampling (LTDS) surveys for gopher tortoises on Florida state conservation lands from March 2014 –June 2016. Most observations occurred using a burrow camera scope; counts in parentheses indicate individuals observed outside of tortoise burrows. Black bear, *Ursus americanus*, tracks and a den site were observed at Etoniah Creek SF.

	Bell Ridge WEA	Bullfrog Creek WEA	Cayo Costa SP	Etoniah Creek SF	Goethe SF Levy Co.	Goldhead Branch SP	Ichetucknee Springs SP	Joe Budd WMA	Jonathan Dickinson SP	O'Leno River Rise SP	St. Sebastian River SP	Watermelon Pond WEA	Withlacoochee SF Croom
Canis latrans				2									
Dasypus novemcinctus	1		2								1		1
Didelphis virginianus				1	1		1	1		3		1	1
Mephitis mephitis							1		1	1		2	
Podomys floridanus					3	1				1		1	
Sigmodon hispidus		1											
Sylvilagus sp.	1									1			2
Ursus americanus				(2)									

Figure 1. Location of Florida conservation lands sampled for gopher tortoise population estimates using line transect distance sampling (LTDS).

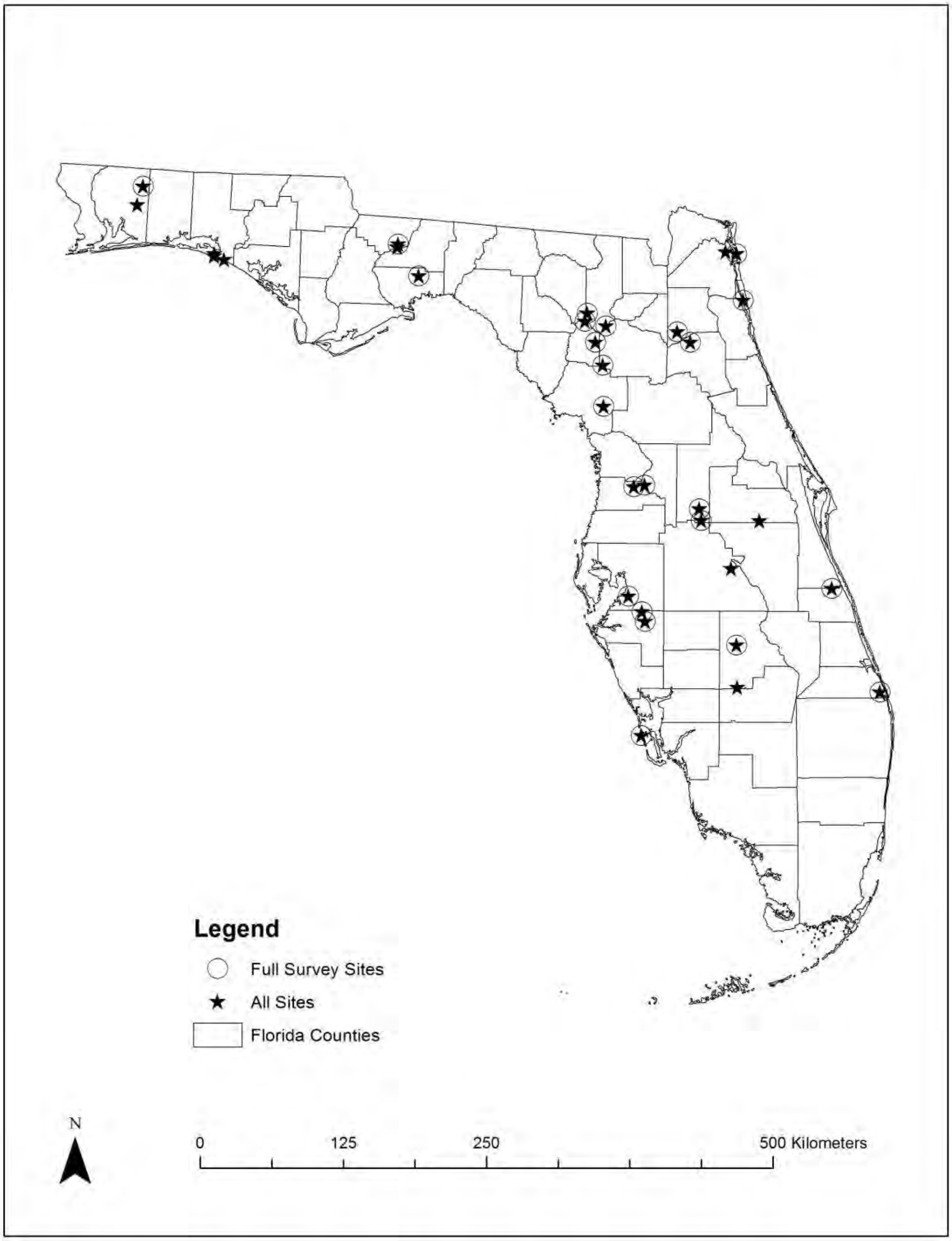
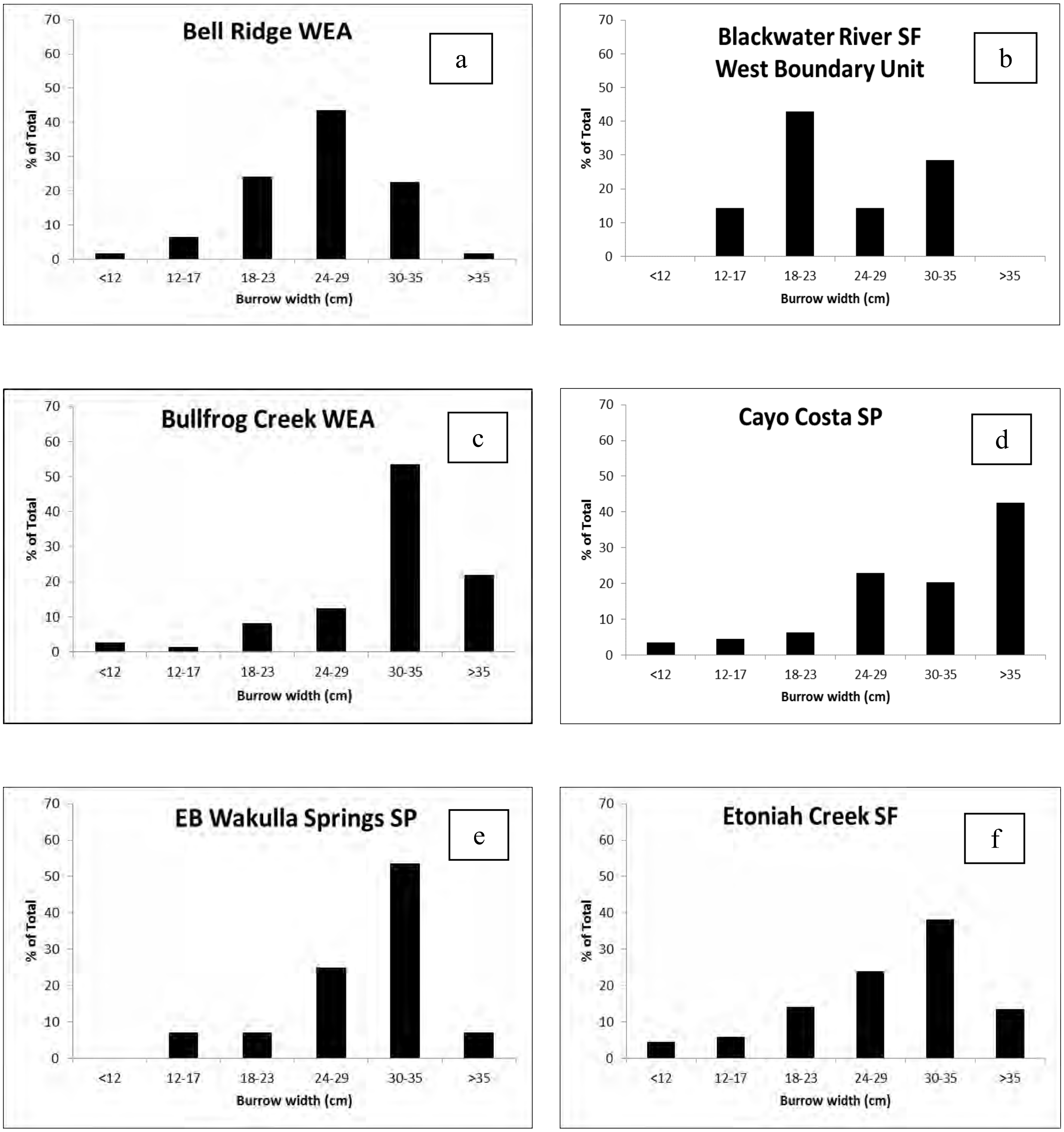
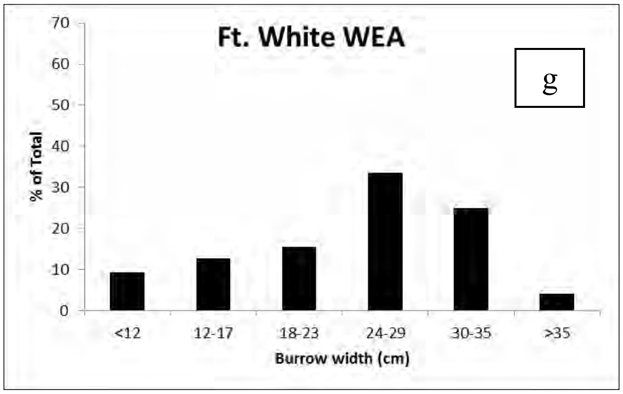
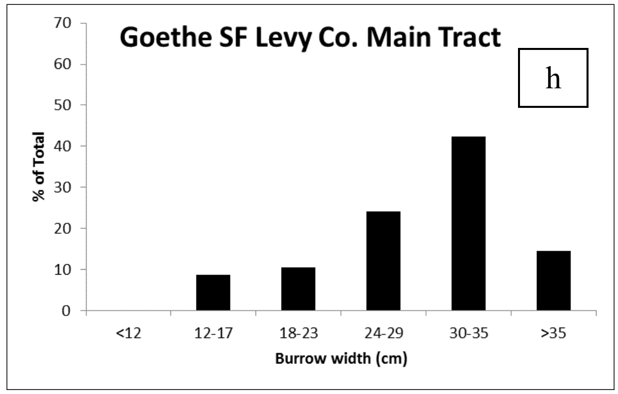
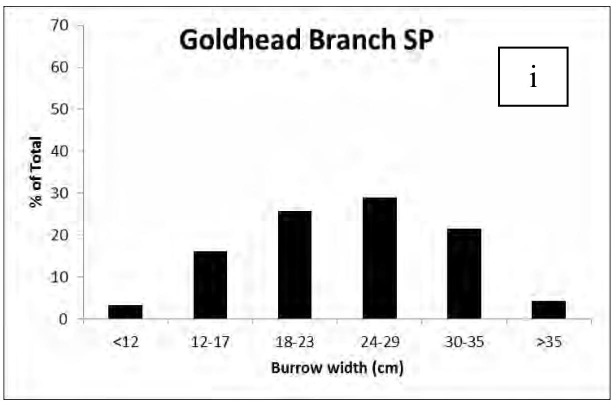


