

RAINBOW SPRINGS STATE PARK

UNIT MANAGEMENT PLAN

APPROVED PLAN

**STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Division of Recreation and Parks**

December 5, 2002



Department of Environmental Protection

Jeb Bush
Governor

Marjorie Stoneman Douglas Building
3900 Commonwealth Boulevard, MS 140
Tallahassee, Florida 32399-3000

David B. Struhs
Secretary

December 10, 2002

Ms. Bryanne White
Office of Park Planning
3900 Commonwealth Blvd., M.S. 525
Tallahassee, Florida 32399-3000

Re: Rainbow Springs State Park

Lease Number: # 3900

Dear Ms. White:

On December 5, 2002, the Acquisition and Restoration Council recommended approval of the Land Management Plan for Rainbow Springs State Park. Therefore, the Office of Environmental Services, acting as agent for the Board of Trustees of the Internal Improvement Trust Fund approves this plan. Pursuant to Section 253.034 and 259.032, Florida Statutes, and Chapter 18-2, Florida Administrative Code the plan's five-year update will be due on December 10, 2007.

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.

Sincerely,

Delmas T. Barber

Delmas T. Barber, OMC Manager
Office of Environmental Services
Division of State Lands

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INTRODUCTION

Rainbow Springs State Park is located in Marion County about 3.5 miles north of Dunnellon. Access to the park is from U.S. Highway 41 (see Vicinity Map). The Vicinity Map also reflects several other significant land and water resources that exist near the park. The park encompasses the headsprings of the Rainbow River and extends south along the east side of the Rainbow River. The park also includes large areas of sandhills, upland mixed forest, and flatwoods, as well as the remnants of a once-thriving tourist attraction and a renovated ornamental garden.

The park was acquired in 1990 using Conservation and Recreational Lands Program (CARL) funds. Currently the park contains approximately 1,084.58 acres; acreage is based on the Division of Recreation and Parks Jurisdiction Report, July 2002.

At Rainbow Springs State Park, public outdoor recreation and conservation is the designated single use of the property (see Addendum 1). There are no legislative or executive directives that constrain the use of this property.

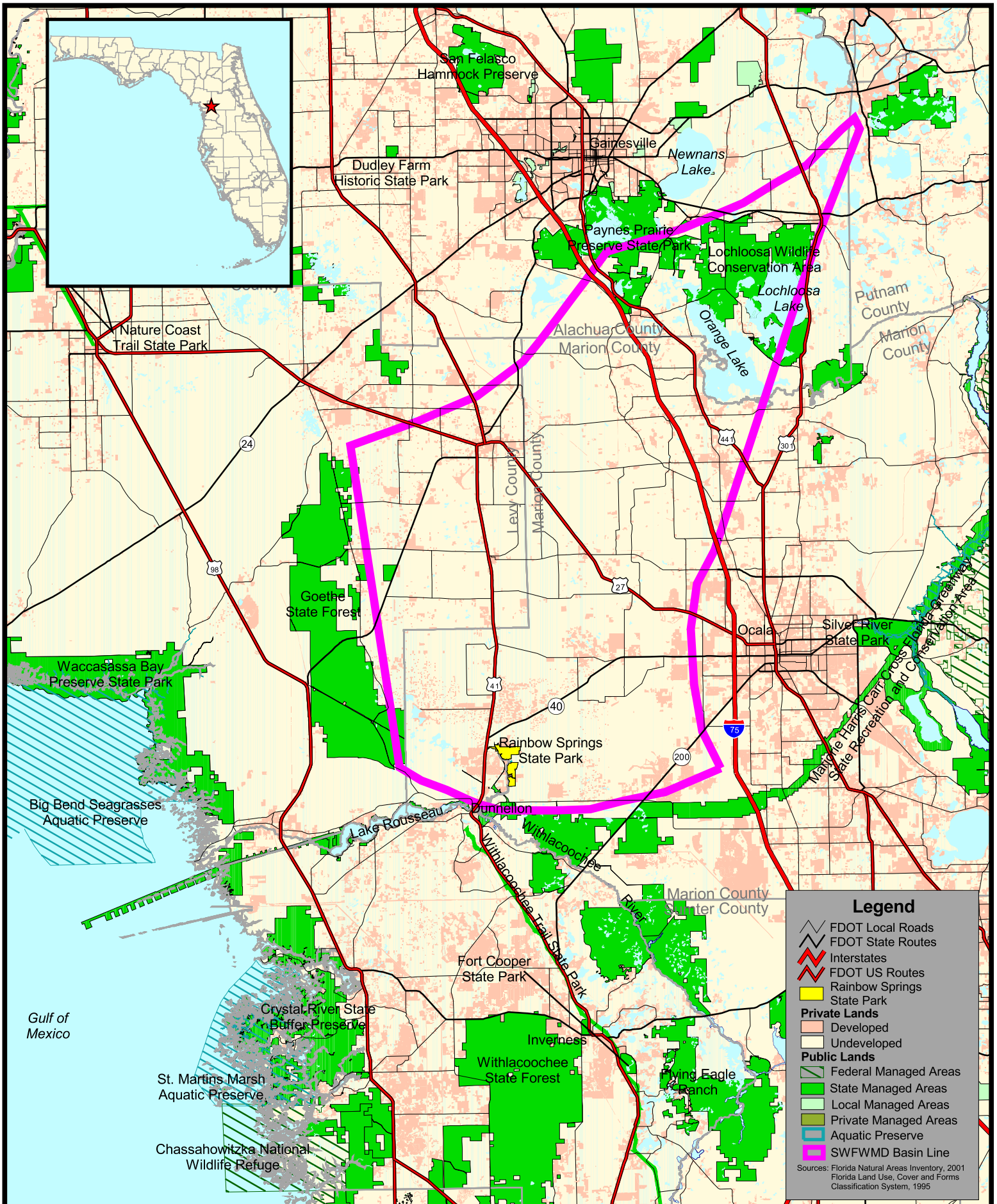
PURPOSE AND SCOPE OF THE PLAN

This plan serves as the basic statement of policy and direction for the management of Rainbow Springs State Park as a unit of Florida's state park system. It identifies the objectives, criteria and standards that guide each aspect of park administration, and sets forth the specific measures that will be implemented to meet management objectives. The plan is intended to meet the requirements of Sections 253.034 and 259.032, Florida Statutes, Chapter 18-2, Florida Administrative Code, and intended to be consistent with the State Lands Management Plan. With approval, this management plan will supercede and replace the current approved plan of May 27, 1997. All development and resource alteration encompassed 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. This plan is also intended to meet the requirements for beach and shore preservation, as defined in Chapter 161, Florida Statutes, and Chapters 62B-33, 62B-36 and 62R-49, Florida Administrative Code.

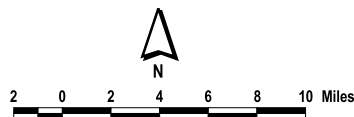
The plan consists of two interrelated components. Each component corresponds to a particular aspect of the administration of the park. The resource management component provides a detailed inventory and assessment of the natural and cultural resources of the park. Resource management problems and needs are identified, and specific management objectives are established for each resource type. This component provides guidance on the application of such measures as prescribed burning, exotic species removal, and restoration of natural conditions.

The land use component is the recreational resource allocation plan for the unit. Based on considerations such as access, population, and adjacent land uses, an optimum allocation of the physical space of the park is made, locating use areas and proposing types of facilities and volume of use to be provided.

In the development of this plan, the potential of the park to accommodate secondary management purposes ("multiple uses") was analyzed. These secondary purposes were considered within the context of the Division's statutory responsibilities and an analysis of the resource needs and values of the park. This analysis considered the park natural and cultural resources, management needs, aesthetic values, visitation, and visitor experiences. For this park, it was determined that no secondary purposes could be accommodated in a manner that would not interfere with the primary purpose of resource-based outdoor



**Rainbow Springs State Park
Vicinity Map**



Prepared By:
Florida Department Of Environmental Protection
Division Of Recreation And Parks
Office Of Park Planning

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

The potential for generating revenue to enhance management was also analyzed. Visitor fees and charges are the principal source of revenue generated by the park. It was determined that multiple-use management activities would not be appropriate as a means of generating revenues for land management. Instead, techniques such as entrance fees, concessions, and similar measures will be employed on a case-by-case basis as a means of supplementing park management funding. The use of private land managers to facilitate restoration and management of this unit was also analyzed. Decisions regarding this type of management (such as outsourcing, contracting with the private sector, use of volunteers, etc.) will be made on a case-by-case basis as necessity dictates.

MANAGEMENT PROGRAM OVERVIEW

Management Authority and Responsibility

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

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

The Trustees have also granted management authority of certain sovereign submerged lands to the Division 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 impact public recreational uses.

Many operating procedures are standard system wide and are set by policy. These procedures are outlined in the Division's Operations Procedures Manual (OPM) and cover such areas as personnel management, uniforms and personal appearance, training, signs, communications, fiscal procedures, interpretation, concessions, camping regulations, resource management, law enforcement, protection, safety and maintenance. All parks have a copy of the OPM.

In the management of Rainbow Springs 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 Goals and Objectives

The following park goals and objectives express the Division's long-term intent in managing the state park. At the beginning of the process to update this management plan, the Division reviewed the goals and objectives of the previous plan to determine if they remain meaningful and practical and should be included in the updated plan. This process ensures that the goals and objectives for the park remain relevant over time.

Estimates are developed for the funding and staff resources needed to implement the management plan based on these goals, objectives and priority management activities. Funding priorities for all state park management and development activities are reviewed each year as part of the Division legislative budget process. The Division prepares an annual legislative budget request based on the priorities established for the entire state park system. The Division also aggressively pursues a wide range of other funds and staffing resources, such as grants, volunteers, and partnerships with agencies, local governments and the private sector, for supplementing normal legislative appropriations to address unmet needs. The ability of the Division to implement the specific goals, objectives and priority actions identified in this plan will be determined by the availability of funding resources for these purposes.

Natural Resources

1. Reduce human impacts on headsprings and river.
 - A. Continue to restrict swimming, snorkeling and wading to areas designated for that purpose. Continue to use photopoints or other methods to document shifts in vegetation and other changes around the swimming area. Continue to designate Bubbling Springs and the unnamed side spring as restricted zones with no access permitted. Coordinate with staff of the Aquatic Preserve in efforts to restore appropriate plant species and to remove hydrilla.
 - B. Develop a monitoring plan, incorporating data collected by U.S.G.S. and the SWFWMD, to assess discharge rates, water quality, and community structure of the springs and spring-runs. The plan should address research needs and management of the existing human impacts on the resource.
 - C. Continue to assist law enforcement staff in enforcing boat speed restrictions on the Rainbow River. Continue to restrict motorized vessels from entering the headspring area.
 - D. Maintain shoreline vegetation to serve as protective buffers to runoff.
2. Encourage and participate in the protection of spring flow and spring water quality on a regional level, which places a focus on preventing excessive groundwater pumping and controlling nutrient and pollutant loading in the watershed.
 - A. Monitor water quality and quantity threats from activities outside the park, and coordinate closely with permitting agencies to ensure Division's interests are considered. Support Marion County land use planning decisions that protect groundwater supplies in the Rainbow Springs recharge basin.
 - B. Support purchase of conservation easements or outright acquisition of crucial lands within the Rainbow Springs groundwater recharge basin to protect spring flow and water quality.
 - C. Maintain close contact with agencies collecting information that may affect the management of Rainbow Springs. Compile monitoring data in suitable formats and distribute to park staff and volunteers for their use.
 - D. Funding from the 2001 and 2002 Springs Initiatives provided staff to the Aquatic Preserve to establish the Rainbow River Coordination Council. Participate in the

Council and support its public outreach and education activities. Encourage landowners in the Rainbow Springs recharge basin to implement BMP's that protect groundwater.

3. Remove invasive exotic plants and animals.
 - A. Continue to cooperate with the Aquatic Preserve staff to control hydrilla within the Rainbow River. Within the park, continue to control hydrilla utilizing a strategy of contain, reduce and eradicate established patches.
 - B. The upland species judged as highest priority for removal include skunk vine, and cogon grass. Other plants with a high priority for removal include air potato, coral ardisia, elephant ear, and taro. Follow-up treatments are among the highest priorities.
 - C. Aggressively remove feral hogs in accordance with the Division feral hog policy whenever they or their signs are noted on site. Restoration of some hog-damaged areas may be necessary if the disturbance is extensive.
 - D. Continue the outreach program to educate neighbors and visitors about the threats of invasive exotic plants. Encourage adjacent landowners to establish control programs for invasive exotic plants.
4. Continue to renovate the ornamental gardens.
 - A. Replace invasive ornamental plant species with native or non-invasive ornamentals.
 - B. Emphasize xeriscaping and limit use of fertilizers in the gardens to protect headsprings.
5. Reintroduce fire to natural communities and restore pastures with native vegetation.
 - A. Continue active prescribed burning program to restore fire-dependent natural communities and where necessary remove offsite hardwoods to speed restoration.
 - B. Convert the site of the former sewage treatment plant to some other use. If not needed for infrastructure or facilities, eliminate exotics and restore it to the appropriate natural community types.
 - C. The pasture and nursery areas should be replanted with longleaf pines, sandhill oak species, and native herbaceous species once the bahiagrass dominated pasture grasses are removed or suppressed enough to allow establishment of native species. Fire will be an important tool in the restoration of these areas.
6. Prevent soil erosion around the headsprings and along developed shorelines.
 - A. Visitors are currently prevented from entering and exiting the water directly from the shore. Continue to require recreational users to use structures provided for accessing the swimming areas.
 - B. Wherever exotic plants are removed from the slopes above the headsprings, plant native species as replacements to prevent erosion. Temporary measures such as erosion control mats and seeding with annual rye grass may be warranted in some cases until the area can be stabilized with perennial species.
 - C. Provide some form of docking structure to remove impacts from the campground shoreline.
7. Improve the attenuation of stormwater runoff from the developed areas above the headsprings; Restore natural hydrological flows within the county campground to the extent possible.
 - A. Monitor stormwater runoff from the walkways and other impervious surfaces on slopes above the headsprings to determine the function and extent of the existing underground drainage system. If necessary, modify the drainage system to meet best management practices and current water quality standards.
 - B. Manage runoff from the grassy slopes and natural areas above the spring to prevent any adverse impacts on water quality. Establish water bars or vegetated berms with shallow swales to divert and absorb runoff.

- C. Control runoff from existing roads in the campground area using vegetated berms and water bars constructed to direct flow to vegetated areas, preventing direct flow of sediments into the spring run.
- D. Redesign the campground access roads, or retrofit with an adequate culvert system, to restore natural sheetflow and surfacewater flows in the adjacent hydric hammock.
- 8. Remove non-essential structures and restore natural areas.
 - A. Remove buildings and other structures that are not necessary for park operations and replant their sites with native vegetation. Carefully review non-essential structures with historic elements before considering them for removal or alteration.
 - B. Continue disposal of scrap piles that remain onsite from the attraction period.
- 9. Protect surrounding natural areas through acquisition and/or close monitoring of proposed land use changes and maintain park boundary lines.
 - A. To ensure the continued survival of species within the park, additional natural areas must be acquired before they are destroyed by development. Attempts should be made to acquire corridors of natural habitat to the north and south of the park to provide connections to other natural areas. Encourage homeowners near the park to maintain native vegetation on their land to provide additional wildlife habitat.
 - B. As part of the prescribed fire program at the park, contact local citizens and instruct them on the importance of fire in preserving natural areas. Interpretation and education about prescribed fire will be vital to its continued use as a management technique on state lands.
 - C. Continually review comprehensive plan amendments and land development regulations that may govern proposed land use changes on properties adjacent to the park. Monitor permits requested of the SWFWMD for those that may impact the watershed of the Rainbow River. Formally present Division comments regarding proposed land use changes or permit requests to appropriate governing bodies and agencies.
 - D. Pursue a survey to determine the park boundary line where the line is in question. Once established, maintain the boundary.

Cultural Resources

- 10. Protect and monitor archaeological and historic sites for vandalism, unauthorized digging, erosion and other forms of encroachment.
 - A. Park staff and law enforcement will continue to patrol remote cultural sites to discourage looting.
 - B. Develop, implement and adhere to a cyclical maintenance program for all cultural resources especially the Cemetery site and resources from the twentieth century attraction.
 - C. Aggressively pursue purchase of adjacent properties containing significant cultural resources to protect sites from development or destruction.
 - D. Regularly assess the condition of archaeological and historic resources. Monitor the condition of sites in poor condition using photopoints.
 - E. Regularly assess condition of historic structures, including glass bottom boats on loan and stored on park grounds. Arrange a consultation with a historic preservation architect to assess and possibly stabilize structures that are in fragile state of preservation or present a safety hazard.
 - F. Create and maintain a cultural resources record keeping system.
 - G. Stabilize the 1920s stone cabins.
- 11. Formalize and properly curate park collections.
 - A. Develop a Scope of Collection Statement for inventory and cataloging all collection objects, including informal collections. Develop plans to exhibit appropriate objects

- in visitor center.
- B. Determine if one or all of the glass bottom boats currently stored at the park could be acquired by the park or be donated to the park. If transfer of ownership is possible, initiate a process such that one boat be restored and displayed out of the water for interpretive purposes.
- 12. Properly document unrecorded cultural sites, conduct additional survey work, and pursue nomination of the park resources as a National Register site.
 - A. Complete Florida Master Site File forms for all unrecorded sites and pursue funding for a Phase II archaeological survey.
 - B. Pursue funding to hire a private sector professional to prepare a systematic detailed history of the park from its earliest settlement to the present time.
 - C. Conduct ground disturbing activities in accordance with the Department of State, Division of Historical Resources guidelines.