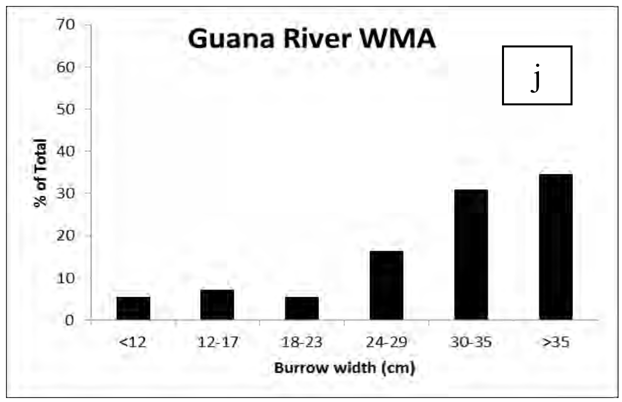
Figure 2a-y. Size class distribution of occupied gopher tortoise burrows at 25 Florida conservation lands surveyed using line transect distance sampling (LTDS) from August 2014-June 2016.

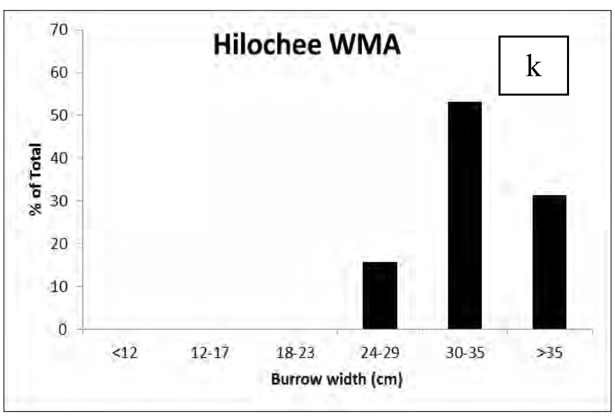


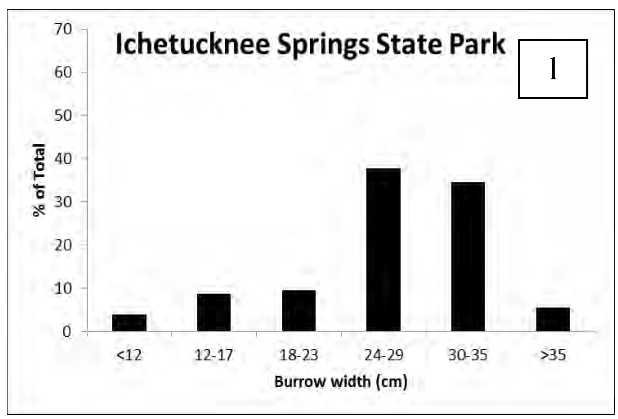

Ft. White WEA
g
% of Total
0
10
20
30
40
50
60
70
<12
12-17
18-23
24-29
30-35
>35
Burrow width (cm)

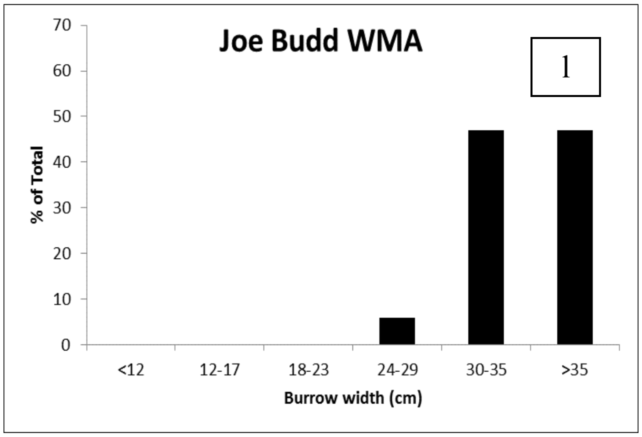

Goethe SF Levy Co. Main Tract
h
% of Total
0
10
20
30
40
50
60
70
<12
12-17
18-23
24-29
30-35
>35
Burrow width (cm)

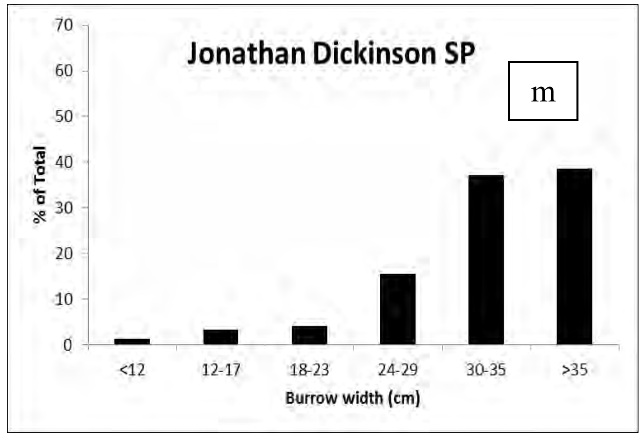

Goldhead Branch SP
i
% of Total
0
10
20
30
40
50
60
70
<12
12-17
18-23
24-29
30-35
>35
Burrow width (cm)