Recreational Uses

- 13. Improve recreational opportunities, visitor services and safety.
 - A. Construct a ranger station on the entrance drive and interpretive facilities in existing buildings in the main use area.
 - B. Remove dilapidated animal cages.
 - C. Develop and implement a restoration master plan for the gardens and landscaped areas.
 - D. Repair and maintain brick walkways.
 - E. Develop an interpretive boardwalk on the eastern shoreline.
 - F. Relocate camping area and develop tube entrance and exit facilities on the south parcel of the state park.
 - G. Develop natural area hiking trails using existing service roads and firebreaks.
- 14. Improve visitor awareness through interpretive programs.
 - A. Increase media contacts, special events, off-site programs to local schools, and on-site interpretive programs.
 - B. Coordinate joint educational programs with other state agencies and the local education community.
 - C. Expand ranger-guided canoeing, snorkeling, and walking tours.

Park Administration/Operations

- 15. Pursue additional staff to provide support for new park operations.
 - A. Request FTE staff and sufficient outsourcing funds for the new tubing facilities to be operated within the park.
 - B. Request FTE staff and sufficient outsourcing funds for the park to assume operations of the state park campground when the sublease agreement with Marion County is terminated.
- 16. Encourage and promote volunteer activities within the park.
 - A. Maintain a park Citizens Support Organization (CSO), which assists in park operations.
 - B. Provide park and community recognition and support for volunteers.
- 17. Pursue acquisition of equipment necessary to manage park resources.
 - A. Acquire needed equipment for prescribed burning and exotics control.
- 18. Provide for the protection of park boundaries and resources
 - A. Maintain posted boundary signs.
 - B. Patrol remote areas of the park to discourage and detect illegal activities.
 - C. Request boundary surveys where necessary to define the park boundary.
 - D. Continue collaborative efforts with staff of the Rainbow River Aquatic Preserve and others for river protection and the management of recreational activities on the river.

19. Promote the park locally and statewide.

- A. Expand special events to be held within the park.
- B. Provide frequent public service announcements to local and state media contacts.
- C. Maintain contacts with adjacent landowners and local residents.
- D. Expand and maintain accurate web site.

Management Coordination

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

The Department of Agriculture and Consumer Services, Division of Forestry (DOF), assists Division staff in the development of wildfire emergency plans and provides the authorization required for prescribed burning. The Florida Fish and Wildlife Conservation Commission (FFWCC), assists staff in the enforcement of state laws pertaining to wildlife, freshwater fish and other aquatic life existing within park boundaries. In addition, the FFWCC aids the Division with wildlife management programs, including the development and management of Watchable Wildlife programs. The Department of State, Division of Historical Resources (DHR) assists staff to assure protection of archaeological and historical sites. The Department of Environmental Protection (DEP), Office of Coastal and Aquatic Managed Areas (CAMA) aids staff in aquatic preserves management programs. The DEP, Bureau of Beaches and Wetland Resources aids staff in planning and construction activities seaward of the Coastal Construction Line. In addition, the Bureau of Beaches and Coastal Systems aid the staff in the development of erosion control projects. Emphasis is placed on protection of existing resources as well as the promotion of compatible outdoor recreational uses.

Rainbow Springs State Park property overlaps and borders on the Rainbow Springs Aquatic Preserve, which is managed by DEP, Office of CAMA. The Rainbow Springs Aquatic Preserve field office is located within Rainbow Springs State Park, providing park and Aquatic Preserve staff the opportunity to interact regularly, and to coordinate management activities for the park and preserve. Aquatic Preserve staff provide technical expertise and support to park staff in the areas of aquatic plant management and exotics control, erosion control and stormwater runoff management, and public outreach and education.

Public Participation

During the development of this management plan, the Division sought public input by conducting a series of meetings. An initial public workshop was held on October 19, 2000. The purpose of the meeting was to solicit comments from the public before the development of this management plan.

A second public workshop was held on May 22, 2002. The purpose of this meeting was to present this draft management plan to the public.

A DEP Advisory Group meeting was held on May 23, 2002. The purpose of this meeting was to provide the Advisory Group members the opportunity to discuss this draft management plan (see Addendum 1).

Other Designations

Rainbow Springs State Park is not within an Area Of Critical State Concern as defined in section 380.05, Florida Statutes. Currently it is not under study for such designation. The park is a component of the Florida Greenways and Trails System.

All waters within the unit have been designated as Outstanding Florida Waters, pursuant to

Chapter 62-302 Florida Administrative Code. Surface waters in this unit are also classified as Class III waters by DEP. Rainbow Springs State Park is adjacent to and overlaps with the Rainbow Springs Aquatic Preserve as designated under the Florida Aquatic Preserve Act of 1975 (section 258.35, Florida Statutes).

RESOURCE MANAGEMENT COMPONENT

INTRODUCTION

The Division of Recreation and Parks has implemented resource management programs for preserving for all time the representative examples of natural and cultural resources of statewide significance under its administration. This component of the unit plan describes the natural and cultural resources of the park and identifies the methods that will be used to manage them. The stated management measures in this plan are consistent with the Department's overall mission in ecosystem management. Cited references are contained in Addendum 2.

The Division's philosophy of resource management is natural systems management. Primary emphasis is on restoring and maintaining, to the degree practicable, the natural processes that shape the structure, function and species composition of Florida's diverse natural communities as they occurred in the original domain. Single species management may be implemented when the recovery or persistence of a species is problematic provided it is compatible with natural systems management.

The management goal of cultural resources is to preserve sites and objects that represent all of Florida's cultural periods as well as significant historic events or persons. This goal may entail active measures to stabilize, reconstruct or restore resources, or to rehabilitate them for appropriate public use.

Because park units are often components of larger ecosystems, their proper management is often affected by conditions and occurrences beyond park boundaries. Ecosystem management is implemented through a resource management evaluation program (to assess resource conditions, evaluate management activities, and refine management actions), review of local comprehensive plans, and review of permit applications for park/ecosystem impacts.

RESOURCE DESCRIPTION AND ASSESSMENT

Natural Resources

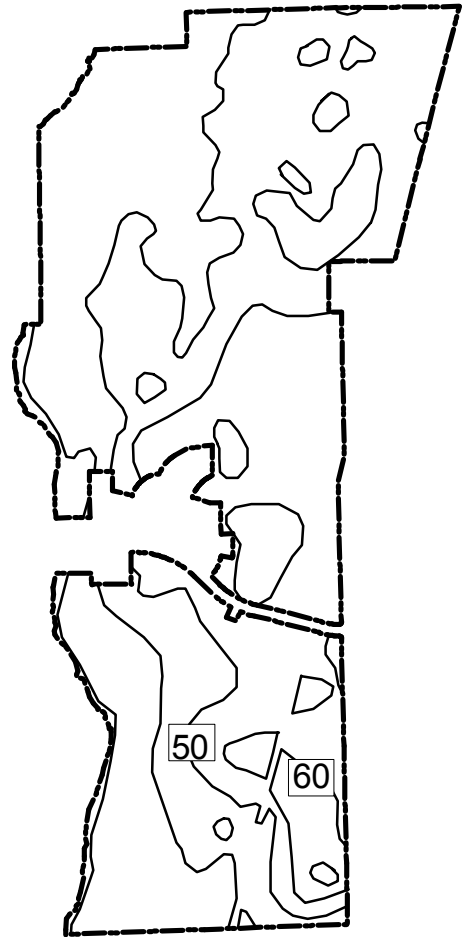
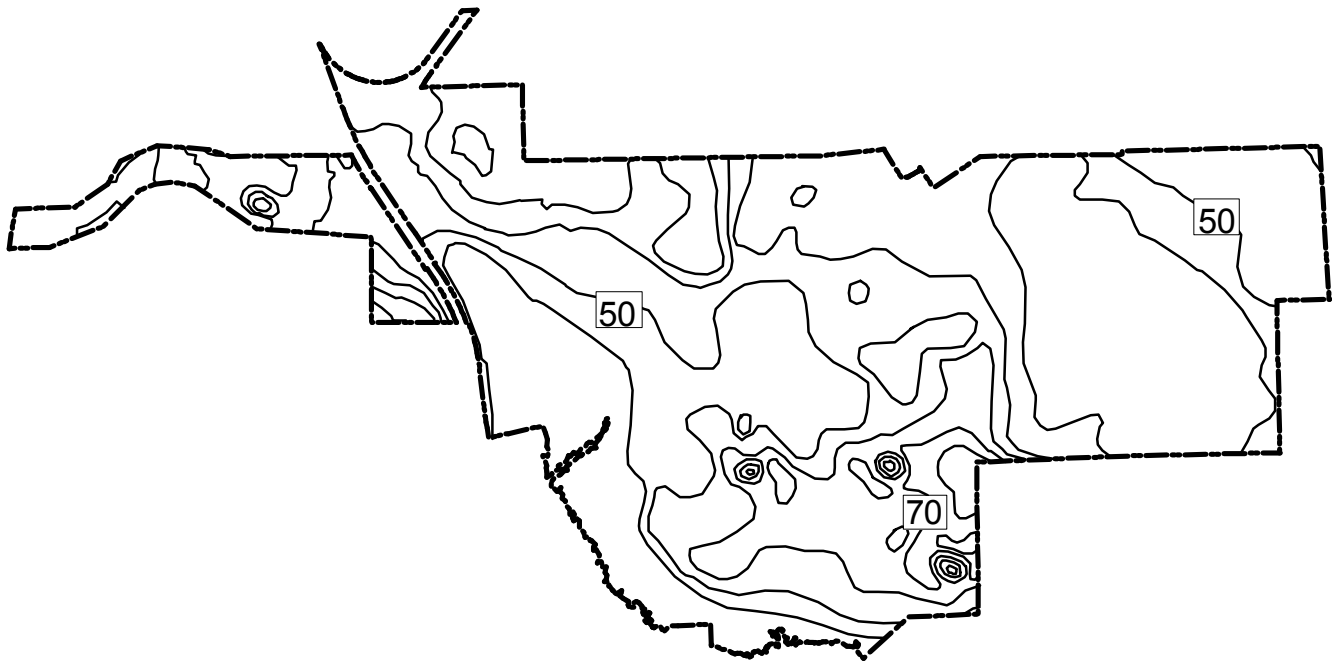
Topography

Rainbow Springs State Park lies within a region of the state known as the Central or Mid-peninsular Physiographic Zone, specifically within the Western Valley between the Brooksville Ridge and the Cotton Plant Ridge. This geomorphic zone is characterized by karst terrain, developed from solution of the underlying limestone. The area exhibits discontinuous highlands, forming nearly parallel ridges or terraces that are separated by broad valleys.

The major drainage system in the area is the Withlacoochee River, which flows westerly through Lake Rousseau before emptying into the Gulf of Mexico near Yankeetown. The confluence of the Rainbow River with the Withlacoochee River is near the southeastern edge of the City of Dunnellon in western Marion County.

Within the park, relatively flattened uplands slope downward to a zone of hydric soils along the eastern side of the Rainbow River. A large depression area that connects to the Indian Creek bottomlands runs through the northeast portion of the property. Several sinkholes also exist within the uplands. Elevations range from about 100 feet above mean sea level (msl) in the uplands west of the headsprings to less than 30 feet in the river floodplain. The headsprings are between 30 and 40 feet above msl (see Topographic Map).

Alterations of topography in the park include old fire plow scars in the flatwoods; several



LEGEND

 **TOPOGRAPHIC LINES**
 **PARK BOUNDARY**



1000 0 1000 2000 Feet

Florida Department of Environmental Protection
Division of Recreation and Parks
Office of Park Planning

**RAINBOW SPRINGS
STATE PARK**

**TOPOGRAPHIC
MAP**

of the scars impacted wetlands in the past. Extensive alterations exist from the mining of hard rock phosphate, which left a number of deep pits and large spoil piles. The development of the headspring area as a tourist attraction also changed the topography considerably. Facilities at the attraction that had the greatest topographic impact include sidewalks, parking lots, artificial waterfalls, an artificial stream, and waterfront docks and buildings.

Geology

Regionally, deposits of varied origin underlie the area. In descending order, these deposits include the Hawthorn Group, Ocala Group, Avon Park Formation, Lake City and Oldsmar Formations. Described from youngest to oldest respectively, these deposits represent the Holocene, Pleistocene, Pliocene, Miocene, and Eocene Series. The Ocala Group is the oldest formation exposed in the vicinity.

Where they occur, Holocene and Pleistocene deposits are made up of beds of soil, sand, and clay of marine and estuarine terraces, and of alluvial, lake, and windblown deposits. These undifferentiated deposits range to 100 feet in thickness and are generally not a reliable source of potable water.

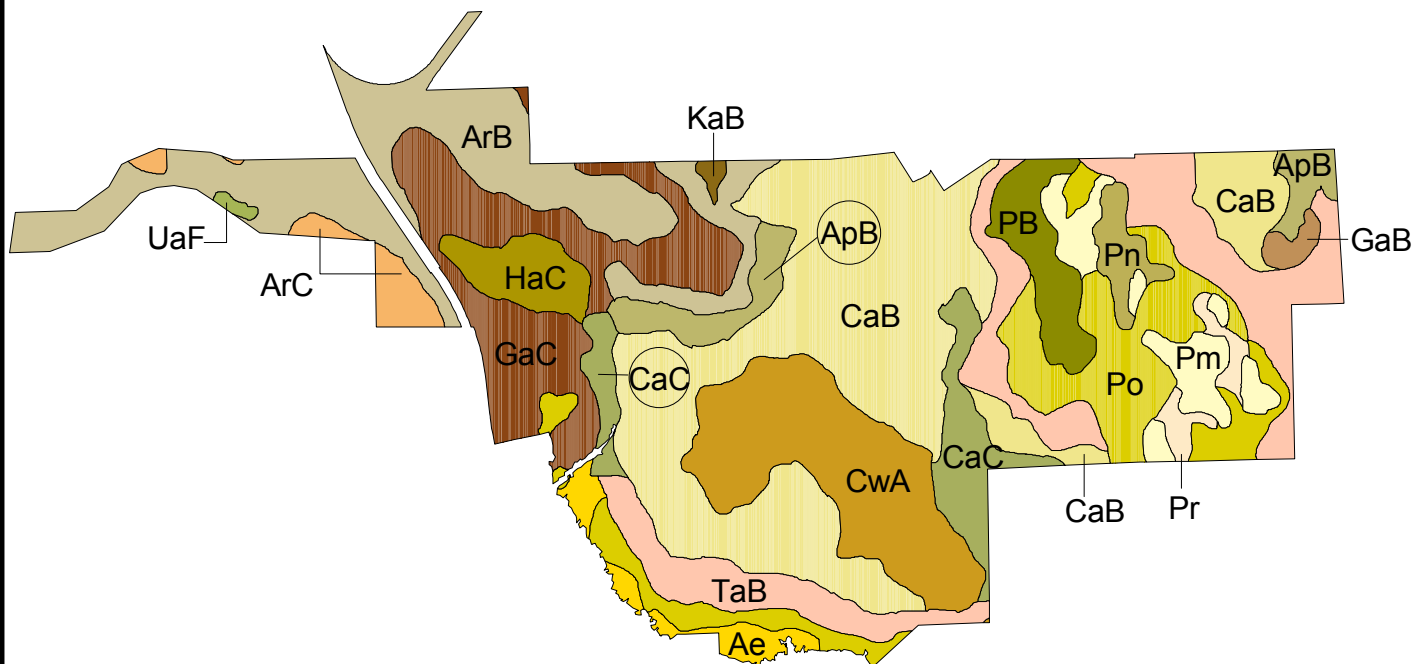
Pliocene and Miocene deposits also range to 100 feet in thickness. These deposits consist primarily of grayish-green, waxy clays and some interbedded sand and limestone, phosphatic clay, marl, calcareous sandstone, and limestone residuum. The unit may contain a confining layer and is generally not used as a source for water.

The Ocala Limestone is from the Upper Eocene and contains limestone that is described as white to tan, fossiliferous, massive, soft to hard, and porous. The unit is 100 to 500 feet thick. The Avon Park Formation is a limestone and dolomite deposit from the Middle Eocene. The limestone is light to dark brown, highly fossiliferous, and the porosity is variable in the lower part. The dolomite is gray to dark brown, very fine to microcrystalline and contains porous fossil molds, thin beds of carbonaceous material, and peat fragments. The unit is 200 to 800 feet thick. Both the Ocala Limestone and Avon Park Formation yield large quantities of water.

Underlying the Avon Park Formation is the Lake City Formation, which averages about 600 feet in thickness. This formation consists of a brown, porous, highly fossiliferous limestone and dolomite. Beneath the Lake City Formation is the Oldsmar Formation, a unit composed of white to light brown chalky limestone interbedded with brown dolomite and intergranular evaporites. The presence of thick layers of carbonate rocks containing intergranular evaporites between the Lake City and Oldsmar Formations prevents the movement of water between the two units. This layer is considered the base of the Floridan aquifer; highly mineralized water lies below.

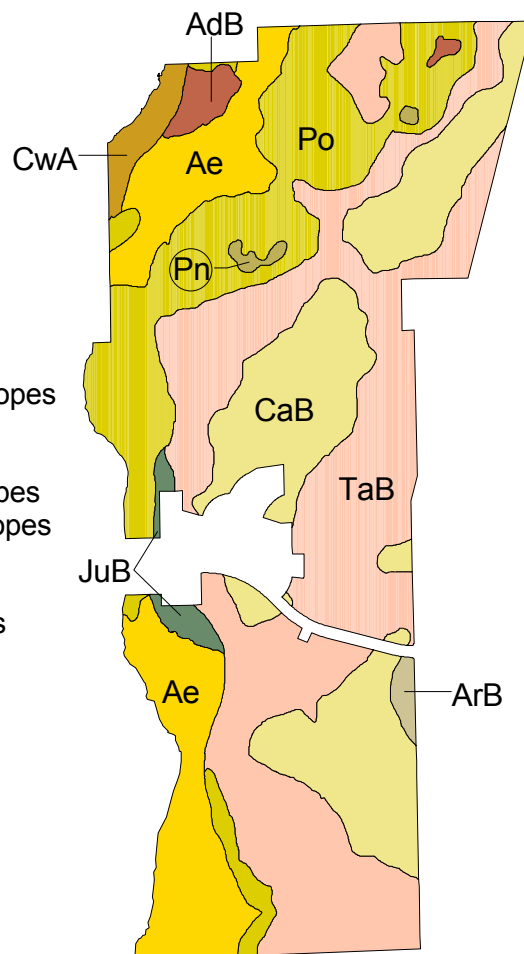
Soils

Twenty-one soil types (see Soils Map) have been identified within Rainbow Springs State Park (Thomas et al 1979). Soils range from well-drained sands of xeric uplands to frequently inundated wetland soils of basin swamps and hydric hammocks. The importance of soil characteristics in determining native vegetative cover is well illustrated at Rainbow Springs State Park, where the soils have undergone drastic disturbances. The Candler Clay, Overwash soil (CwA) consists of mine tailings and spoil from phosphate mining in the area. These tailings were dumped in a continuous layer over a large area southeast of an old tailings pond. The original soil in the area was probably Candler Sand, which would have naturally supported sandhill vegetation. Few sandhill species remain in the area of Overwash soil, however. At present, the vegetative cover there consists of mesophytic oaks and other invader species able to benefit from the rich phosphate and

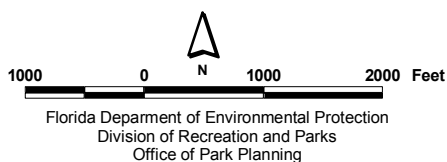


LEGEND

- AdB-Adamsville sand, 0 to 5 percent slopes
- Ae-Anclote sand
- ApB-Apopka sand, 0 to 5 percent slopes
- ApC-Apopka sand, 5 to 12 percent slopes
- ArB-Arredondo sand, 0 to 5 percent slopes
- CwA-Candler clay, overwash, 0 to 2 percent slopes
- CaB-Candler sand, 0 to 5 percent slopes
- CaC-Candler sand, 5 to 12 percent slopes
- GaB-Gainesville loamy sand, 0 to 5 percent slopes
- GaC-Gainesville loamy sand, 5 to 8 percent slopes
- HaC-Hague sand, 5 to 8 percent slopes
- JuB-Jumper fine sand, 0 to 5 percent slopes
- KaB-Kanapaha fine sand, 0 to 5 percent slopes
- PB-Pamlico-Martel association
- Pm-Placid sand
- Pn-Placid-Pompano-Pomona complex
- Po-Pomona sand
- Pr-Pompano sand, ponded
- TaB-Tavares sand, 0 to 5 percent slopes
- UaF-Udalfic Arents, 15 to 60 percent slopes



**RAINBOW SPRINGS
STATE PARK**



SOILS MAP

clays in the tailings. Restoration of the site to the natural sandhill community is probably not feasible.

Several developed areas in the park have experienced soil erosion. These include the slopes around the headspring and portions of the shoreline at the campground. In addition, access roads in the campground direct runoff towards the river shoreline. Vegetated berms have been installed working with Aquatic Preserve staff to slow and redirect runoff during storm events. Previous erosion problems along the shoreline of the headsprings have been mitigated through the installation of shoreline access structures. Management activities will follow generally accepted best management practices to prevent further soil erosion and conserve soil and water resources on site. Complete descriptions of the soils found in the park are contained in Addendum 3.

Minerals

Phosphate mining has occurred in the uplands, in the lowlands along the river, and in the Rainbow River itself. Relicts of this historic activity persist today in the form of excavated pits and mounds of overburden spoil, tailings or debris. Apparently the pre-1940s mining method was used, where deposits relatively close to the surface were mined and most of the ore extraction was done by hand or steam shovel. Only the hard rock and larger, grain-sized phosphate nodules were removed. Since the technology to remove the smaller-sized particles was not yet available, ore processing consisted simply of screening and washing. Leftover materials, primarily sands, clays, and phosphate, were deposited as waste next to the mine pit. As discussed earlier, mining activity changed the topography in certain areas of the park.

Hydrology

The Rainbow River, also known as Blue Run, is a spring-fed river of exceptional ecological significance and scenic beauty. The river is approximately 5.9 miles long and joins the Withlacoochee River just upstream of Lake Rousseau, an impoundment on the Withlacoochee (Jones et al. 1996). The U.S. Department of the Interior has designated it as a National Natural Landmark. The river is also designated as an Aquatic Preserve and Outstanding Florida Water. In addition, the Rainbow River is the second priority water body of the Surface Water Improvement and Management (SWIM) program at the SWFWMD. The state designations, in combination with the SWIM designation and local ordinances (Marion County Codes 3-8, 5-52, and 5-54), provide useful means and authority to monitor and maintain the integrity of the riverine system and to prevent further degradation of water quality and biota.

Rainbow Springs, once known as Blue Springs, is a first magnitude spring complex with four main vents or exsurgences in the headspring area. These springs, along with several others in the spring run, and the springs along Indian Creek contribute to the total discharge of the Rainbow River. The Rainbow Springs groundwater basin varies in size seasonally, encompassing approximately 645 square miles in the dry season and nearly 770 square miles in the wet season (Jones et al. 1996). The basin forms a recharge area that includes southern Alachua County, eastern Levy County, and western Marion County. This subsurface area dwarfs the surface watershed of the river, which totals only 8.3 square miles. The average annual rainfall for the region is around 55 inches, with the wet season occurring from June through September and the dry season from October through May. Surface runoff from the surface watershed contributes less than one-percent of the total discharge of the Rainbow River (Water and Air Research, Inc. 1991)—the rest is contributed by groundwater recharge.

Several agencies are involved in gathering information from the Rainbow Springs complex

and the Rainbow River. The USGS measures daily discharge of the Rainbow River approximately five miles downstream of the headspring area at the County Road 484 bridge. The volume of flow from the Rainbow Springs complex ranges from 518 to 1060 cubic feet per second (cfs) or 335 to 685 million gallons per day (mgd) and averages 714 cfs or 461 mgd (USGS 2000). Analyses of individual spring flows indicate discharge from the headspring area contributes to approximately 52 percent of the overall river discharge (Jones et al. 1996).

Approximately one mile south of the headwater area, just below the park boundary, Indian Creek joins the river from the northeast. The creek system is fed by two depressional wetland systems, one of which extends north into the park as a series of basin swamps in the mesic flatwoods. A circular clear water pool about 70 feet in diameter is located about 2,000 feet upstream from the confluence of Indian Creek and the Rainbow River (Henigar and Ray 1987). Judging from the topography of the creek channel, at one time the flow of the creek was much greater than at present. The majority of the flow perhaps originated from an artesian spring that may have formed the circular pool mentioned above.

Located just downstream of the confluence of the Rainbow River and the Withlacoochee River is Lake Rousseau. The lake is a man-made reservoir built by the Federal government in the 1930s. Navigation to the Gulf of Mexico is via a lock and canal facility operated by the U.S. Army Corps of Engineers. The Lake Rousseau dam has relevance to Rainbow Springs State Park in that it controls water levels in the Withlacoochee and Rainbow Rivers. The Rainbow River floodplain has undoubtedly been altered by the disruption of its natural hydroperiod. The dam also may have led to the disappearance of certain anadromous fishes such as the Hogchoker (*Trinectes maculatus*) and the Striped Mullet (*Mugil cephalus*) from the Rainbow River, since fish migration routes to the Gulf of Mexico may have been blocked.

Published water quality data from the Rainbow Springs complex date back to 1927. Methods of sample collection vary both spatially and temporally, and data for specific constituents are limited before 1965. The USGS collects and compiles water quality data for samples collected from the County Road 484 bridge for annual publication (see Addendum 4). While these data are useful for monitoring general water quality trends in the spring run, they reflect influences from springs and surrounding development below the park boundary.

In 1993, the SWFWMD began collecting water quality data from 18 individual springs in an effort to identify sources of nitrate in the Rainbow Springs complex. The SWFWMD published a report of their initial findings in 1996. Since then, the SWFWMD has collected quarterly water quality data from 12 of the 18 springs originally studied. Data generated from this effort provide useful insight into the flow and water quality of springs within the park boundary (see Addendum 4).

Based upon an analysis of the historic water quality data for the Rainbow Springs complex, Jones et al. (1996) estimated a 20-fold increase in nitrate concentrations in the complex over the past 40 years. The primary source for nitrate inputs from groundwater was identified as inorganic fertilizers applied to surrounding pasturelands. Sources related to development, such as sewage treatment systems, septic tanks and fertilizers applied to golf courses and home lawns were found to be relatively minor contributors to spring nitrate concentrations. However, as development increases, contributions from these sources will likely become more significant.

The 2001 Springs Initiative focused the attention of government and the private sector on

the need to protect springs on a regional level. Funding from that initiative, and from the subsequent 2002 Springs Initiative, has supported research and work to protect springs. The water quality and quantity monitoring cited above, traditionally funded through the agencies performing the monitoring, has more recently been funded from the 2001 and 2002 initiatives. Funding from subsequent initiatives will be necessary for these monitoring efforts to continue. In addition to recent water quality and quantity monitoring, projects funded to date by the Springs Initiatives also include: baseline biological surveys of spring fauna, semi-annual stream condition index (SCI) monitoring of the spring run, 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.

In addition to the springs and riverine wetlands, the park contains several basin swamps. These swamps, located in the eastern uplands, appear to be in very good condition and evidently are not being adversely affected by pollution. The primary inputs of water to the basin swamps are from rainfall and groundwater seepage. These swamps may provide surficial aquifer recharge, through lateral movement of groundwater, during periods of drought.

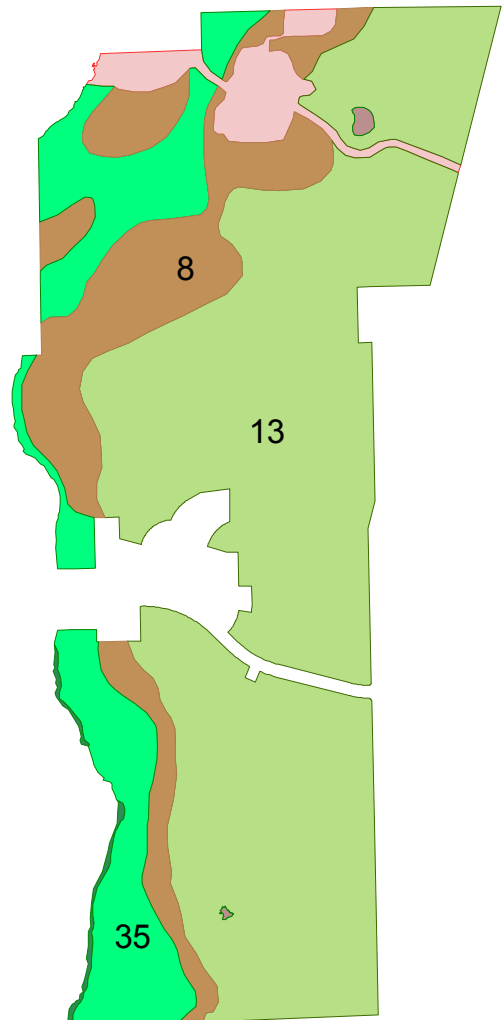
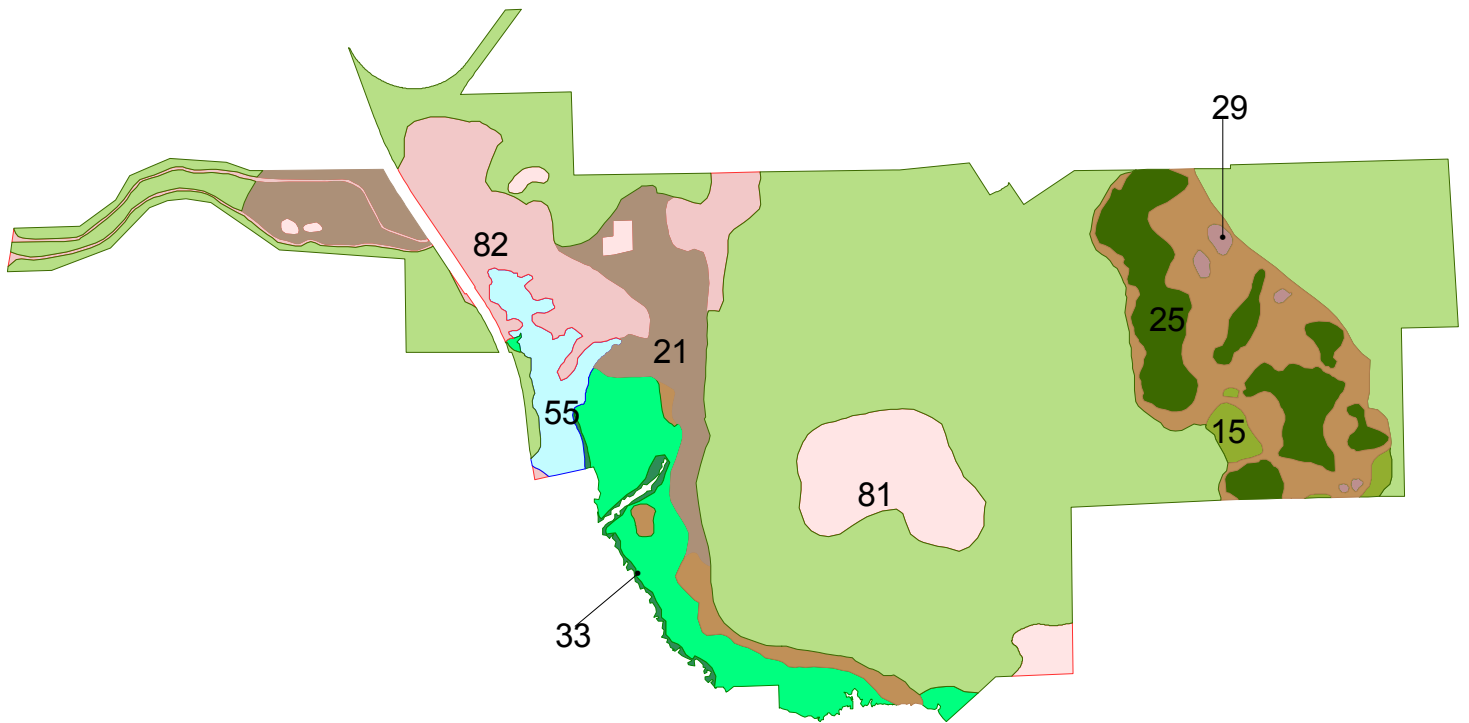
Natural Communities

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 which are similar with respect to these factors will tend to have natural communities with similar species compositions. Obvious differences in species composition can occur, despite similar physical conditions. In other instances, physical factors are substantially different, yet the species compositions are quite similar. For example, coastal strand and scrub--two communities with similar species compositions--generally have quite different climatic environments, and these necessitate different management programs.

The park contains 11 distinct natural communities (see Natural Communities Map) in addition to ruderal and developed areas. Map. Park specific assessments of the existing natural communities are provided. FNAI descriptions of these natural communities are contained in Addendum 5. A list of plants and animals occurring in the unit is contained in Addendum 6.

- **Mesic flatwoods.** The best example of mesic flatwoods occurs in the northeastern portion of the property in association with the basin swamps and depression marshes that drain towards the Indian Creek Bottoms. The mesic flatwoods are located along an elevation gradient between the down-slope depression marshes and basin swamps and the up-slope scrubby flatwoods and sandhills. A narrow band of mesic flatwoods also occurs as a transition zone on slopes parallel to the river between the sandhill and hydric hammock communities. This transition zone is broadest in the area of the campground. Isolated patches of mesic flatwoods also occur within the hydric hammock.

The longleaf and slash pine overstory of the mesic flatwoods was logged in the past, leaving an artificially low density of mature pines. The herbaceous component of the community seems to be relatively intact with a healthy population of wiregrass (*Aristida beyrichiana*) on site. Several old fire plow scars and abandoned roads dissect the mesic flatwoods, but they do not appear to have altered the hydrology greatly. The community appears to be in good condition despite past abuses. Additional prescribed fires and replanting with longleaf pines should suffice to restore this community.



LEGEND

- 8 - Mesic Flatwoods-128.80 ac.
- 13 - Sandhill-645.36 ac.
- 15 - Scrubby Flatwoods-4.55 ac.
- 21 - Upland Mixed Forest-42.58 ac.
- 25 - Basin Swamp-35.12 ac.
- 29 - Depression Marsh-2.73 ac.
- 33 - Floodplain Swamp-4.57 ac.
- 35 - Hydric Hammock-106.40 ac.
- 55 - Spring-Run Stream-13.64 ac.
- 81 - Ruderal-34.07 ac.
- 82 - Developed-66.76 ac.



**RAINBOW SPRINGS
STATE PARK**

Florida Department of Environmental Protection
Division of Recreation and Parks
Office of Park Planning

**NATURAL COMMUNITIES
MAP**

- **Sandhill.** The sandhill natural community occurs throughout the xeric uplands of the park. Most of the sandhills are in good shape, but they have suffered from past fire exclusion. Before state acquisition, the last fires in the northern sandhills occurred in the late 1970s. It is likely that much, if not all, of the area was clear-cut at some point. The herbaceous plant diversity has probably decreased through the years because of fire exclusion and low intensity cattle grazing. Despite these impacts, most of the sandhills remain in relatively good condition due to natural regeneration of longleaf pines and the presence of a relatively intact herbaceous layer. With the exception of the most disturbed sites, the sandhills of the park have been burned at least once since state acquisition. Additional lightning season fires will no doubt continue to improve these areas.