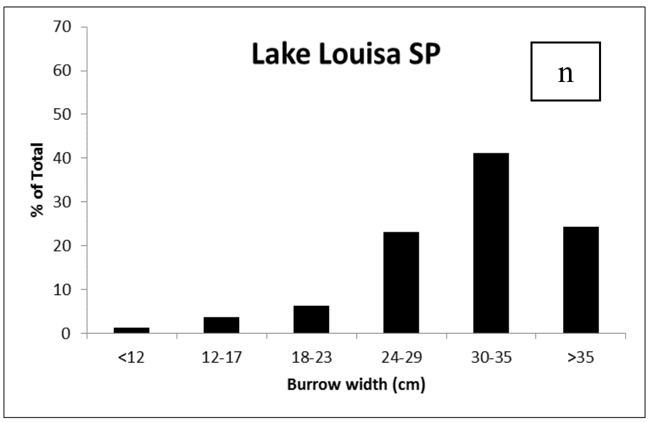

Guana River WMA
j
% of Total
0
10
20
30
40
50
60
70
<12
12-17
18-23
24-29
30-35
>35
Burrow width (cm)

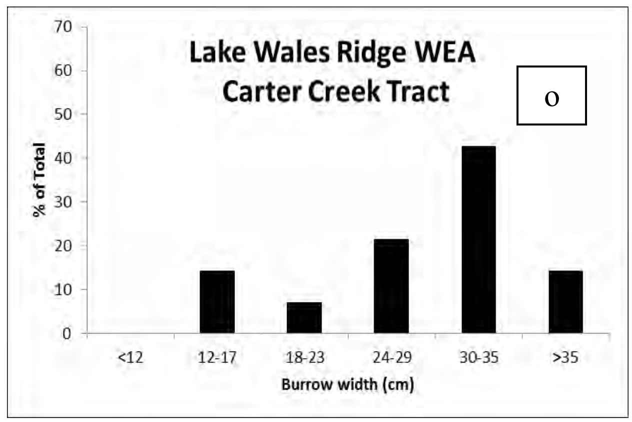

Hilochee WMA
k
% of Total
0
10
20
30
40
50
60
70
<12
12-17
18-23
24-29
30-35
>35
Burrow width (cm)

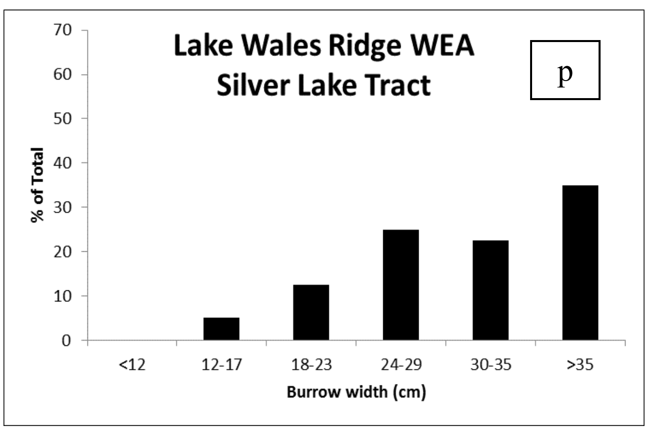

Ichetucknee Springs State Park
l
% of Total
0
10
20
30
40
50
60
70
<12
12-17
18-23
24-29
30-35
>35
Burrow width (cm)

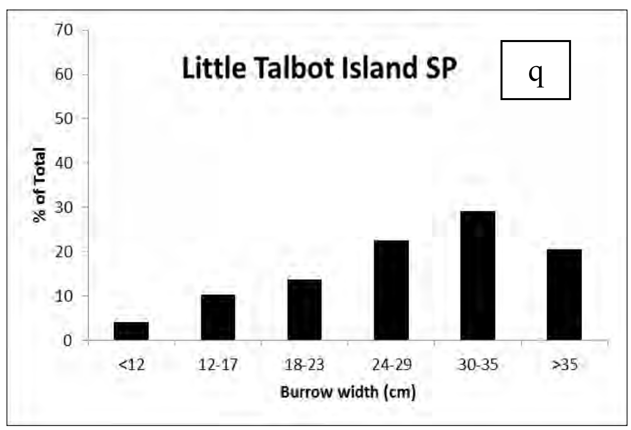

Joe Budd WMA
l
% of Total
0
10
20
30
40
50
60
70
<12
12-17
18-23
24-29
30-35
>35
Burrow width (cm)