The sandhills in the best condition are located on both sides of the mesic flatwoods in the northeastern part of the park, to the east of the large pasture. Another area in good condition lies to the east and south of the campground. These intact sandhill communities support a variety of wildlife species including several rare and threatened species such as indigo snakes, gopher tortoises, Florida mice, Sherman's fox squirrels, Florida pine snakes, and gopher frogs. Unfortunately, few natural sandhill areas remain outside the park to support these populations. Restoration of disturbed sandhills within the park and acquisition of adjacent sandhill habitats remain a priority at Rainbow Springs.

Several sandhill areas just west of the pastures have endured a relatively long period of fire exclusion; these areas have been extensively invaded by laurel oaks and other non-fire-adapted species and are only in fair condition. The small area of sandhill northeast of the parking lots is in poor condition. A small remnant area of sandhill in poor condition also occurs on the west bank of the Rainbow River south of the old Village Café building.

Most of the highly disturbed areas within the park were originally sandhills, including all of the pastures, the plant nursery area, and the entrance drive. These areas are in very poor condition, but they may be restorable. The pasture areas that are surrounded by relatively good sandhills should be among the easiest to restore. Several areas within the pastures have been planted with longleaf pines to initiate the restoration process. Remnants of the sandhill community also exist along the entrance drive. Much of this area has suffered from phosphate mining or has succeeded to upland mixed forest, making restoration more problematic. Initial sandhill restoration efforts along the entrance drive have included hardwood removal and the reintroduction of fire.

Parts of the northern sandhill community were mined for phosphate within and to the east of the large pasture area. Several deep pits remain, surrounded by extensive spoil areas of the Candler Clay Overwash soil type. These areas, considered ruderal, lack wiregrass and other species characteristic of sandhills and are dominated by mesophytic oaks and weedy invader species. The areas covered by phosphate tailings are probably beyond reclamation as sandhill because of the massive soil disturbance and the high density of offsite vegetation.

- **Scrubby flatwoods.** The scrubby flatwoods at Rainbow Springs are located in the northeastern part of the property, slightly upslope from the mesic flatwoods. Although limited in size, these areas contribute to the diversity of the park. As in the mesic flatwoods, it is apparent that the scrubby flatwoods have endured logging activities and fire exclusion in the past. Fire plow scars are also evident. In general, the scrubby flatwoods are in good condition. The only active management required would be the application of prescribed fire at proper intervals.
- **Sinkhole.** Small sinkholes occur within the upland mixed forest of the park. The

sinkholes are widely scattered and appear to be in good condition.

The park is riddled with phosphate pits that superficially resemble sinkholes. Many of these pits are relatively old and contain mature trees. They may easily be mistaken for true sinkholes. Close inspection, however, reveals earthen ramps leading into the pits and spoil piles around their rims. Many of these pits receive runoff from the surrounding uplands.

- **Upland mixed forest.** The upland mixed forest at Rainbow Springs State Park is located around and to the north of the headspring area. Most of the upland mixed forest is in good condition, except for those areas classified as developed or ruderal. Much of the original upland mixed forest has been converted to ornamental gardens or other types of development. Parts of the existing upland mixed forest may have once been upland pine forest or sandhill communities, but they have undergone extensive succession as a result of human occupation, agriculture, and many years of fire exclusion. Most of these areas are not considered restorable to the original community type.

Some of the previously developed sites southeast of the ornamental gardens may be restorable to upland mixed forest. As the sites are cleaned up and dilapidated structures are removed, the area should be restored to upland mixed forest. This area will continue to be part of the main visitor use area, as discussed in the land use component.

- **Basin swamp.** A number of basin swamps are located in the northeastern part of the park, surrounded by mesic flatwoods. Pond cypress is the dominant tree. Superficially, the basin swamps of the park resemble domes, another natural community. However, their irregular, elongate shapes distinguish them from the more circular domes. It is likely that, during periods of exceptionally high rainfall, these swamps are hydrologically connected, by surface water flow, with the Indian Creek bottomlands to the south.

Historically, these areas were probably logged, either selectively or by clear-cut. However, the second growth cypress is well established and most of these swamps are in good condition. A boundary road or firebreak along the south fence line bisects one basin swamp. A second road with fire plow scars skirts the northern edge of the same basin swamp, but the disturbance is not as substantial. Soil disturbance from feral hog rooting has also impacted the basin swamps.

The basin swamps are reported to host a variety of amphibians and are critical breeding habitat for many of those species. The gopher frog (*Rana capito*), a species of special concern, has been recorded in at least one of the basin swamps. Maintenance of a natural hydroperiod is essential for the preservation of these basin swamps and the species that depend upon them.

- **Depression marsh.** Several depression marshes of various sizes are located in the eastern and southern areas of the park. The grass-dominated marshes often contain open water, especially when rain has fallen recently. Hardwood encroachment into the marshes is not severe and should be easily controlled when the surrounding mesic flatwoods and sandhills are burned. The depression marshes are in good condition, although most show some adverse impacts from feral hogs.

- **Floodplain swamp.** A thin band of floodplain swamp lies between the Rainbow River and the hydric hammock that parallels the river. An additional finger of floodplain swamp extends from the river into the hydric hammock for approximately 700 feet, appearing as a narrow depressional system. The floodplain swamps of the park lack the cypress overstory characteristic of this natural community. Past logging practices and alterations of the natural hydroperiod of the river may explain this apparent aberration.

- **Hydric hammock.** Hydric hammock occurs in the lowlands along the east bank of the Rainbow River. The hydric hammock community at Rainbow Springs shares many characteristics and species with the bottomland forest and the floodplain forest communities. One primary difference between these communities is the frequency and source of flooding. For example, river flooding inundates bottomland and floodplain forests, while hydric hammocks receive hydrologic input from groundwater seepage and rainfall as well (Vince et al. 1989).

Historically, the lowland forests along the Rainbow River may have flooded at regular intervals. However, the construction of the dam across the Withlacoochee River, forming Lake Rousseau, may have stabilized any natural fluctuations in the levels of the Rainbow River. The primary hydrologic inputs appear to be groundwater seepage from the adjacent spring-run stream, rainfall, and runoff from the uplands.

Alteration of the natural hydroperiod of the river has had an undetermined impact on the natural communities along the river. Much of the hydric hammock remains in fair to good condition, although feral hogs have severely impacted many areas. Phosphate mining within the hydric hammock has had severe localized impacts on the community. The presence of pits, spoil piles, and mine tailings has permanently altered portions of this community. These areas, where identified, are classified as ruderal.

- **Spring-run stream.** Rainbow River is one of the largest spring-fed rivers in Florida. The headsprings are first magnitude, in fact the fourth largest in the state (Rosenau et al. 1977). The park extends about one-third of a mile south along the west bank of the river and about 1.1 miles south along the east bank of the river to the Priest property. Then there is a quarter mile gap in public ownership along the east bank to a point just north of the campground. From the campground, park property runs another 1.6 miles south along the eastern shoreline, with two private inholdings occupying about 0.4 miles of that shoreline. The sovereign lands below mean high water of the headsprings are included within the boundary of Rainbow Springs State Park. The remainder of the spring and river, bounded by the park only on the east bank, is included in the Rainbow Springs Aquatic Preserve.

At least four major spring vents occur within the headspring area, with numerous smaller vents and sand boils scattered throughout. The maximum depth in the headsprings is about 15 feet at one of the main vents. Depths of the other main vents average about 13 feet. Actual water depths may vary significantly depending on river levels. Several small springs, many of which have been landscaped with exotic plant species, are located around the periphery of the headspring area. Two major side springs and their spring runs occur on the east side, Bubbling Springs to the south, and an unnamed sand boil spring to the north. Bubbling Springs has a rocky limestone pavement around the main vents, while the unnamed spring has a predominately sandy bottom.

A large, deep basin occurs along the west bank just north of the property's south boundary. Although it superficially resembles a large side spring, no vent is visible in the floor of the basin. While some natural process may have scoured it out, it is also possible that the basin was artificially dredged or perhaps mined for phosphate in the past.

Several docking structures associated with the old Rainbow Springs attraction remained in the headspring area after state acquisition. Both occurred on the west bank and consisted of large fiberglass-coated steel pilings that were sunk into the substrate. A concrete bulkhead was located by the northernmost set of pilings. A covered wooden structure near the Village Café was associated with the pilings to the south. These structures have been adapted for support of a swimming access platform to the north and a canoe launch facility

at the Village Café site to the south.

Plants are a fundamental necessity for a healthy spring-run community. Research by DuToit (1979) on the Ichetucknee River has shown that arthropod abundance is lower in areas where vegetation has been impacted by foot traffic. Fish numbers are also reduced in areas where vegetation has been removed by human disturbances. Arthropods are an important component of the food chain within spring-run streams and form the primary diet of many game fish. Both arthropods and fishes depend upon the aquatic vegetation for shelter.

Fortunately, studies at Ichetucknee Springs by DuToit (1979) and by FDEP staff (Doig 1990 and 1991; Workman 1999) have shown that spring systems are quite resilient, and that impacted areas can recover if given a respite from disturbance. However, DuToit also found that aquatic plant species differ in their ability to recover after a disturbance. In addition, certain species are less resistant to disturbance than others. Those species that grow in shallow water are expected to suffer more direct impacts from foot and boat traffic than the deep-water species. The overall diversity of the spring-run community may be reduced by chronic disturbances in areas of concentrated use. However, the Rainbow River is infested with the highly invasive exotic submerged aquatic plant hydrilla (*Hydrilla verticillata*), which has proven to be extremely difficult to control in any of Florida's springs where it exists.

The aquatic plant beds in the headsprings of the Rainbow River may be adversely affected by factors such as decreased water clarity, increased nitrate levels, and high public use. Fortunately, despite steadily increasing recreational use of the headsprings over the past twenty years, the spring waters continue to exhibit a high degree of clarity (Henigar and Ray, 1987). Increasing nitrate levels in the river and in individual springs are reasons for concern, however, and rapid development in the recharge areas of Rainbow Springs will likely cause these trends to continue. Increased recreational use has had the most significant impact on the aquatic plant beds in the headsprings. In water depths of less than five feet, the spring bottom is especially vulnerable to disturbance by visitors. Plant beds in shallow areas throughout the spring run suffer extensive damage from recreational activities such as swimming and boating.

Analysis of aerial photographs taken in October 1991 shows that approximately 36 percent of the headspring basin were lacking in vegetative cover and that the sandy bottom of the springs was completely exposed in these areas. This degraded condition was due mainly to visitors exiting boats and subsequently trampling and uprooting submersed vegetation. Other major contributors were the beaching and anchoring of boats, and the scarring of boat channels by prop cuts. Boats, with the exception of canoes and kayaks, have since been excluded from the headspring area for these reasons and for the safety of visitors using the designated swimming areas.

One of the dominant plants within the headsprings is the exotic species hydrilla. Human disturbance of the headsprings may benefit this species by causing suppression of native species, giving the hydrilla a competitive advantage. Hydrilla can spread rapidly by fragmentation of the plant and by multiplication of tubers on the root systems. Boat traffic accelerates the spread of hydrilla by causing fragmentation of the plant. The threat of hydrilla spreading from the headsprings area downstream, throughout the river and aquatic preserve is very serious. Swimmers and canoeists uproot, fragment and disperse the plants within the park, while boaters and tubers outside the park perpetuate spread of the plant downstream.

Other exotic plant species found in the headspring area are the result of landscaping efforts in the years before state acquisition. Species such as elephant-ear (*Xanthosoma sagittifolium*) and papyrus (*Cyperus papyrus*) were important components in the landscaping design of the old attraction. These species persist today to some degree, but have been largely removed from the headspring area. Efforts to control reinfestations are continuing. Other exotics within the spring-runs include alligator weed (*Alternanthera philoxeroides*) and *Chryptocorian wendtii*, a released aquarium plant. Aquatic Preserve staff have been very active in the control of exotic plants within the Rainbow River and headspring.

Although the removal of motorized vessels from the headspring area has undoubtedly benefited aquatic plant beds and improved water quality, the designation of swimming areas within the headsprings has had dramatic impacts on aquatic plant cover. Initially, an interim swimming area was located just upstream of the Village Café along the western shoreline. It quickly became severely degraded by recreational use. The area is relatively shallow compared with the rest of the headsprings, which allowed visitors to stand freely and impact aquatic plant beds. Most of the sandy substrate was washed away due to swimming activity exposing the limestone bedrock. Sand stirred from the bottom shifted downstream and threatened to bury adjacent plant beds. Where sand boils once occurred, a spring vent bounded by eroded limestone was exposed. The interim swimming area was never intended to function for an extended period under the intense use it received.

In 1996, an amendment to the unit management plan was approved which allowed the abandonment of the interim swimming area and the construction of a new swimming area in the northwest corner of the headsprings area. An access ramp and floating dock were constructed adjacent to an existing concrete bulkhead in an area that was already in poor condition due to past disturbances and an infestation of hydrilla. Relocation of swimming to this new area has resulted in an almost complete loss of aquatic vegetation within the boundaries of the designated swimming area and remarkable loss of sediments, resulting in exposure of the underlying bedrock in many areas. These migrating sediments now pose a threat to aquatic plant beds downstream of the swimming area.

A second, much smaller, wading area has been located downstream of the main swimming area. Access is via a set of steps. Minimal disturbance is associated with this area due to the relatively low level of use compared with the main swimming area.

Other impacts within the headsprings include the dislocation and stacking of limestone boulders by swimmers to form platforms in deeper areas of the swimming area. Loss of native aquatic plants and dislocation of sediments is also occurring adjacent to the newly opened canoe launch facility at the Village Café. Hydrilla has begun to replace the lost native vegetation. In this case the damage is exacerbated by lower than normal water levels, which causes canoes to run aground and encourages foot traffic in the shallow areas.

Another human-related impact on the headsprings and side springs is past disturbance of the streambed by artifact hunters. Bubbling Springs is pockmarked with deep pits excavated by artifact seekers as they fanned away loose sediments with their swim fins. Illegal digging has also occurred within the headspring area. To discourage these disturbances, scuba diving is prohibited in the upper reaches of the river.

Stormwater runoff from adjacent uplands can also affect water quality. Restoration of shoreline vegetation and construction of vegetated berms by Aquatic Preserve and Park staff have mitigated these impacts to some extent.

The spring-run stream community is generally in fair to good condition. The portions of the community considered to be in fair condition either have been subjected to severe physical disturbance, or have a heavy infestation of hydrilla. Given proper management and reduction or removal of hydrilla, the spring-run stream outside the swimming areas is likely to return to an excellent condition. The removal of exotic plants, replanting of extirpated vegetation, and establishment of restrictions on the type and intensity of public use should suffice to restore portions of the headsprings to their original natural condition. Unfortunately, restoration of the current designated swimming areas to a natural condition is not feasible due to the intensity and repetitive nature of the disturbances they endure. Protection, restoration, and preservation of the aquatic plant beds outside the designated swimming areas are greater priorities due to the loss of aquatic vegetation within the swimming areas.

- **Aquatic cave.** Although none of the spring vents within Rainbow Springs State Park are large enough to allow human access and exploration, there are undoubtedly large underground conduits feeding the springs. These conduits within the Floridan aquifer are considered aquatic caves and are of unknown extent within the park. Since they are undisturbed, their condition is assumed excellent.

- **Ruderal.** The majority of the ruderal areas within the park are the result of past phosphate mining activities. The massive soil disturbances associated with the mine pits, spoil piles, and mine tailings probably preclude restoration to a natural condition. Most of the mining took place in sandhills that have been irrevocably altered by the dumping of highly fertile mine tailings over naturally sterile sands. Some of these areas are now dominated by a thick growth of mesic-adapted oaks and other secondary succession plant species. Two large pits remain in the large pasture. These have historically been used as a dumping site for organic debris such as logs, limbs, and leaf litter. Few species native to the sandhills remain on the phosphate-mined lands.

The mine tailings are identified as the Candler Clay Overwash soil type. Sites having Overwash soils could potentially be developed as use areas since they are already degraded. However, it is very likely that the mine tailings contain uranium deposits that may release radon. No permanent enclosed structures are advisable for areas that have a high radon contamination.

The upland mixed forest and hydric hammock areas that were mined have a more natural species composition, but portions are still considered ruderal because of topographic alterations. Only the spoil piles and pits are labeled as ruderal in these communities.

- **Developed.** Rainbow Springs State Park contains a large developed area. This area has numerous buildings and other structures, including abandoned animal cages and waterfalls. In addition to the buildings associated with the tourist attraction at the headsprings, there are parking lots, staff residences, a shop complex, and a pair of greenhouses. Most of the developed area was once either upland mixed forest or sandhill.

Another remnant of the old Rainbow Springs tourist attraction is the large ornamental garden on the slopes above the headsprings. Some native species remain on site, primarily tree species. Most of the ornamental plants used in the gardens are either native to Florida or are non-invasive exotic species. A large number of Asian azaleas (*Rhododendron* sp.) are present. Some exotic ornamentals that aggressively invade natural areas, such as Japanese honeysuckle (*Lonicera japonica*) and coral ardisia (*Ardisia crenata*) are also present. Another exotic, the air potato (*Dioscorea* spp.) has spread throughout much of the gardens and surrounding areas during the two decades of neglect. The most insidious

threat, skunk vine (*Paederia foetida*) is established in the gardens and surrounding areas and poses the greatest threat to adjacent natural areas.

Most of the exotic control efforts in the park have concentrated in and adjacent to the gardens and parking lots since these areas had the highest concentrations of exotics. Control of exotics in these developed areas should prevent large-scale invasions of the adjacent hydric hammock, sandhill, and upland mixed forest.

Designated Species

Designated species are those which are listed by the Florida Natural Areas Inventory (FNAI), U.S. Fish and Wildlife Service (USFWS), Florida Fish and Wildlife Conservation Commission (FFWCC), and the Florida Department of Agriculture and Consumer Services (FDA) as endangered, threatened or of special concern. The Division will consult and coordinate with appropriate federal, state and local agencies for management of designated species. Addendum 7 contains a list of the designated species and their designated status for this park. Management measures will be addressed later in this plan.

The number of designated plant species within the park is probably underestimated. More extensive surveys for rare and endangered plants must be conducted before a list that truly reflects the natural diversity of the park will be available. The designated species list for vertebrates, however, is much more complete, because of a comprehensive survey that was conducted by the Nongame Wildlife Program of the FFWCC.

Many of the designated vertebrate species are associated with the sandhill natural community. Years of fire suppression and conversion to other uses by humans have altered most of this habitat statewide, resulting in the endangerment of a number of species that depend upon sandhills. At Rainbow Springs, there still appears to be a relatively healthy population of gopher tortoises, although some poaching probably occurred on the property before state acquisition. Other designated species that occur as gopher tortoise commensals, such as eastern indigo snakes (*Drymarchon corais couperi*), gopher frogs, and Florida mice (*Peromyscus floridanus*) have also been recorded on the property. Sherman's fox squirrels (*Sciurus niger shermani*) are often sighted in or near the sandhills, but the population is probably very small given the limited amount of habitat. Other designated sandhill species identified within the park include the Southeastern kestrel (*Falco sparverius paulus*), Florida pine snake (*Pituophis melanoleucus mugitus*), and Bachman's sparrow (*Aimophila aestivalis*). The continued existence of these species in Florida is jeopardized by habitat destruction. Large tracts of natural sandhills are necessary to maintain viable populations. In the future, if the park becomes isolated by development, the small number of sandhill acres currently found within the park will not support most of these species indefinitely. Relatively few undeveloped sandhills remain in western Marion County, with Rainbow Springs State Park representing the only major publicly owned sandhills tract.

Other designated bird species recorded within the park include several species of herons, egrets, and raptors. These populations are probably not seriously threatened at present, although continued habitat loss and human-related disturbance may ultimately change that situation.

Most of the designated plant species found within the park do not appear to have any imminent threats now. Careful management of the natural communities of the park and prudent park development planning should suffice to protect and preserve their populations. However, feral hogs have the potential for causing severe impact to certain plant species, particularly those that occur within wetland edges or ecotones. Feral hogs have damaged many of the wetland ecotones in the park. These areas may have harbored

populations of designated plant species. The park has a feral hog removal program.

Several designated plant species, however, occur under slightly unusual circumstances in the park. The star anise (*Illicium parviflorum*), a threatened species endemic to central Florida, is found planted as an ornamental throughout the developed area of the park. While it is questionable whether any naturally occurring star anise grows along the banks of the Rainbow River, the proper habitat for it does exist there. Planted specimens of Ashe's magnolia (*Magnolia ashei*), an endangered species endemic to the Florida panhandle, are found along the entrance drive. The coontie (*Zamia pumila*) is commonly found within the ornamental gardens, but it has not yet been documented in the natural areas of the park.

Special Natural Features

The headspring area is remarkably beautiful and serves as the focal point of the park. The discharge of the springs is the fourth highest among all the springs in the state. However, when only vents that are hydrologically linked are considered, the discharge is second only to that of Silver Springs (Wilson and Skiles, 1989). The headspring waters are generally clear, affording extraordinary visibility. In recognition of the outstanding qualities of the springs, the U.S. Department of the Interior has designated the site as a National Natural Landmark.

Cultural Resources

Evaluating the condition of cultural resources is accomplished using a three part evaluative scale, expressed as good, fair, poor. These terms describe the present state of affairs, rather than comparing what exists against the ideal, a newly constructed component. 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 judgment is cause for concern. Poor describe 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 to reestablish physical stability.

Rainbow Springs State Park contains evidence of over ten thousand years of human history, from prehistory through the development of tourism during the mid-twentieth century. The park and some of the adjoining properties encompass highly significant prehistoric and historic cultural resources that merit the unit's nomination to the National Register of Historic Places as an archaeological and historic district. Because the park contains archaeological evidence for many periods of the aboriginal cultural sequence from Paleo-Indian times through European contact, it has the potential to yield significant information concerning changing settlement patterns in north central Florida. In addition, the region contains significant historic sites (Vojnovski et al. 1999). The park also contains numerous unrecorded resources associated with phosphate mining and turpentine industries during the early twentieth century.

The Florida Master Site File (FMSF), maintained by the DHR lists five known cultural sites. These consist of two prehistoric sites, one historic site and two multicomponent sites. More sites have been located that have not yet been recorded. Several archaeological surveys and studies have been undertaken at Rainbow Springs State Park over the past quarter century. These include Chance (1980, 1988); Vojnovski et al. (1999); and Memory and Newman (2000).

The known prehistoric sites within the park include 8MR208, and 8MR2701. Both of these

sites are large. The Rainbow Springs site (8MR208) is located on the east side of the river above the floodplain on a knoll that parallels the 50-foot contour line. About a mile in length from north to south, the site is described as a large contiguous area containing a continuous scatter of cultural material (Chance 1980: 28). The profusion of lithic material found indicates seasonal encampments used in successive cultural periods, from Paleo-Indian times through the contact period (Chance 1980). The site appears to be in good condition, although a portion of it has been impacted by past agricultural activities and parts of it lie outside the park boundary.

8MR2701 (Tipi Site) was first recorded during an investigation of unauthorized digging at Rainbow Springs. The initial site inspection defined the site as an approximately 1.25 acre area in the vicinity of the Sateke Village subdivision based on artifacts exposed by looters' activities (Memory 1999). However, investigation that is more extensive indicated that the site appears to be much larger (Memory and Newman 2000:3). Recent observations suggest that unauthorized digging has continued. The looted portion of the site is assessed to be in poor condition, while other parts of the site are in good condition.

Two other sites in close proximity to the Rainbow River headsprings, 8MR2397 and 8MR2667, contain deposits from both prehistoric and historic periods. 8MR2397 (Rainbow Springs State Park) is located on a sand ridge on the north side of the headspring west of the main park office/gift shop. The site, a subsurface lithic and ceramic scatter, shows evidence of both prehistoric and historic occupations. Artifacts found during 1999 testing comprise mainly chert debitage (waste flakes) and historic glass and whiteware ceramics. The absence of diagnostic lithics or ceramics indicates a pre-Late Archaic occupation. One piece of Jefferson ware (a northwest Florida prehistoric ceramic type belonging to the Leon-Jefferson period, i.e., (AD 1565-1700) attests to contact period aboriginal presence in the area. The historic artifacts may be related to the earlier settlement at Juliette and/or the later uses of the site as a tourist attraction. The area has been impacted in the past by previous construction and ground-disturbing activities connected with the attraction and has subsequently been filled and landscaped. The site appears to be in fair to good condition.

8MR2667 (Jungle Café) is a subsurface lithic scatter on the west side of the Rainbow River located immediately north of the old Village Café (part of the old tourist attraction closed in 1973). The name of the site "Jungle Café" is likely a misnomer based on the traditional name "Village Café." The site, discovered in the context of testing before construction activities in 1999, is located south of the new restroom/bathhouse facility and west of the canoe launch area. The area had been impacted in the past by previous construction and ground disturbing activities connected with the attraction. A brick walkway partly covers the site. It appears to be in fair to good condition.

The other known site within the park is the Cemetery site (8MR2057) from the late 19th century. Three grave markers are known to exist on the site. One tombstone marks two graves, those of Eliza J. Greer (1823-1884) and John W. Greer (1820-1884), and another designates the grave of Joseph McNeil (1854-1898). At one point, a third wooden marker read "John..." Its condition has deteriorated and no inscriptions are discernable. It is not known whether the wooden stake represents a burial (Newman, 1991). To date, boundaries of the cemetery have not been determined and additional unmarked burials are possible within the cemetery. Furthermore, a pile of brick rubble has been noted near the cemetery that may be related to the cemetery. The cemetery may be associated with a settlement near the headsprings sequentially called Canton, Blue Springs and finally Juliette, which existed from around the 1840s to the 1920s (Newman 1991; Dinkins 1969). Another hypothesis is

that the cemetery may be that of the Greer family (Vojnovski et al. 1999).

The condition of the cemetery site is fair with the exception of the wooden marker, which is in poor condition. The site has become overgrown with vegetation, including smilax vines encircling the gravestones, and is being invaded by fire intolerant oaks. Gopher tortoise burrows are evident in the cemetery. The site has been fenced in recent years. The post of the wooden marker has rotted and the marker is partially on the ground. The masonry markers are generally in fair condition, with some moss growth.

Several cultural sites have been located that are yet unrecorded. These unrecorded resources include prehistoric sites and resources from the Boom Era attraction, the phosphate industry, early agricultural efforts, the turpentine industry, and the historic settlement located near the spring.

Archaeologists and amateur divers familiar with the Rainbow River tell of collecting stone tools and points from a number of unrecorded submerged archaeological sites. One of these is a "kill site," where projectile points are found in association with preserved animal bone (Weisman 1991).

The first economic and political center of western Marion County was a settlement sequentially called Canton, Blue Springs and finally Juliette. This settlement, situated around the headwaters of the Rainbow River, was homesteaded as early as 1839. By 1883, about 75 people lived in this farming community. Juliette's railroad station, sawmill, hotel, several stores, and post office were located at Rainbow Springs (Vojnovski et al. 1999).

A number of unrecorded cultural resources may relate to this settlement. Piles of brick and limestone rubble lie south of the park drive. This rubble is part of an unrecorded site that extends outside the park boundary and may be associated with two possible (very large) cisterns located off park property. These cisterns may date from the Hemphill homestead or Hemphill owned West Coast Bottling Company (Vojnovski et al. 1999). The parcel to the south, containing portions of this site, is being developed as a subdivision.

Another smaller cistern exists in the park east of the cemetery. Very little is known about it except that it is located in an area of phosphate tailings.

Numerous phosphate pits and associated tailings piles are located throughout the park. Hardrock phosphate was discovered in Marion County in 1889. At the time of discovery, the Dunnellon hardrock deposits were the highest quality of phosphate known. Phosphate mining became a prominent industrial activity in and around Dunnellon including lands immediately surrounding the town of Juliette. The importance of this industry increased after the hard freezes of the 1890s that devastated the citrus industry. The 1889 discovery ushered in a phosphate "boom" that influenced development of the Dunnellon area for the next 40 years (Vojnovski et al. 1999).

Two railroads traverse the park. The older of the two, constructed in the 1880s, that historically connected Ocala to Homosassa is still in use by CSX Transportation. It skirts the western bank of the spring. The other rail line that historically ran from Ocala to Juliette is located east of the Rainbow River. It is of later origin than the Ocala to Homosassa line and has since been abandoned (See Dinkins 1969 for further discussion).

Much of the present development around Rainbow Springs was completed as part of the now defunct tourist attraction that existed at the spring. In the 1920s, Rainbow (then Blue) Springs became a favorite spot for outings by church groups, school classes, and civic organizations. In the 1930s, the Blue Springs Company, owned by John D. and F. E. Hemphill, made improvements to attract more tourists to the springs. The company

constructed sea walls and new bathhouses, improved access roads, and purchased the "Blue Bell," a glass-bottomed boat. Increasing numbers of visitors from Marion County and throughout central Florida were drawn to the springs by these improvements.

The stone cabins located northeast of the headsprings purportedly date from the late 1920s development. The cabins are currently unrecorded. The conditions of the four cabins vary. The southeastern-most structure is in poor condition. Significant structural damage has resulted from a leaking roof. The other cabins are in fair condition. Leaking roofs have contributed to declines in the condition of all of the cabins. A modern addition, nearly equaling the size of the original structure, was added to the cabin currently used as a CSO meeting space. The remaining two cabins are used as Park and Aquatic Preserve offices. Cosmetic modifications have been made to facilitate use as offices.

Seminole and Rainbow Falls, built on piles of phosphate tailings, are the other surviving structures from the early development of the attraction. Despite recent repairs, their conditions are fair. Several pools leak, undermining the runs and destabilizing the structures.

The attraction changed hands in 1967 at which point an expansion of facilities was planned. The attraction operated until the mid-1970s. Bypassed when Interstate 75 was built through Ocala and hurt by the competition from Walt Disney World near Orlando, the Rainbow Springs tourist attraction experienced a steady decline in business and was forced to close in 1973. In 1990, the property was acquired by the State of Florida to be managed as a state park.

Much of the infrastructure within the park dates from the 1960s era of attraction development. This includes the rainbow fountain that marked the entrance to the park off U.S. Highway 41, the entrance walk, gift shop, dining terrace, remains of a large aviary, animal cages, foundations for a monorail with leaf-shaped gondolas that wound through the property, and trails on the east side of the Rainbow River. Several old glass-bottom boats used during the attraction era, in varying states of decay, are located on the park grounds. Their vintage is unclear. A private individual apparently owns the boats. They are currently in poor condition and continue to deteriorate because they are exposed to weather.

RESOURCE MANAGEMENT PROGRAM

Special Management Considerations

Timber Management Analysis

Chapters 253 and 259, Florida Statutes, require an assessment of the feasibility of managing timber in land management plans for parcels greater than 1,000 acres if the lead agency determines that timber management is not in conflict with the primary management objectives of the land. The feasibility of harvesting timber at this park during the period covered by this plan was considered in context of the Division'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 early successional communities such as sand pine scrub and coastal strand.

During the development of this plan, an analysis was made regarding the feasibility of timber management activities for this park. It was then determined that the primary management objectives of the unit could be met without conducting timber management activities for this 5-year management plan cycle. Timber management will be reevaluated during the next 5-year revision of this management plan.

Timber sales will be considered on an emergency basis to prevent the spread of Southern pine beetles within the park. The park has had limited areas affected by pine beetles in the past, but the potential may exist for greater impacts in areas dominated by loblolly pines. In the case of a Southern pine beetle outbreak, a variety of control measures may be used, including timber harvests when feasible.

Additional Considerations

- **Management of spring-run systems.** As with most of Florida's springs, Rainbow Springs has suffered significant damage from intensive public use. The headspring area, however, is a unique natural feature that can be protected and preserved if sound management practices are implemented. In springs managed by the Florida Park Service, a fine balance must be achieved between protection of the natural resources and provision of outdoor recreation.

Florida Park Service experience with aquatic systems such as Ichetucknee Springs, Manatee Springs, Blue Springs, and Wakulla Springs has shown that continuously high levels of human use will eventually degrade spring systems. For instance, if the type and intensity of recreation at Ichetucknee Springs is not carefully regulated, then submerged vegetation that has been damaged by public use during the busy summer season will not fully recover during the off-season. The result will be a gradual, but inevitable decline in the quality of the entire spring-run community. This management plan seeks to create a management scheme for Rainbow Springs that will, in the long term, restore the headwaters of the Rainbow River to a naturally balanced, spring-run stream ecosystem, while allowing an appropriate, sustainable level of public access to, and enjoyment of, the natural feature.

To expedite restoration of these sensitive resources, boating was restricted in the portion of the spring-run stream managed by the Division in the early 1990s. Since that time swimming access has been restricted to designated areas to minimize visitor impacts while providing recreational access to the headsprings. The two side springs and spring-runs on the eastern shoreline are designated as restricted zones to protect them from user impacts. These areas are the last hydrilla-free sites in the Rainbow River and will remain closed to access to prevent the introduction of hydrilla. Division staff periodically monitors the headsprings area to effectively measure improvement and degradation trends. This monitoring program consists of aquatic vegetation surveys and photo-documentation. In addition, Division staff compile and review monitoring results from various agencies (SWFWMD, USGS, DEP) to gain a better understanding of the spring and spring run communities, and to develop appropriate management plans for them.

Extensive efforts will be required to eliminate exotic plant species, to prevent their reintroduction, and to restore the natural abundance and diversity of native plant species in the system. Close coordination of these efforts with the Rainbow Springs Aquatic Preserve is imperative to ensure that the activities within the park complement resource management downstream of the park, within the preserve. The Rainbow Springs Aquatic Preserve field office is located within Rainbow Springs State Park. Aquatic Preserve staff regularly assist the park with aquatic exotic plant control, runoff and erosion control efforts, and public outreach and education. In 2001, the Rainbow River Coordination Council was formed under the leadership of Aquatic Preserve staff.

Division staff will continue to work closely with Aquatic Preserve staff to successfully restore portions of the headsprings and mitigate the effects of recreational use. In addition to guidance from Aquatic Preserve staff, the park relies heavily on volunteer labor to hand-remove exotic plants, primarily hydrilla, from the headsprings area. Recent proposed

changes in DEP's diving safety requirements may jeopardize these volunteer efforts. If the new requirements hinder volunteer dive activities, more emphasis will have to be placed on chemical control of exotic plants.

Management of spring-run systems does not end at park or aquatic preserve boundaries. The Rainbow Springs complex receives all of its water from groundwater recharge within the Rainbow Springs groundwater basin. This basin spans an area of 645 square miles in the dry season, to nearly 770 square miles in the wet season (Jones et al. 1996), and includes parts of Gainesville and Ocala, and the towns of Dunnellon, and Williston. The quality and quantity of groundwater originating from these communities and throughout the basin determines water quality and quantity discharging from the Rainbow Springs complex. For that reason, the protection of spring flow and spring water quality is a regional effort that must focus on preventing excessive groundwater pumping and controlling nutrient and pollutant loading in the watershed.