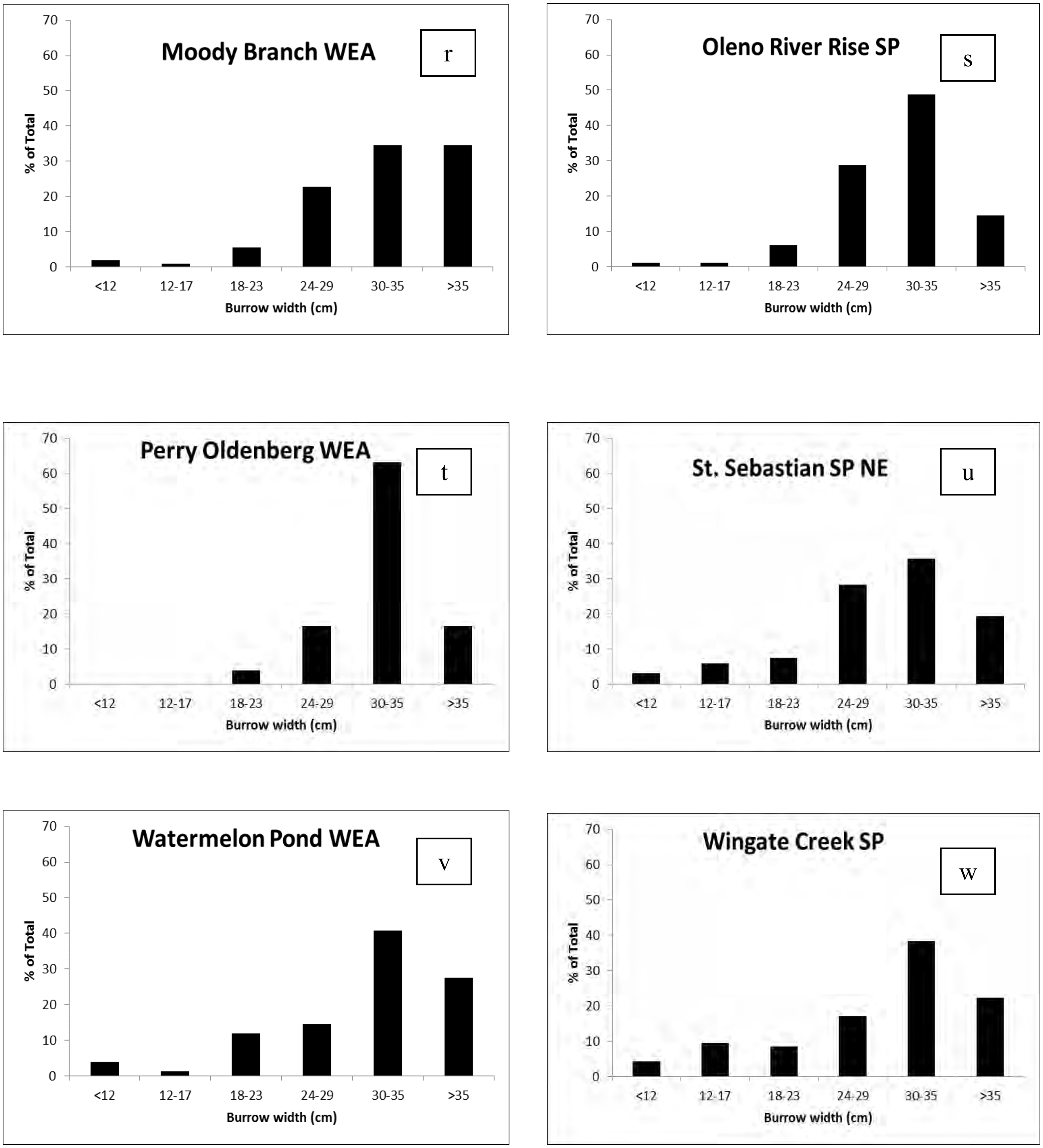

Jonathan Dickinson SP
m
% of Total
0
10
20
30
40
50
60
70
<12
12-17
18-23
24-29
30-35
>35
Burrow width (cm)

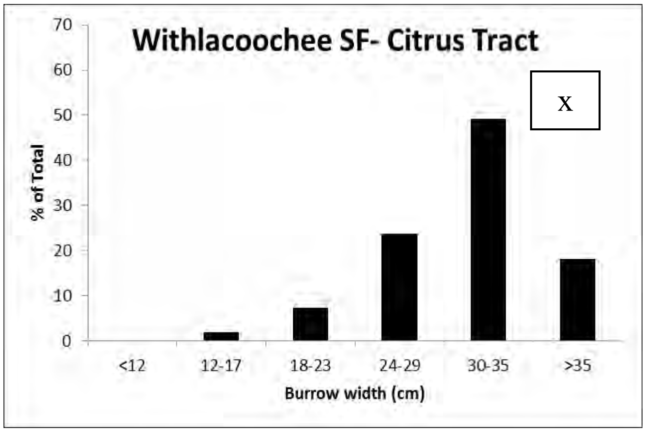

Lake Louisa SP
n
% of Total
0
10
20
30
40
50
60
70
<12
12-17
18-23
24-29
30-35
>35
Burrow width (cm)


Lake Wales Ridge WEA
Carter Creek Tract
o
% of Total
0
10
20
30
40
50
60
70
<12
12-17
18-23
24-29
30-35
>35
Burrow width (cm)


Lake Wales Ridge WEA
Silver Lake Tract
p
% of Total
0
10
20
30
40
50
60
70
<12
12-17
18-23
24-29
30-35
>35
Burrow width (cm)


Little Talbot Island SP
q
% of Total
0
10
20
30
40
50
60
70
<12
12-17
18-23
24-29
30-35
>35
Burrow width (cm)


Moody Branch WEA
r
Oleno River Rise SP
s
Perry Oldenberg WEA
t
St. Sebastian SP NE
u
Watermelon Pond WEA
v
Wingate Creek SP
w
% of Total
Burrow width (cm)
0
10
20
30
40
50
60
70
<12
12-17
18-23
24-29
30-35
>35


Withlacoochee SF- Citrus Tract
x
% of Total
70
60
50
40
30
20
10
0
<12
12-17
18-23
24-29
30-35
>35
Burrow width (cm)

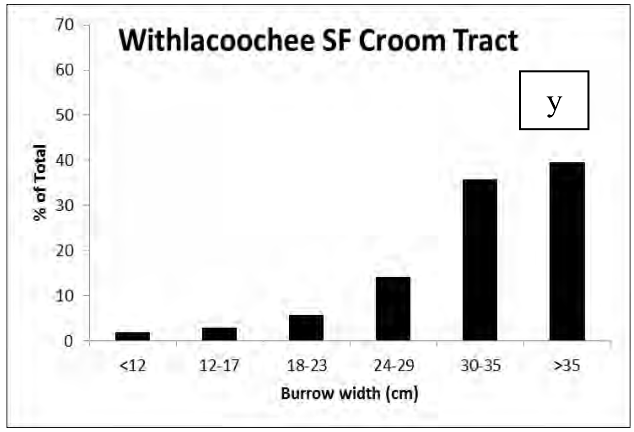

Withlacoochee SF Croom Tract
y
% of Total
70
60
50
40
30
20
10
0
<12
12-17
18-23
24-29
30-35
>35
Burrow width (cm)

Figure 3a-c. High quality gopher tortoise habitat at Bell Ridge Wildlife Environmental Area (a), a tortoise burrow on the dunes at Little Talbot Island State Park (b), and fire suppressed habitat at Wakulla Springs State Park (c).

a

b

c

Appendix 1. Florida gopher tortoise survey rapid habitat assessment protocol.