The 2001 Springs Initiative focused the attention of government and the private sector on the need to protect springs on a regional level. Funding from that initiative, and from the subsequent 2002 Springs Initiative, have supported research and work to protect springs. Projects funded to date which benefit Rainbow Springs include: continued monitoring of water quality and quantity in first magnitude springs, baseline biological surveys of first magnitude spring fauna, semi-annual stream condition index (SCI) monitoring of first magnitude spring runs, research to define relationships between water quality and quantity and aquatic plants and animals in springs, 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.

- **Ornamental garden management.** During the development of the attraction at Rainbow Springs in the late 1960s, a large ornamental garden was installed on the slopes above the headsprings. Following the closure of the attraction the gardens were not maintained as before and fell into disrepair. Since state acquisition of the site, the gardens have been cleaned up largely. Great efforts have been made to control the invasive exotic plant species that overran the gardens during the period of neglect. The large number of active volunteers at the park have not only contributed a great deal of time working in the gardens, but have also raised significant funds to pay for the planning and renovation of the gardens.

Renovation of the ornamental gardens is underway. The goals of the renovation include removing invasive exotic plants and combining historical aspects of the garden with xeriscaping design, focusing on native plants but including existing non-invasive ornamental plants such as azaleas and camellias. Another goal of this project is to provide park visitors with a showcase for progressive and creative landscaping techniques. A master plan has been produced and a landscape architect has been hired to create plans for demolition, planting, new infrastructure and maintenance of the gardens. The proposed extent of the intensively managed garden footprint has been reduced to essential areas and areas adjacent to pathways.

Management Needs and Problems

1. Visitor use impacts continue to degrade the spring-run stream natural community. Swimmers, snorkelers, and waders are scouring the river bottom, destroying aquatic vegetation, perpetuating the aggressive spread of hydrilla, and seriously impacting the ecological integrity and aesthetic qualities of the headsprings.
 - A. Proposed additional tubing facilities for the Rainbow River may result in additional user impacts to the river system such as destruction of native aquatic vegetation, the

- spread of hydrilla, and scouring of the river bottom.
- B. Establishment and implementation of an effective carrying capacity for the headsprings and continual monitoring of visitor impacts on this system is imperative in order to ensure that the springs and spring-run are managed properly.
 - C. Degraded areas outside the designated swimming area and the headsprings canoe launch require restoration with appropriate plant species and continuous removal of hydrilla if reinfestation occurs.
 - D. Hydrocarbon pollution from boat motors and disturbances of bottom sediments by boats may be degrading water quality and encouraging the spread of hydrilla in the river.
 - E. Foot traffic and development have impacted shoreline vegetation in the past.
2. The protection of spring flow and spring water quality is a regional effort that must focus on preventing excessive groundwater pumping and controlling nutrient and pollutant loading in the watershed.
 - A. Activities occurring in areas outside the management authority of the park threaten water quality and quantity inside the park.
 - B. As open lands in the Rainbow Springs groundwater recharge basin continue to be developed, pressures on groundwater recharge—increasing withdrawals for water use and additional pollutant loading—will add to the degradation of spring flow and water quality.
 - C. Several agencies are involved in gathering information that affects the management of Rainbow Springs. Compilations of monitoring data occur in various formats and locations, making utilization by on-the-ground managers difficult.
 - D. Public outreach and education is crucial to ensure long-term improvement in and protection of springs.
 3. Natural communities are disrupted by invasive exotic species.
 - A. Numerous species of terrestrial exotic plants, many of them escapees from cultivation, are well established in the park and are invading natural areas.
 - B. Hydrilla and other aquatic exotics have extensively invaded the headsprings and spring run within the park, displacing native aquatic plant species.
 - C. Feral hogs are also disturbing natural areas within the park, especially the wetlands.
 - D. Exotic plants may be dispersing into the park from adjacent neighborhoods and undeveloped lands.
 4. The ornamental gardens associated with the former attraction require renovation.
 - A. The ornamental gardens contain a reservoir of invasive exotic plants that threaten surrounding natural communities.
 - B. Traditional irrigation and fertilization techniques are not compatible with water conservation measures and the protection of the adjacent spring-run stream.
 5. Upland natural communities are degraded and in need of restoration.
 - A. The fire-dependent communities in the uplands suffer from fire exclusion before state acquisition and offsite hardwoods have invaded some areas.
 - B. Removal of the former sewage treatment plant has left a large disturbed area within the park.
 - C. The pastures, nursery areas, and abandoned spray field are in need of restoration to the sandhill community which once occurred on site.
 6. Soils on the slopes above the headsprings and along developed shorelines have been eroded.
 - A. Erosion around the headsprings is caused by unauthorized visitor access along the shoreline and by inadequate facilities for preventing soil erosion caused by runoff.
 - B. Removal of invasive exotic plants on slopes about the headsprings may destabilize

- soils and cause erosion.
- C. Docking of boats along the shoreline of the campground has eroded the banks of the river.
7. Runoff is inadequately attenuated in the gardens and developed areas. Development within the campground has altered natural hydrology.
 - A. Brick or concrete walkways channel runoff from slopes above the springs into a passive underground drainage system. It is not known at this time if this system allows leakage into the headsprings, or whether the runoff simply percolates into the groundwater from within the drains.
 - B. Runoff from other developed areas, including the grassy slope above the headsprings, drains directly into the springs without adequate treatment.
 - C. Untreated runoff from roads in the campground area flows directly into the spring run, causing sedimentation.
 - D. Natural sheetflow and surfacewater flows are disrupted by the existing campground roads.
 8. Dilapidated remnants of the Rainbow Springs attraction still exist on site.
 - A. Several structures in various stages of disrepair remain on site. Non-repairable buildings located in natural areas need to be removed. Several animal cages also remain southeast of the ornamental gardens in an area to be replanted with native vegetation.
 - B. Scrap piles from the attraction period require additional removal and disposal.
 9. Encroachment of residential developments and other development may negatively affect park resources.
 - A. Residential development along the boundaries of the park is threatening to isolate the upland communities from other natural areas. Many designated species within the park may have home ranges that encompass natural areas outside the park boundary.
 - B. Increased residential and institutional development near the park will also hinder the prescribed burn program by reducing the available options for conducting burns.
 - C. Development within the spring system's recharge area may adversely impact natural spring discharge and water quality parameters. Similarly, water withdrawals from the Floridan Aquifer or the river itself may impact water levels in the river and associated wetlands.
 10. Cultural resources are threatened within the park.
 - A. Facility development or other forms of disturbance such as artifact hunting may impact the known archaeological sites within the park. Artifact hunting was once a serious problem in the headsprings and side springs. Recently, archaeological looting has occurred in the hydric hammock and mesic flatwoods in the southern portion of the park. Removal of artifacts from the river downstream of the headsprings may be continuing.
 - B. The historic cemetery is a possible target for vandalism. It is also likely to be encroached on by successional tree species and should be protected from prescribed fires.
 - C. Part of a significant archaeological site in the northern portion of the park extends onto adjoining private lands along the Rainbow River. The site is within the optimum boundary for the unit.
 - D. The conditions of the 1920s stone cabins are deteriorating and one is in poor condition.
 11. Park object collections have not been formalized or cataloged. A glass bottom boat may be desirable to add to the collection.
 - A. Informal collections exist at the park, but the park lacks a Scope of Collection

Statement and catalog.

- B. Several privately owned glass bottom boats formerly associated with the attraction are stored at the park. The conditions of the boats are declining. In a restored condition, one of these boats could be used as an interpretive display.
12. Cultural resources at the park lack complete documentation, remain undiscovered, and may be deserving of special designations.
- A. Several unrecorded sites have been discovered and unrecorded structures exist at the park. These resources include prehistoric sites, sites associated with historic settlement, sites associated with the phosphate industry and structures associated with the early attraction development. The extent of archaeological sites is not well defined.
 - B. Cultural resources, particularly unknown ones, may be impacted by park activities.

Management Objectives

The resources administered by the Division are divided into two principal categories: natural resources and cultural resources. The primary objective in natural resource management is to maintain and restore, to the extent possible, to the conditions that existed before the ecological disruptions caused by man. The objective for managing cultural resources is to protect these resources from human-related and natural threats. This will arrest deterioration and help preserve the cultural resources for future generations to enjoy.

Specific objectives for managing the natural and cultural resources of the park are as follows:

1. Reduce human impacts on headsprings and river.
 - A. Aquatic plant beds adjacent to and downstream of the designated swimming areas, the headsprings canoe launch, the proposed tube launch and swimming area adjacent to the Rainbow River campground and the proposed tube landing must be protected from negative impacts and, if necessary, restored with native plant species. Control and eradication of hydrilla in these areas will be a priority resource management activity, in collaboration with the Aquatic Preserve staff and the DEP Bureau of Invasive Plant Management.
 - B. Establish baseline data, and develop a long-term monitoring plan to quantify anticipated impacts to the river system from visitor use at the proposed tubing facilities. Use the data collected to establish recreational carrying capacities that will prevent degradation of the river system.
 - C. Implement and enforce the existing carrying capacity for the headsprings, and through monitoring of visitor impacts determine whether that carrying capacity is sufficient. Refine the carrying capacity as necessary to reduce visitor impacts to the headsprings.
 - D. Continue to restrict swimming, snorkeling and wading to areas designated for that purpose. Continue to use photopoints or other methods to document shifts in vegetation and other changes around the swimming area. Continue to designate Bubbling Springs and the unnamed side spring as restricted zones with no access permitted. Coordinate with staff of the Aquatic Preserve in efforts to restore appropriate plant species and to remove hydrilla.
 - E. Develop a monitoring plan, incorporating data collected by U.S.G.S. and the SWFWMD, to assess discharge rates, water quality, and community structure of the springs and spring-runs. The plan should address research needs and management of the existing human impacts on the resource.
 - F. Continue to assist law enforcement staff in enforcing boat speed restrictions on the Rainbow River. Continue to restrict motorized vessels from entering the headspring

- area.
- G. Maintain shoreline vegetation to serve as protective buffers to runoff.
2. Encourage and participate in the protection of spring flow and spring water quality on a regional level, which places a focus on preventing excessive groundwater pumping and controlling nutrient and pollutant loading in the watershed.
 - A. Monitor water quality and quantity threats from activities outside the park, and coordinate closely with permitting agencies to ensure Division's interests are considered. Support Marion County land use planning decisions that protect groundwater supplies in the Rainbow Springs recharge basin.
 - B. Support purchase of conservation easements or outright acquisition of crucial lands within the Rainbow Springs groundwater recharge basin to protect spring flow and water quality.
 - C. Maintain close contact with agencies collecting information that may affect the management of Rainbow Springs. Compile monitoring data in suitable formats and distribute to park staff and volunteers for their use.
 - D. Funding from the 2001 and 2002 Springs Initiatives provided staff to the Aquatic Preserve to establish the Rainbow River Coordination Council. Participate in the Council and support its public outreach and education activities. Encourage landowners in the Rainbow Springs recharge basin to implement BMP's that protect groundwater.
 3. Remove invasive exotic plants and animals.
 - A. Continue to cooperate with the Aquatic Preserve staff to control hydrilla within the Rainbow River. Within the park, continue to control hydrilla utilizing a strategy to contain, reduce and eradicate established patches.
 - B. The upland species judged as highest priority for removal include skunk vine, and cogon grass. Other plants with a high priority for removal include air potato, coral ardisia, elephant ear, and taro. Follow-up treatments are among the highest priorities.
 - C. Aggressively remove feral hogs in accordance with the Division feral hog policy whenever they or their signs are noted on site. Restoration of some hog-damaged areas may be necessary if the disturbance is extensive.
 - D. Continue the outreach program to educate neighbors and visitors about the threats of invasive exotic plants. Encourage adjacent landowners to establish control programs for invasive exotic plants.
 4. Continue to renovate the ornamental gardens.
 - A. Replace invasive ornamental plant species with native or non-invasive ornamentals.
 - B. Emphasize xeriscaping and limit use of fertilizers in the gardens to protect the headsprings.
 5. Reintroduce fire to natural communities and restore pastures with native vegetation.
 - A. Continue active prescribed burning program to restore fire-dependent natural communities and where necessary remove offsite hardwoods to speed restoration.
 - B. Convert the site of the former sewage treatment plant to some other use. If not needed for infrastructure or facilities, eliminate exotics and restore it to the appropriate natural community types.
 - C. The pasture and nursery areas should be replanted with longleaf pines, sandhill oak species, and native herbaceous species once the bahiagrass dominated pasture grasses are removed or suppressed enough to allow establishment of native species. Fire will be an important tool in the restoration of these areas.
 6. Prevent soil erosion around the headsprings and along developed shorelines.
 - A. Visitors are currently prevented from entering and exiting the water directly from the shore. Continue to require recreational users to use structures provided for accessing

- the swimming areas.
 - B. Wherever exotic plants are removed from the slopes above the headsprings, plant native species as replacements to prevent erosion. Temporary measures such as erosion control mats and seeding with annual rye grass may be warranted in some cases until the area can be stabilized with perennial species.
 - C. Provide some form of docking structure to remove impacts from the campground shoreline.
7. Improve the attenuation of stormwater runoff from the developed areas above the headsprings. Restore natural hydrological flows within the campground to the extent possible.
 - A. Monitor stormwater runoff from the walkways and other impervious surfaces on slopes above the headsprings to determine the function and extent of the existing underground drainage system. If necessary, modify the drainage system to meet best management practices and current water quality standards.
 - B. Manage runoff from the grassy slopes and natural areas above the spring to prevent any adverse impacts on water quality. Establish water bars or vegetated berms with shallow swales to divert and absorb runoff.
 - C. Control runoff from existing roads in the campground area using vegetated berms and water bars constructed to direct flow to vegetated areas, preventing direct flow of sediments into the spring run.
 - D. Redesign the campground access roads, or retrofit with an adequate culvert system, to restore natural sheetflow and surfacewater flows in the adjacent hydric hammock.
 8. Remove non-essential structures and restore natural areas.
 - A. Remove buildings and other structures that are not necessary for park operations and replant their sites with native vegetation. Carefully review non-essential structures with historic elements before considering them for removal or alteration.
 - B. Continue disposal of scrap piles that remain onsite from the attraction period
 9. Protect surrounding natural areas through outright acquisition and/or close monitoring of proposed land use changes and maintain park boundary lines.
 - A. To ensure the continued survival of species within the park, additional natural areas must be acquired before they are destroyed by development. Attempts should be made to acquire corridors of natural habitat to the north and south of the park to provide connections to other natural areas. Encourage homeowners near the park to maintain native vegetation on their land to provide additional wildlife habitat.
 - B. As part of the prescribed fire program at the park, contact local citizens and instruct them on the importance of fire in preserving natural areas. Interpretation and education about prescribed fire will be vital to its continued use as a management technique on state lands.
 - C. Continually review comprehensive plan amendments and land development regulations that may govern proposed land use changes on properties adjacent to the park. Monitor permits requested of the SWFWMD for those that may impact the watershed of the Rainbow River. Formally present Division comments regarding proposed land use changes or permit requests to appropriate governing bodies and agencies.
 - D. Pursue a survey to determine the park boundary line where the line is in question. Once established, maintain the boundary.
 10. Protect and monitor archaeological and historic sites for vandalism, unauthorized digging, erosion and other forms of encroachment.
 - A. Park staff and law enforcement will continue to patrol remote cultural sites to discourage looting.

- B. Develop, implement and adhere to a cyclical maintenance program for all cultural resources especially the Cemetery site and resources from the twentieth century attraction.
 - C. Aggressively pursue purchase of adjacent properties containing significant cultural resources to protect sites from development or destruction.
 - D. Regularly assess the condition of archaeological and historic resources. Monitor the condition of sites in poor condition using photopoints.
 - E. Regularly assess condition of historic structures, including glass bottom boats on loan and stored on park grounds. Arrange a consultation with a historic preservation architect to assess and possibly stabilize structures that are in fragile state of preservation or present a safety hazard.
 - F. Create and maintain a cultural resources record keeping system that follows guidelines set forth by the Bureau of Natural and Cultural Resources.
 - G. Stabilize the 1920s stone cabins.
11. Formalize and properly curate park collections.
- A. Draft a Scope of Collection Statement and inventory and catalog all collection objects, including informal collections. Develop plans to exhibit appropriate objects in visitor center.
 - B. Determine if one or all of the glass bottom boats currently stored at the park could be acquired by the park or be donated to the park. If transfer of ownership is possible, initiate a process such that one boat be restored and displayed out of the water for interpretive purposes.
12. Properly document unrecorded cultural sites, conduct additional survey work, and pursue nomination of the park resources as a National Register site.
- A. Complete Florida Master Site File forms for all unrecorded sites and pursue funding for a Phase II archaeological survey.
 - B. Pursue funding to hire a private sector professional to prepare a systematic detailed history of the park from its earliest settlement to the present time.
 - C. Conduct ground disturbing activities in accordance with DHR guidelines.

Management Measures for Natural Resources

Hydrology

Hydrological data historically and currently collected for the Rainbow Springs complex include daily discharge data by the USGS, and quarterly water quality data by the SWFWMD. There is a remarkable lack of consistent biological data collection, published or unpublished. To avoid unnecessary overlap in data collection, data from other agencies will be compiled and monitored to assess overall condition of the springs and spring run. In addition, current deficiencies in the collection of biological data will be addressed. Baseline biological monitoring of the spring run was performed in October 2000. Baseline surveys for fish and invertebrates were conducted in 2002. If funding for future monitoring is approved, continued regular collection and analysis of biological data will be implemented, with the cooperation of the DEP Bureau of Laboratories. Division staff will continue regular monitoring of aquatic vegetation in the headsprings.

The primary recharge area for the headsprings is the extensive upland region north of the park. This area encompasses approximately 750 square miles. In order to ensure that the high quality standards and natural discharge rates of Rainbow Springs are maintained, it will be essential to monitor the prime recharge zone for potential sources of pollution of the aquifer and for proposed land use changes that may significantly alter recharge rates. Potential threats from outside land use and development to water resources within the park will increase as the surrounding areas continue to be developed. Reviewing permit requests

to agencies such as the SWFWMD will monitor such threats. Any proposed development, which may cause adverse impacts to water resources within the park, will be addressed and appropriate comments made pursuant to Chapter 120, Florida Statutes. Division will support efforts to acquire lands or purchase conservation easements within the Rainbow Springs groundwater recharge basin for the purpose of springs protection.

Residential septic systems have been shown to be impacting the river downstream from the park (Henigar and Ray, 1987). When the state acquired Rainbow Springs, a sewage treatment facility was located in the park, which accepted wastewater from the Rainbow Springs Estates subdivision, and from facilities within the park. That treatment plant provided secondary treatment only. The effluent was sprayed onto a field located on an upland site known to be a high recharge area for the aquifer. Fortunately, both the subdivision and the park subsequently connected with a larger, more efficient municipal facility. At the time of abandonment, the facility within the park was dismantled.

Other water quality threats to the springs and spring run from runoff within the park will be clearly defined and addressed. Currently, stormwater runoff from impervious surfaces in the park is captured and routed both to and away from the springs area by a variety of structures, ranging from trench-and-culvert to capture-and-pump systems. While some of these systems are operational, they may not provide necessary water quality treatment before discharge. Furthermore, the location and functionality of some of the systems is questionable. The existing stormwater capture and treatment structures throughout the park will be identified and assessed for function. If necessary, a master stormwater plan for the park and all of its facilities will be devised, incorporating existing structures where feasible. Any future park development will include appropriate stormwater management systems to protect both surface and groundwater quality.

Erosion currently appears to be a minor problem on some of the steep slopes surrounding the north and east areas of the headsprings. Restricting boat access to the headspring area, improving visitor access points to the water, and allowing natural vegetation to recover along the shoreline has reduced bank erosion in the headspring area. Erosion into the headsprings from the higher slopes could be further reduced by terracing the slopes or by otherwise slowing the velocity of surface water flow. Exotic vegetation control efforts on the slopes surrounding the headsprings will incorporate anti-erosion measures such as erosion control mats, replanting with native vegetation and seeding with annual rye grass until the areas are stabilized with perennial species.

Erosion is also a concern in the existing campground area. Runoff from campground roads carries sediments into the spring run with no treatment or attenuation. A vegetated berm constructed by Aquatic Preserve and Park staff was designed to redirect runoff near the end of the main campground road, adjacent to the swimming area. This method appears to be a worthwhile way to reduce direct runoff from the road to the spring run. However, it is only a partial solution to a larger problem. Attenuating runoff from the campground road system will be addressed, with consideration given to removing and redesigning the roads for more effective stormwater control.

A final area of concern is the hydrologic disruption resulting from historic management activities. Margins of certain basin swamps were historically fire-plowed. Use of fire plows in or near wetlands is especially harmful to natural community structure. Fire plow trenches promote soil erosion and inhibit natural overland flow and infiltration to the surficial aquifer. Since DEP began managing the Rainbow Springs property, the use of fire plows has been discouraged. Given time, the fire plow trenches around the basin swamps should be able to restore themselves through natural processes. In addition to disturbance

from fire-plowing, natural sheetflow and overland flow has been disrupted in the campground area by the construction of fill roads with inadequate surfacewater conveyance structures. These roads will be retrofitted with adequate culverts, or redesigned to restore the natural conveyance of surfacewater.

Prescribed Burning

The objectives of prescribed burning are to create those conditions that are most natural for a particular community, and to maintain ecological diversity within the unit's natural communities. To meet these objectives, the park is partitioned into burn zones (see Burn Zone Map), and burn prescriptions are implemented for each zone. The park burn plan is updated annually to meet current conditions. All prescribed burns are conducted with authorization from the Department of Agriculture and Consumer Services, Division of Forestry (DOF). Wildfire suppression activities will be coordinated between the Division and the DOF.

Rainbow Springs State Park contains a significant amount of burn habitat. Natural communities within the park that are naturally maintained by fire include sandhills, mesic flatwoods, scrubby flatwoods, basin swamps, and depression marshes. Most of the burn habitat is located east of the developed areas. Four groupings of management zones have been defined based on natural community type, condition, and location. These have been subdivided into zones. Those zones that contain burn habitat will be prescribed burned as individual units.

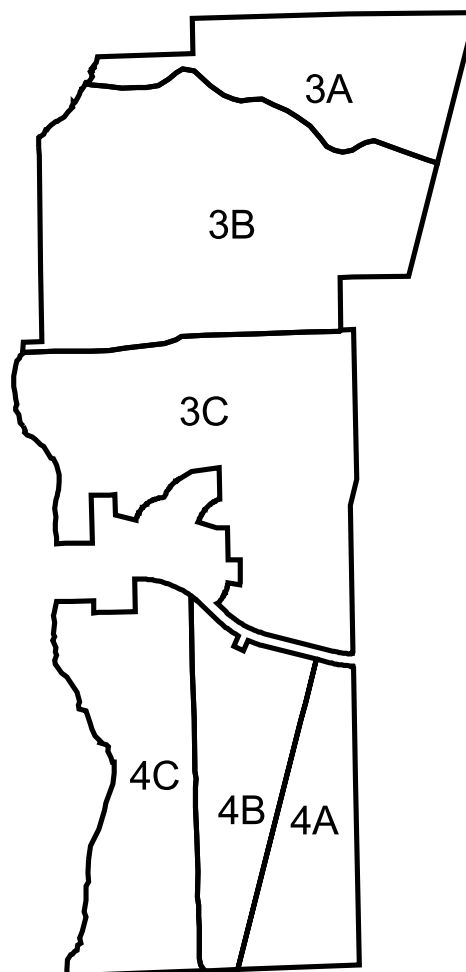
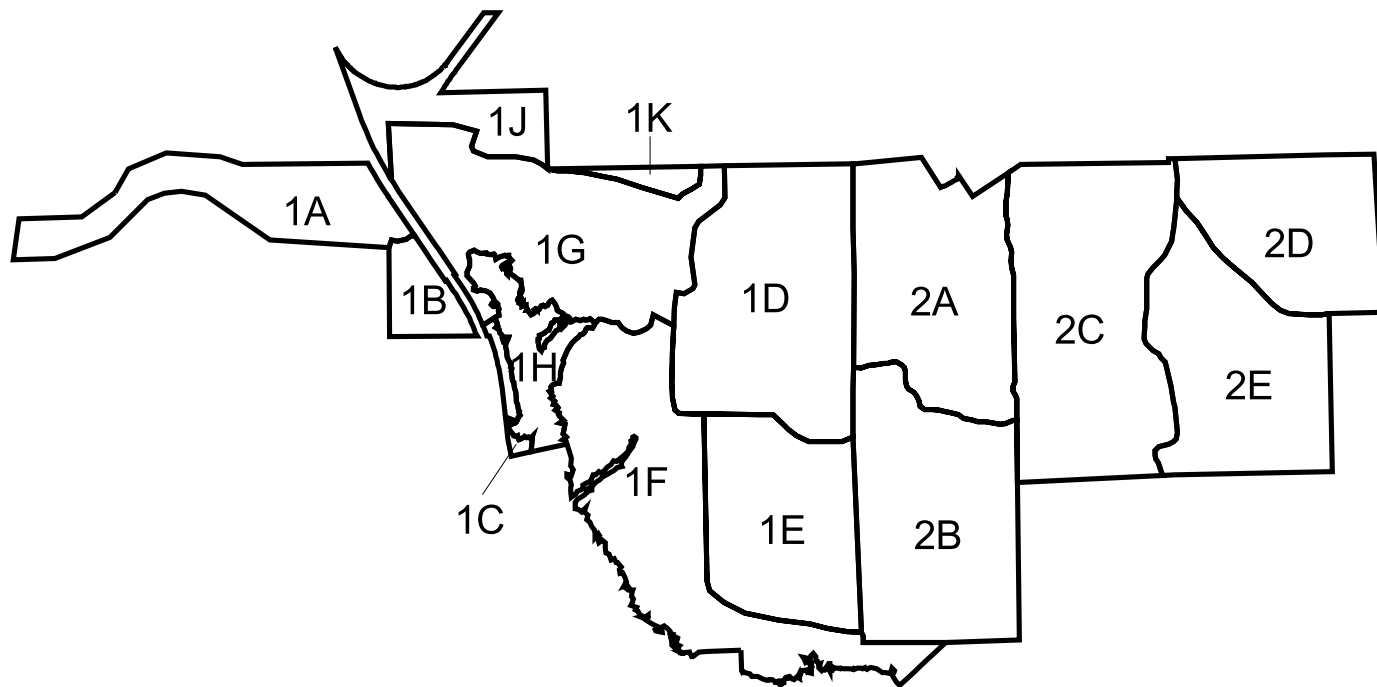
The majority of the burn habitat consists of sandhills and mesic flatwoods of varying quality. Careful planning and execution of prescribed fires is essential due to the proximity of U.S. Highway 41, State Road 40, adjacent schools, and numerous residential communities. The highways and most of the residences are located to the north and west of the park boundaries, while two schools and a two-lane county road (SW 180th Avenue Road) are located east of the park.

Firebreaks around zones consist of pre-existing breaks such as service roads and park boundary lines, as well as natural firebreaks such as mesic woods or watercourses. Wherever appropriate, ecotones between natural communities will be maintained by fire. Prescribed fires should be allowed to burn through ecotones to the extent that natural fires would have. The basin swamps can be used as natural firebreaks during wet years, but may burn if the soils are not saturated.

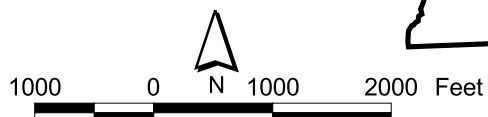
The construction of artificial firebreaks between natural communities is discouraged.

Where significant archaeological sites occur, soil disturbance in the preparation of firebreaks should be minimized. Neither the periphery of the large pasture (Zone 1E) nor the road that runs along the south boundary of Zone 2B should be disked. In most other areas, disking will not be required if proper equipment and staff are available to rake lines or if wet lines are used.

Fire had been excluded from most of the burn habitat of the park for at least a decade before state acquisition. In many cases, fire had been absent much longer. All of the larger burn zones have been burned at least once if not twice since acquisition. Some of the smaller zones in poorer condition near the developed areas remain to be burned, along with the large pasture areas. Some overgrown areas may require at least one additional non-lightning season burn to reduce fuel levels. Even sandhills in relatively good condition that have been excluded from fire for too long require a fuel reduction burn in the non-lightning season to protect longleaf pines that are surrounded by heavy fuel buildups and thick layers



LEGEND
 1A-1H, 1J, 1K
 2A-2E
 3A-3C
 4A-4C



**RAINBOW SPRINGS
STATE PARK**

Florida Department of Environmental Protection
 Division of Recreation and Parks
 Office of Park Planning

**BURN ZONES
MAP**

of duff. The ultimate goal, however, will be to burn during the lightning season to simulate natural fires in all burn zones.

Prescribed fire-return intervals will ideally mimic natural fire-return intervals. Sandhills tend to burn more frequently than mesic or scrubby flatwoods. As a general rule, the park's sandhills will ideally be burned every 2 to 5 years, while the mesic flatwoods will be burned at slightly longer intervals. Scrubby flatwoods may be burned every 8 to 25 years (FNAI/FDNR 1990). In practice, however, these intervals are flexible and fire-return intervals should vary over time to mimic natural random events. Season of fire should also vary over time with the majority of prescribed burns occurring during the lightning season peaking in May and June. However, occasional fires at other times of the year may increase habitat and species diversity. Fires should be prescribed to mimic natural fire behavior and intensity to the extent possible.

Designated Species Protection

The welfare of designated species is an important concern of the Division. In many cases, these species will benefit most from proper management of their natural communities. At times, however, additional management measures are needed because of the poor condition of some communities, or because of unusual circumstances which aggravate the particular problems of a species. The Division will consult and coordinate with appropriate federal, state and local agencies for management of designated species.

Restoration of a natural fire regime to the park's sandhill natural community is probably the single most important measure that could be employed to benefit designated species within Rainbow Springs State Park. Many of the designated species of the park are endemic to sandhills. When those areas are excluded from natural or prescribed fires, these species suffer. Preservation of natural areas within the park, particularly the sandhills, will be a priority in the management of designated species.

Long term survival of designated animal species within the park will not only depend upon proper management of the existing habitats, but will require additional land acquisition to assure connections to other natural areas. Isolation of the animal populations from other populations in the landscape will greatly increase the risk of local extinction since the chances of recolonization would be minimal. The Division will continue in its efforts to acquire adjacent natural areas to provide better landscape connectivity and to increase the amount of available, and protected, habitat in the region.

Specific concerns at the park include park development impacts on designated species. Impacts on gopher tortoises and their burrows should be avoided. Impacts to tortoises also affect burrow commensals including other designated species including indigo snakes, Florida mice, and gopher frogs which all occur within the park's sandhills. Any loss of native groundcovers in the flatwoods or sandhills should also be avoided to preserve designated species habitat. Likewise, impacts to isolated wetlands should be avoided to protect breeding sites of rare amphibians. The nest box program for the southeastern kestrel should also be continued and monitored to measure success of the program.

Intensive surveys of sites for listed plant species should be conducted during the planning phase of any future development in the park. These surveys within the unit are recommended in order to identify potential additional listed species and to define the locations of known populations. A complete floristic study of the park would undoubtedly expand the plant species list and discover additional designated plant species. The Division encourages such research projects.

Due to their destructive nature, feral hogs should be removed from the park immediately

according to Division policies. Feral hog damage to wetlands and ecotones should be monitored in natural areas to assess impacts and to measure the success of the removal program.

Exotic Species Control

Exotic species are those plants or animals that are not native to Florida, but were introduced as a result of human-related activities. Exotics have fewer natural enemies and may have a higher survival rate than do native species, as well. They may also harbor diseases or parasites that significantly impact non-resistant native species. Therefore, the policy of the Division is to remove exotic species from native natural communities.

The Florida Exotic Pest Plant Council (FLEPPC) ranks exotic pest plants within the state of Florida according to their abilities to invade and disrupt native plant communities. Species that are known to invade and disrupt natural communities are listed as Category I, while Category II species are those that have shown the potential for disrupting natural communities. Rainbow Springs State Park is faced with the management of 17 Category I species, 12 Category II species, and several invasive species that are not FLEPPC lists (FLEPPC 1999). These exotics occur on roughly 48 acres of the park. Most of the upland invasive exotic plant species, and the densest infestations at Rainbow Springs State Park, were located originally within the gardens of the former attraction but have spread into adjacent areas. Air potato is the most widespread and dense infestation in the garden areas. Another area with a dense exotic infestation is the park entrance drive, which hosts wisteria (*Wisteria sinensis*), camphor tree (*Cinnamomum camphora*), sword fern (*Nephrolepis cordifolia*), coral ardisia, skunk vine and mimosa (*Albizia julibrissin*). Two large phosphate pits formerly used as dumps in the pasture area contain a nearly 100 percent cover of air potato, paper mulberry (*Broussonetia papyifera*), elephant ear, golden rain tree (*Koelreuteria elegans*), and chinaberry (*Melia azedarach*). Skunk vine is widespread within the park, but is patchy in its distribution. It probably did not originate within the ornamental gardens but was brought into the park by birds. Skunk vine has also infested many forest edges and wood lots surrounding the park and continues to be dispersed into the park.

Several species have established smaller, less dense infestations in outlying areas away from the gardens. Cogon grass is established along the east boundary of the park on SW 180th Avenue Road and on private lands. Cogon grass is a threat to good quality sandhills that lie to the west. A small population of camphor tree is established in a disturbed area at the south end of park. Air potato has become established along the edge of the park campground. Yard clippings containing invasive exotics from Sateke Village, a neighborhood inholding, have historically been dumped on park property. Aside from the small infestations mentioned above, most of the natural areas of the park are presently free of invasive exotics.

A number of aquatic and emergent weeds have infested the Rainbow River. Hydrilla is one of the most prominent and problematic of these weeds. It is currently established in the headspring from the swimming area past the canoe launch. Its distribution needs mapping and monitoring. Small populations of papyrus and taro are scattered along the shoreline.

The park has an active and extensive invasive exotic plant control program. Participation in the Bureau of Invasive Plant Management (BIPM), Upland Plant Management program has resulted in the funding of exotics control activities outside the gardens in 1999 and in 2001. The gardens and other infested portions of the park have been divided into small, manageable exotic control sections (most of which are much smaller than established management zones). Control activities within the gardens are prioritized by section.

Park staff and volunteers will continue to follow established priorities for upland weeds, which include the following. Plants that have the highest potential to disrupt natural communities due to their rate of spread or other ecosystem altering properties shall be controlled as the highest priority throughout the park (i.e., skunk vine and cogon grass). Follow-up treatments in areas that were previously treated, either by contractors or in areas treated by staff and volunteers, will receive a higher priority for treatment than initial control on untreated areas. Among previously treated areas, threatened, good quality natural communities, such as the upland mixed forest and hydric hammock around Bubbling Springs, shall be a higher priority than disturbed and developed sections of the park. In beginning treatment of untreated areas, containment is the goal. Outlying populations in the natural areas of the park will take precedence over the core infestation in and around the gardens. However, control activities in the gardens are essential for the success of the garden renovation so control in the gardens will take precedence over non-outlying populations of exotics in ruderal and degraded areas of the park.

The strategy for control of aquatic weeds, like the upland program, will adopt a goal of containment, then eradication of infestations. The most noxious weeds (i.e., hydrilla) will be the highest priority for control. The infestation will be mapped to identify outlying populations, which will receive the highest priority for removal. Areas that will receive special attention for removal are those where chronic disturbance (i.e., the canoe launch, swimming area, tube launch and tube landing or other areas) promotes its spread. After removal of aquatic and emergent weeds, natives will be replanted as deemed appropriate. The park should continue to use volunteers for the control of hydrilla and will continue cooperative efforts with the staff of the Rainbow River Aquatic Preserve to control and eradicate hydrilla in the entire river.