Habitat sampling points were randomly selected (1 per transect) in ArcGIS. At each point, we sampled the following:

Basal Area:

- Collected using a 10 factor prism horizontally at a height of 4.5 ft.
- Trees were counted (referred to as "in") if the displaced part of the trunk overlaped what could be seen above or below.
- Counted trees where just the borderline overlapped as half a tree.
- If the image did not overlap, the tree was out (not counted).
- Reported the raw counts in Nomad (multiplied these by 10 in Excel database for final reporting).

Canopy cover:

- Used a concave spherical densiometer, visualized 4 dots per square (up to 96 potential dots), counted the number of dots that were OPEN (not covered by any forest canopy).
- Took 4 readings, one in each cardinal direction holding the densiometer at the same height and orientation.
- Recorded all 4 readings or the mean of the 4 readings.
- Reported % canopy cover as: The number of open dots multiplied by 1.04 to obtain the percent of overhead area not occupied by canopy. The difference between this percentage and 100% is the estimated overstory density in percent, e.g., 100% (72 open dots x 1.04) = 25.12 or 25% canopy cover.

Overstory composition:

- Selected the dominant overstory type at the point (pine, oak, mixed, other, none).

% Midstory:

- Estimated the % cover of woody perennial vegetation 1-3 m tall within a 5 m radius of point.

Midstory composition:

- Selected the woody perennial vegetation from 1-3 m tall (pine, oak, shrubs, palmetto, mixed, other, none).

% Ground Cover:

- Selected the dominant ground cover type within a 1 m radius of the point (bare ground, litter, grass, woody, vines, mixed).

Photos:

- Took landscape oriented digital photos N, W, S, and E at each point.
- After taking above 4 photos, take photo denoting transect number.

Appendix 2. Model output for distance sampling for gopher tortoise populations on state conservation lands in Florida, August 2014– May 2016. Methods included conventional distance sampling (CDS), CDS with cluster analysis, and multiple covariate distance sampling (MCDS). Analyses were run using Distance software v.6.2 (Buckland et al. 2001). Burrow diameter was used as a covariate in all MCDS models. Best fitted models (highlighted in yellow) were selected using Akaike's Information Criteria (AIC; Akaike 1974) and consideration of the coefficient of variation (D CV) and detection probability (P). # obs= number of tortoises in burrows or at large observed from transects, Effort= total length of transect surveyed, D= Density (tortoises/hectare), N= abundance, LCL= lower confidence limit for D and N, UCL= upper confidence limit for density and abundance estimate.

Method: MCDS

Bell Ridge WEA	**Models**	**# obs**	**Effort**	**AIC**	**D**	**D LCL**	**D UCL**	**D CV**	**N**	**N LCL**	**N UCL**	**P**
Survey dates	HN 5%	118	9516.1	729.499	4.101	2.578	6.523	0.182	1197	753	1905	0.626
8/26-8/29/14	HR 5%	118	9516.1	735.258	4.398	2.767	6.991	0.184	1284	808	2041	0.583

Method: Cluster CDS

Blackwater River SF West Boundary Unit	**Models**	**# obs**	**Effort**	**AIC**	**D**	**D LCL**	**D UCL**	**D CV**	**N**	**N LCL**	**N UCL**	**P**
Survey dates	UN cos 5%	67(14)	82516.2	332.52	0.100	0.055	0.182	0.308	284	156	514	0.577
9/21-9/25/15, 1/18-2/12/16	HR 5%	67(14)	82516.2	333.17	0.101	0.053	0.193	0.335	286	150	546	0.571
	HN 5%	67(14)	82516.2	333.40	0.101	0.055	0.186	0.314	286	156	525	0.571

Method: Cluster CDS

Bullfrog Creek WEA	**Models**	**# obs**	**Effort**	**AIC**	**D**	**D LCL**	**D UCL**	**D CV**	**N**	**N LCL**	**N UCL**	**P**
Survey dates	UN simp 5%	323	21033.5	1529.91	2.042	1.584	2.633	0.130	378	293	487	0.683
9/14-9/16/15, 1/5-1/12/16	HN simp 5%	323	21033.5	1530.55	2.154	1.634	2.839	0.141	399	302	525	0.648
	HR 5%	323	21033.5	1532.32	1.985	1.520	2.594	0.137	367	281	480	0.702

Method: MCDS

Cayo Costa SP	Models	# obs	Effort	AIC	D	D LCL	D UCL	D CV	N	N LCL	N UCL	P
Survey dates	HN 5%	107	20597.0	639.526	1.791	1.374	2.335	0.135	293	225	382	0.693
4/27-5/1/15, 5/4/-5/8/15	HR cos 5%	107	20597.0	637.185	2.095	1.597	2.750	0.139	343	261	450	0.592

Method: CDS

E.B. Wakulla Spring SP	Models	# obs	Effort	AIC	D	D LCL	D UCL	D CV	N	N LCL	N UCL	P
Survey dates	HN 5%	28	50914.9	160.233	0.167	0.090	0.310	0.319	75	41	140	0.973
1/20-1/22/15; 2/10-2/13/15,	UN 5%	28	50914.9	158.250	0.163	0.101	0.264	0.247	73	45	119	1.000
5/19/2015	HR 5%	28	50914.9	162.250	0.163	0.101	0.264	0.247	73	45	119	1.000

Method: MCDS

Etoniah Creek SF	Models	# obs	Effort	AIC	D	D LCL	D UCL	D CV	N	N LCL	N UCL	P
Survey dates	HN 5%	127	50591.45	751.134	1.028	0.733	1.442	0.173	1538	1096	2157	0.521
6/10-6/12/15, 6/25-6/26/16, 8/31-9/4/15, 9/24-/9/25/15, 11/3-11/6/15	HR 5%	127	50591.45	751.530	1.114	0.792	1.566	0.174	1667	1186	2343	0.480

Method: MCDS

Ft. White WEA	Models	# obs	Effort	AIC	D	D LCL	D UCL	D CV	N	N LCL	N UCL	P
Survey dates	HN 5%	142	18444.9	840.957	2.969	2.361	3.735	0.116	974	774	1224	0.587
9/2-9/5/14, 9/9-9/10/14	HR 5%	142	18444.9	842.754	2.684	2.141	3.364	0.114	880	702	1103	0.650

Method: CDS

Goethe SF Levy Co. Main Tract	Models	# obs	Effort	AIC	D	D LCL	D UCL	D CV	N	N LCL	N UCL	P
Survey dates	HN 5%	99	23393.7	670.973	1.042	0.698	1.556	0.203	1991	1333	2974	0.622
12/16-12/19/14, 12/22-12/23/14,	UN cos 5%	99	23393.7	670.292	1.067	0.721	1.579	0.198	2039	1378	3017	0.607
12/29-12/31/14	HR 5%	99	23393.7	673.554	1.114	0.687	1.807	0.248	2129	1312	3454	0.582

Method: MCDS

Goldhead Branch SP	Models	# obs	Effort	AIC	D	D LCL	D UCL	D CV	N	N LCL	N UCL	P
Survey dates	HN 5%	88	19907.1	565.391	1.116	0.783	1.591	0.176	843	591	1201	0.769
9/24-9/26/14, 9/30-10/2/14	HR 5%	88	19907.1	570.169	1.044	0.744	1.463	0.166	788	562	1105	0.822

Method: MCDS

Guana River	Models	# obs	Effort	AIC	D	D LCL	D UCL	D CV	N	N LCL	N UCL	P
Survey dates	HN 5%	52	53557.9	261.816	0.575	0.403	0.822	0.183	219	154	313	0.617
3/16-3/20/15, 4/13-4/17/15, 5/11-5/12/15	HR 5%	52	53557.9	263.358	0.667	0.461	0.964	0.189	254	176	368	0.532

Method: CDS

Hilochee WMA	Models	# obs	Effort	AIC	D	D LCL	D UCL	D CV	N	N LCL	N UCL	P
Survey dates	HN 5%	27	22829.8	182.456	0.333	0.191	0.581	0.285	176	101	306	0.474
2/26-2/27/15, 3/2-3/4/15,	UN 5%	27	22829.8	182.455	0.374	0.208	0.671	0.301	197	110	353	0.422
6/22-6/23/15	HR 5%	27	22829.8	181.928	0.350	0.180	0.681	0.344	184	95	359	0.451

Method: MCDS

Ichetucknee Springs SP	Models	# obs	Effort	AIC	D	D LCL	D UCL	D CV	N	N LCL	N UCL	P
Survey dates	HN 5%	121	13561.7	665.481	3.970	3.008	5.240	0.138	1269	962	1675	0.658
9/12/14, 9/15-9/16/14, 9/18-9/19/14, 9/22/14	HR 5%	121	13561.7	670.061	3.878	2.941	5.114	0.137	1240	940	1635	0.673

Method: CDS

Joe Budd WMA	Models	# obs	Effort	AIC	D	D LCL	D UCL	D CV	N	N LCL	N UCL	P
Survey dates	UN 5%	28	27478.2	167.930	0.254	0.133	0.486	0.336	66	34	125	1.00
10/20-10/23/14,	HN 5%	28	27478.2	169.330	0.254	0.120	0.536	0.391	66	31	138	1.00
11/17-11/21/14	HR 5%	28	27478.2	171.930	0.254	0.133	0.486	0.336	66	34	125	1.00

Method: MCDS

Jonathan Dickinson SP	Models	# obs	Effort	AIC	D	D LCL	D UCL	D CV	N	N LCL	N UCL	P
Survey dates	HR 5%	141	60288.2	855.485	0.769	0.580	1.021	0.144	870	656	1154	0.553
3/9-3/13/15, 4/6-4/10/15,	HN 5%	141	60288.2	857.544	0.905	0.680	1.204	0.146	1023	769	1361	0.4704
6/1-6/6/15, 8/10-8/13/15												

Method: MCDS

Lake Louisa SP	Models	# obs	Effort	AIC	D	D LCL	D UCL	D CV	N	N LCL	N UCL	P
8/3-8/7/15, 8/17-8/20/15, 8/24-8/28/15	HN 5%	226	42393.6	1342.853	2.168	1.580	2.975	0.161	1626	1185	2232	0.4974
	HR 5%	226	42393.6	1350.206	1.926	1.406	2.637	0.160	1445	1055	1978	0.5599

Method: CDS

Lake Wales Ridge WEA Carter Creek	Models	# obs	Effort	AIC	D	D LCL	D UCL	D CV	N	N LCL	N UCL	P
Survey dates	HN 5%	13	9685.2	81.633	0.373	0.180	0.775	0.376	293	141	609	0.828
5/13-5/14/15, 6/8-6/9/15	UN 5%	13	9685.2	80.032	0.309	0.173	0.551	0.294	243	136	433	1.000
	HR 5%	13	9685.2	82.964	0.517	0.139	1.922	0.685	406	109	1509	0.598

Method: MCDS

Lake Wales Ridge WEA Silver Lake	Models	# obs	Effort	AIC	D	D LCL	D UCL	D CV	N	N LCL	N UCL	P
Survey dates	HN 5%	38	21614.6	164.590	1.700	1.093	2.645	0.225	243	156	378	0.460
3/23-3/27/15	HR 5%	38	21614.6	163.210	2.068	1.314	3.255	0.231	296	188	465	0.380

Method: MCDS

Little Talbot Island SP	Models	# obs	Effort	AIC	D	D LCL	D UCL	D CV	N	N LCL	N UCL	P
Survey dates	HN 5%	301	22252.7	1846.763	4.504	3.924	5.169	0.070	779	679	894	0.632
10/6-10/10/14, 11/10-11/14/14	HR 5%	301	22252.7	1844.606	4.356	3.796	4.999	0.070	754	657	865	0.654

Method: MCDS

Moody Branch WEA	Models	# obs	Effort	AIC	D	D LCL	D UCL	D CV	N	N LCL	N UCL	P
Survey dates	HN 5%	104	23906.8	517.640	2.636	2.030	3.422	0.132	478	369	621	0.620
3/30-4/3/15, 4/20-4/23/15	HR 5%	104	23906.8	519.140	2.977	2.280	3.888	0.135	540	414	706	0.550

Method: MCDS

O'Leno River Rise SP	Models	# obs	Effort	AIC	D	D LCL	D UCL	D CV	N	N LCL	N UCL	P
Survey dates	HN 5%	190	21486.9	1308.974	2.178	1.603	2.960	0.155	1011	744	1374	0.546
11/24/14, 12/8-12/12/14, 10/13-10/17/14, 12/15/2014	HR 5%	190	21486.9	1311.508	2.318	1.703	3.154	0.156	1076	791	1464	0.513

Method: MCDS

Perry Oldenberg WEA	Models	# obs	Effort	AIC	D	D LCL	D UCL	D CV	N	N LCL	N UCL	P
Survey dates	HN 5%	75	17370.31	466.449	1.579	1.173	2.127	0.149	213	158	287	0.469
2/23-2/25/15	HR 5%	75	17370.31	466.601	2.130	1.553	2.921	0.159	287	209	394	0.348

Method: MCDS

St. Sebastian SP	Models	# obs	Effort	AIC	D	D LCL	D UCL	D CV	N	N LCL	N UCL	P
Survey dates	HN 5%	64	33284.0	362.806	0.857	0.564	1.301	0.213	977	644	1483	0.588
6/29-7/3/15, 7/13-7/17/15	HR 5%	64	33284.0	368.083	0.928	0.608	1.415	0.216	1058	694	1614	0.543

Method: MCDS

Watermelon Pond WEA	Models	# obs	Effort	AIC	D	D LCL	D UCL	D CV	N	N LCL	N UCL	P
Survey dates	HN 5%	173	36421.06	1090.596	1.378	1.118	1.697	0.106	184	149	226	0.706
10/27-10/28/14, 11/3-11/7/14, 12/1/14, 12/4-12/5/14	HR 5%	173	36421.06	1092.987	1.218	0.993	1.493	0.104	162	132	199	0.799

Method: MCDS

Wingate SP	Models	# obs	Effort	AIC	D	D LCL	D UCL	D CV	N	N LCL	N UCL	P
Survey dates	HN 5%	89	21955.85	477.390	1.9938	1.537	2.586	0.132	303	234	394	0.648
7/20-7/24/15, 7/27-7/29/15	HR 5%	89	21955.85	479.368	2.2742	1.735	2.981	0.137	346	264	454	0.568

Method: MCDS

Withlacoochee SF Citrus Tract*	Models	# obs	Effort	AIC	D	D LCL	D UCL	D CV	N	N LCL	N UCL	P
Survey dates	HN 5%	51	29667.61	350.785	0.4011	0.268	0.601	0.205	7179	4789	10761	0.654
2/16-2/20/15, 4/24/15	HR 5%	51	29667.61	352.005	0.3688	0.248	0.548	0.201	6600	4440	9813	0.711

Method: MCDS

Withlacoochee SF Croom Tract	Models	# obs	Effort	AIC	D	D LCL	D UCL	D CV	N	N LCL	N UCL	P
Survey dates	HN 5%	125	35083.7	720.950	1.592	1.221	2.075	0.135	8221	6308	10714	0.498
2/24-2/26/16, 4/4-4/7/16	HR 5%	125	35083.7	722.232	1.537	1.182	1.998	0.134	7938	6106	10320	0.516

Appendix 3. Roster of participants in the Gopher Tortoise Line Transect Distance Sampling Workshop held at Archbold Biological Station, Lake Placid, Florida on 5-7 May 2016.

Name	Agency/location
Rachel King	FWC GT biologist/South Region
Samantha Dupree	FWC GT Biologist/NE Region
Eric Seckinger	FWC GT Biologist/NC & NW Region
Mehan Harris	FPS District 2
Andi Christman	FPS District 2
Chris Becker	FPS District 4
Rosalind Rowe	FPS District 4
Allegra Buyer	FPS District 3
Bernie Kaiser	Hillsborough County
Candace Donato	DEP/GTMNERR NE Region
Joe Burgess	DEP/GTMNERR NE Region
Matt Corby	Camp Blanding
Tabitha Biehl	Polk County
Alex Kalfin	FWC GT Local Government Coordinator
Michelina Dziadzio	FWC GT GIS and Monitoring Coordinator
Tyler Mosteller	St. Johns River Water Mgmt District
Betsie Rothermel	Archbold
Instructors	
Eric Sievers	FWC GT Biologist/SW Region
Lora Smith	JWJERC
Jennifer Howze	JWJERC
Workshop organizer	
Deborah Burr	FWC