The feral hog is the exotic animal causing the most damage to natural communities within the park. Hog wallows and rooting signs are common in the upland mixed forest, basin swamp, flatwoods, depression marsh, and hydric hammock communities. The wetland areas are the most severely affected by these intrusions.

Hog damage throughout the park is serious. Feral hogs should be aggressively removed from the park in accordance with the Division's OPM. Active hog removal plus the construction of quality fencing should suffice to bring the problem under control.

Nine-banded armadillos are present within the park and should be removed whenever possible. It is likely that domestic cats and dogs may also become a problem within the park due to the proximity of residential areas. As the land north of the park is developed, an influx of domestic animals into the park can be expected. An attempt should be made to limit this immigration through proper fencing and the removal of strays.

The exotic fire ant (*Solenopsis saevissima*) also occurs within the park. This noxious species may compete with native ant species, and is undesirable in visitor use areas. Fire ants should be controlled using fire ant bait approved by the Division of Recreation and Parks. Bait should be applied directly to the mounds, rather than broadcast, to avoid impacting non-target ant species.

Problem Species

Problem species are defined as native species whose habits create specific management problems or concerns. Occasionally, problem species are also a designated species, such as alligators. The Division will consult and coordinate with appropriate federal, state and local agencies for management of designated species that are considered a threat or problem.

Alligators do occur within the park and occasionally take up residence in the headspring area. The proximity of alligators to the swimming area is a cause for concern. Park staff carefully monitors alligator movements within the headspring area and follows established procedures if it appears that an alligator may be a safety threat. At this time, there are no other known native animal species in Rainbow Springs State Park that can be considered as problem species.

Certain native plants such as laurel and water oaks may present problems when they invade fire-adapted communities, but these species can usually be controlled with prescribed fire. Those trees that have grown too large to be impacted by fire may be mechanically girdled or herbicided to speed natural community restoration.

Management Measures for Cultural Resources

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. Approval from Department of State, Division of Historical Resources (DHR) must be obtained before taking any actions, such as development or site improvements, that could affect or disturb the cultural resources on state lands. A statement of DHR's policies and procedures for the management and protection of cultural resources is contained in Addendum 8.

Actions that require permits or approval from DHR include development, site excavations or surveys, disturbances of sites or structures, disturbances of the substrate, and any other actions that may affect the integrity of the cultural resources. These actions could damage evidence that would someday be useful to researchers attempting to interpret the past.

1. Because of the likelihood for prehistoric sites in the park and surrounding areas, park and District 2 staff will routinely visit known sites to protect them from vandalism. Monitoring sites using photopoints is encouraged. Reports of activities should be filed at both the park and District offices.
2. Manage woody vegetation in archaeological sites according to established guidelines.
3. Review burn prescriptions for impacts to cultural resources before prescribed burns are conducted.
4. Ground-disturbing activities will be conducted in accordance with the DHR guidelines.
5. Should additional ground-disturbing activities be planned for sites in the vicinity of the Jungle Café site (8MR2667), more testing must be carried out to determine the extent of the site and assess its significance (Vojnovski et al, 1999).
6. Discourage vandalism using interpretive signage that includes warnings against collecting artifacts in both terrestrial and aquatic environments.
7. Develop and implement cyclical schedules for the management of each element of structural cultural resources. Schedules will be periodically reviewed and updated.
8. Develop and implement appropriate materials and techniques for maintaining each element of the complex. Consult with an historic preservation architect to develop materials and techniques use in performing routine maintenance functions. These will be periodically reviewed and updated to ensure appropriateness of chemical compounds, materials used to apply and remove such compounds, and reversibility of processes performed.
9. Create and maintain a cultural resources record keeping system.
10. Consult the DHR for guidance on cleaning and conservation treatments of the markers at the cemetery site. Map all grave markers and surrounding structural elements. Follow established guidelines for vegetation maintenance surrounding the grave marker
11. Document and fill out the appropriate FMSF Historic Structure forms for all structures

associated with the attraction, including glass bottom boats. Photopoints should be taken at regular intervals.

12. Determine if one or all of the glass bottom boats currently stored at the park could be acquired by the park or be donated to the park. If transfer of ownership is possible, initiate a process such that one boat be restored and displayed out of the water to commemorate that part of the history of the park.
13. Draft a Scope of Collection Statement and inventory and catalog information for collection objects housed in the visitor center. Copies of these records should be stored at both the park and district offices.

Research Needs

Natural Resources

Any research or other activity that involves the collection of plant or animal species on park lands requires a collecting permit from the Department of Environmental Protection. Additional permits from the Florida Fish and Wildlife Conservation Commission, the Department of Agriculture and Consumer Services, or the U.S. Fish and Wildlife Service may also be required.

The following is a list of specific research needs identified for Rainbow Springs State Park.

1. Tuber impacts associated with proposed put-in and take-out facilities. New tuber facilities are proposed for the Rainbow River. A monitoring program is necessary to evaluate and manage potential impacts from tuber use. Baseline data collection and annual monitoring efforts should include detailed mapping of aquatic vegetation, existing hydrilla infestations, and native habitat throughout the projected tubing area, but particularly in higher use areas. In addition, detailed water depth surveys are needed to define areas most susceptible to impacts associated with tuber use. Annual monitoring efforts will focus on tracking changes in the river system associated with tuber use. Monitoring protocol will include methods such as transect surveys of vegetation and bathymetry, photopoint monitoring, and stream condition index (SCI) monitoring. Staff will use data collected from monitoring efforts to evaluate the effects of recreational use on the river system and to establish management methods for controlling adverse effects. These methods might include recreational carrying capacities, restriction of use in sensitive areas, and mitigation of impacts through restoration.
2. Visitor impacts on the springs and spring runs. A long-term monitoring study must be set up within the headsprings and side springs to track the impact of visitors on the spring systems. The existing series of photopoints should be expanded to include underwater photos, which monitor changes in aquatic vegetation cover and sediment shifting. Vegetation and substrate monitoring transects should be established to monitor changes in high-use areas. Water quality data collected by other agencies should be compiled and monitored to ensure that visitor use, runoff, or aquifer contamination does not degrade the springs any further.
3. Hydrogeological study of the Rainbow Springs headwaters. To protect the quality of water entering the Rainbow River, an understanding of the hydrogeology of the region is necessary. Activities occurring within the surface and subsurface watersheds may impact the groundwater resources of Rainbow Springs State Park. An investigation of the Floridan aquifer to locate conduits that may supply Rainbow Springs is essential to the long-term protection of the springs.
4. Floral inventory. A complete inventory of the plant species within the park is lacking. A floral inventory would identify additional designated plant species and provide information on currently known populations.

5. Surface Hydrology and the Impact of Lake Rousseau. The specific impacts of the Rousseau impoundment on the hydrology and biology of the Rainbow River should be addressed. This study should investigate the feasibility of restoring the natural hydroperiod of the Withlacoochee/Rainbow River systems and the anadromous fishery.
6. Stormwater runoff from the developed areas of the park. Existing stormwater treatment structures for the parking and gardens areas should be identified and assessed for function. A master stormwater plan to capture and treat runoff from developed areas including the existing parking and the gardens area should be designed, implementing existing structures where possible.

Cultural Resources

1. History of park resources. Because of its possible association with the historic community of Juliette, the Cemetery site (8MR2057) is significant at the local level and may be considered potentially eligible for listing in the National Register of Historic Places. A systematic detailed history of the park from its earliest settlement to the present time would help enhance its National Register nomination potential. Potential studies include research on: Seminole War; Civil War; settlement of the town of Juliette; the early to mid-twentieth century attraction; turpentine and phosphate mining, as well as other industries in the area. This research should include oral history as well as documentary research.
2. Further investigation into prehistoric archaeological resources of the park. The park has the potential to yield significant information concerning changing prehistoric settlement patterns in north central Florida. The park was included in a Phase I archaeological survey (Chance 1980) and in more recent years was tested in areas scheduled for development (see Chance 1988; and Vojnovski et al. 1999). The Rainbow Springs site (8Mr208) is probably eligible for listing in the National Register of Historic Places because it is a land site with a Paleo-Indian component (Chance 1980). The connection to the spring further increases its significance. Staff should pursue funding for a Phase II survey to confirm Marsha Chance's 1980 findings, to assess the site's significance for National Register nomination, and to document other unrecorded prehistoric and historic sites in the park.

Resource Management Schedule

A priority schedule for conducting all management activities which is based on the purposes for which these lands were acquired, and to enhance the resource values, is contained in Addendum 9. Cost estimates for conducting priority management activities are based on the most cost effective methods and recommendations currently available (see Addendum 9).

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 of the Internal Improvement Trust Fund (board) are being managed for the purposes for which they were acquired and in accordance with a land management plan adopted pursuant to s. 259.032, the board of trustees, acting through the Department of Environmental Protection (department). The managing agency shall consider the findings and recommendations of the land management review team in finalizing the required 5-year update of its management plan.

Rainbow Springs State Park was subject to a land management review on August 23, 2000. The review team made the following determinations:

1. The land is being managed for the purpose for which it was acquired.

2. The actual management practices, including public access, complied with the management plan for this site.

The land management review team report, including the Division response to that report, is contained in Addendum 10.

LAND USE COMPONENT

INTRODUCTION

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

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

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

EXTERNAL CONDITIONS

An assessment of the conditions that exist beyond the boundaries of the unit can identify any special development problems or opportunities that exist because of the unit's unique setting or environment. This also provides an opportunity to deal systematically with various planning issues such as location, adjacent land uses, and the park interaction with other facilities.

Existing Use of Adjacent Lands

Rainbow Springs State Park is surrounded by single-family residential development, undeveloped residential and agricultural lands. The city of Dunnellon is located about three miles south of the main park entrance on U.S. Highway 41. The city of Ocala lies approximately 20 miles east of the park.

The population surrounding the state park continues to grow at a high rate. An analysis of population growth within the four-county region (Marion, Citrus, Levy, and Sumter) surrounding the park shows that the local population increased by 25 percent between 1990 and 1999 to grow from approximately 345,837 to 464,796 residents. While significant, this growth rate has declined from that of 53 percent in the previous ten-year period (1980-89).

Research by Division staff in preparation of this plan identified two public and three private boat ramps providing access to the Rainbow River. Additional public access points include tube and canoe rental operations at the K.P. Hole Park operated by Marion County, and canoe rentals at the Rainbow River Campground, both located about 1.5 miles downstream from the headsprings. Multiple-slip boat docks or other storage facilities are located at the Rainbow River Club at the lower end of the river, at Sateke Village, and at the Village of Rainbow Springs immediately south of the park's western shoreline boundary. According to staff of the Rainbow Springs Aquatic Preserve, more than 160 private docks are located on the Rainbow River.

Recreational and commercial uses of the Rainbow River affect the spring-run community of the park. Boating, swimming, fishing, snorkeling, SCUBA, tubing, canoeing and sightseeing activities bring substantial numbers of visitors upstream to the park boundary or to the headsprings area during all months of the year.

Planned Use of Adjacent Lands

Residential development near Rainbow Springs State Park is expected to continue at a rapid pace. The 2000 Florida Statistical Abstract medium-range estimate of population for the four-county area surrounding the park in the year 2010 is 565,400 residents, an 18 percent increase over the 1999 estimate. This anticipated population growth would continue to place additional recreational pressure on the Rainbow River and the state park property. The state park has already been experiencing increased pressures on the recreation resource through an influx of visitors to the park. Over the last four years (1997-2001), visitation to the park has averaged 153,118 people per year. This number is significant because it demonstrates a 54 percent increase over the previous four-year period (1993-1997) when visitation averaged 83,767. With a further increase in the population of the region, visitation to the park and the demands on the resources will continue to grow. Increasing park visitation will accentuate the Division's responsibilities to manage the levels and intensities of recreational uses of the resources of the park and maintain appropriate visitor carrying capacities, in the future.

It is expected that the future development of residential subdivisions contiguous to the property on the north, east and south boundaries may encroach on the natural character of the park. Future state land acquisition projects may expand the park boundary to the northwest, the northeast, and the south in order to maintain the character of the park, protect the spring recharge areas, and connect with other public lands.

PROPERTY ANALYSIS

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

Recreation Resource Elements

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

Land Area

The Rainbow Springs property contains approximately 2,143.5 upland, wetland and submerged acres. Eleven natural communities, in addition to ruderal and developed areas, are identified in the resource management component of this plan.

The area immediately surrounding the headsprings and spring-run stream, formerly an upland mixed forest community was developed for phosphate mining, as a vacation resort, and as a commercial attraction by a series of private owners before state acquisition. Visitor and support facilities for the abandoned attraction cover approximately 40 acres. These structures and facilities include numerous buildings, ornamental gardens with paved walkways and manmade waterfalls, deteriorating cages of an animal display area, a plant nursery and greenhouses, roads, and utility systems. Many of the facilities are suitable for use in park activities and programs and many have been renovated since the property was acquired.

In the northern parcel of the park, the central portion is an improved pasture that contains the old phosphate pits and an abandoned sewage treatment plant sprayfield. The eastern portion of this parcel contains sandhill community, pine flatwoods and two types of wetland communities.

When looking at user preferences and aesthetic appeal, the spring-run stream and upland mixed forest communities provide the greatest recreational values. Improved pasture areas will offer few recreational activities until many years after restoration efforts have been implemented. The sandhill and pine flatwoods areas and wetland communities offer good opportunities for hiking and nature study.

The southern parcel of the park lies on the east bank of the Rainbow River, approximately 1.25 miles downstream from the headsprings. This area is primarily sandhill community with hydric hammock vegetation located along the river. Sateke Village, a single-family residential subdivision, is located on the river at the middle of the southern parcel. The Rainbow River Campground, currently operated by Marion County under agreement with the Division, is located just south of Sateke Village. Campsites were developed by a previous owner both in upland sandhills and in the hydric hammock community along the river.

Water Area

The Rainbow Springs and the spring-run stream are the outstanding water features of the park. The head pool of the springs has a diameter of about 250 feet and contains four major spring vents. The water area enclosed by the park boundary on both sides of the river approaches 15 acres. Water in the headsprings is remarkably clear and has long been an attraction to local residents and visitors. The headsprings and spring-run stream provide exceptional recreational opportunities, but must be carefully managed in light of the sensitivity of the natural and aesthetic resources. Shallow water areas along the eastern shoreline just below the headsprings are the location of unique and extremely sensitive sand-covered spring vents that could be damaged or destroyed by human intrusion. Although the sand vents should be included in interpretive programs at the park, the area will continue to be restricted from all public access as a protective measure. In all areas of the spring run stream, invasion by the exotic aquatic plant hydrilla is a constant management problem that is exacerbated by any disturbance of the native aquatic vegetation.

The Rainbow Springs and the spring-run stream are the outstanding water features of the park. The vast majority of visitors to the state park come to view, swim in or canoe the spring run stream and downstream along the Rainbow River. The significance of the aquatic resources of the state park and the Rainbow River Aquatic Preserve should be emphasized in management decisions and in the interpretive and environmental education programs of the state park. The Division's management of these outstanding resources should seek to create a setting for an ecological education and ecotourism showplace for state, national and international visitors.

Shoreline

The initial park acquisition contains about 7,500 feet of shoreline on the Rainbow River (approximately 5,200 feet of the eastern shoreline and 2,300 feet of the western shoreline of the spring-run stream). Measured in straight-line distances, the managed area extends about 0.7 miles from the headsprings on the east bank, and about 0.3 miles (1800 feet) downstream on the west bank. The shoreline is vulnerable to erosion resulting from uncontrolled access, and the design of facilities and day to day management all shoreline areas of the park has been directed toward minimizing visitor impacts away from the park's shorelines.

The southern parcel of the park contains approximately 5,900 feet (1.1 mi.) of shoreline on the east bank of the river. Facilities of the Rainbow River Campground on this shoreline include a small fishing pier, swimming and picnicking area and a boat ramp. Campers moor boats along the shoreline, resulting in some damage to submerged and

emergent vegetation and causing problems with invading hydrilla.

Natural Scenery

The natural beauty of the Rainbow River headsprings and spring-run area contribute greatly to the unit's special quality. Management of the ornamental gardens and some of the headspring areas include careful management of visual resources.

Significant Wildlife Habitat

Rainbow Springs State Park provides habitat for a variety of upland, wetland and aquatic plant and animal species. These habitats and the biota they support will continue to be featured by park interpretive programs.

The sandhill communities of the park host a variety of protected species, most notably gopher tortoises. For this reason, the sandhill areas, with the exception of 2 to 3 acres at the southern boundary of the state park are included in designated protected zones. In all cases, where future development of park facilities is required to manage the public demand for recreational uses of the park and the Rainbow River, site-specific surveys of all listed species will be conducted prior to site planning and design processes in order to avoid or minimize impacts to the protected species and habitat.

Natural Features

Rainbow Springs is registered as a National Natural Landmark. The springs and the spring-run stream are the outstanding natural features of the park. Other karstic geological features, such as sinkholes and the steep topography around the headsprings are also significant natural features in this park.

Archaeological and Historical Features

These features are thoroughly discussed in the preceding component of this plan. At this time, visitor access to the archaeological and the cemetery sites is not recommended for security purposes. After further study of the cultural resources of the park, an interpretive trail allowing controlled visitor access and interpretation of the archaeological sites should be considered. Access to the cemetery should be allowed only for family visits, research or other resource management activities. The Department of State, Division of Historical Resources (DHR) will be consulted during the planning of any future activities in these areas.

Assessment of Use

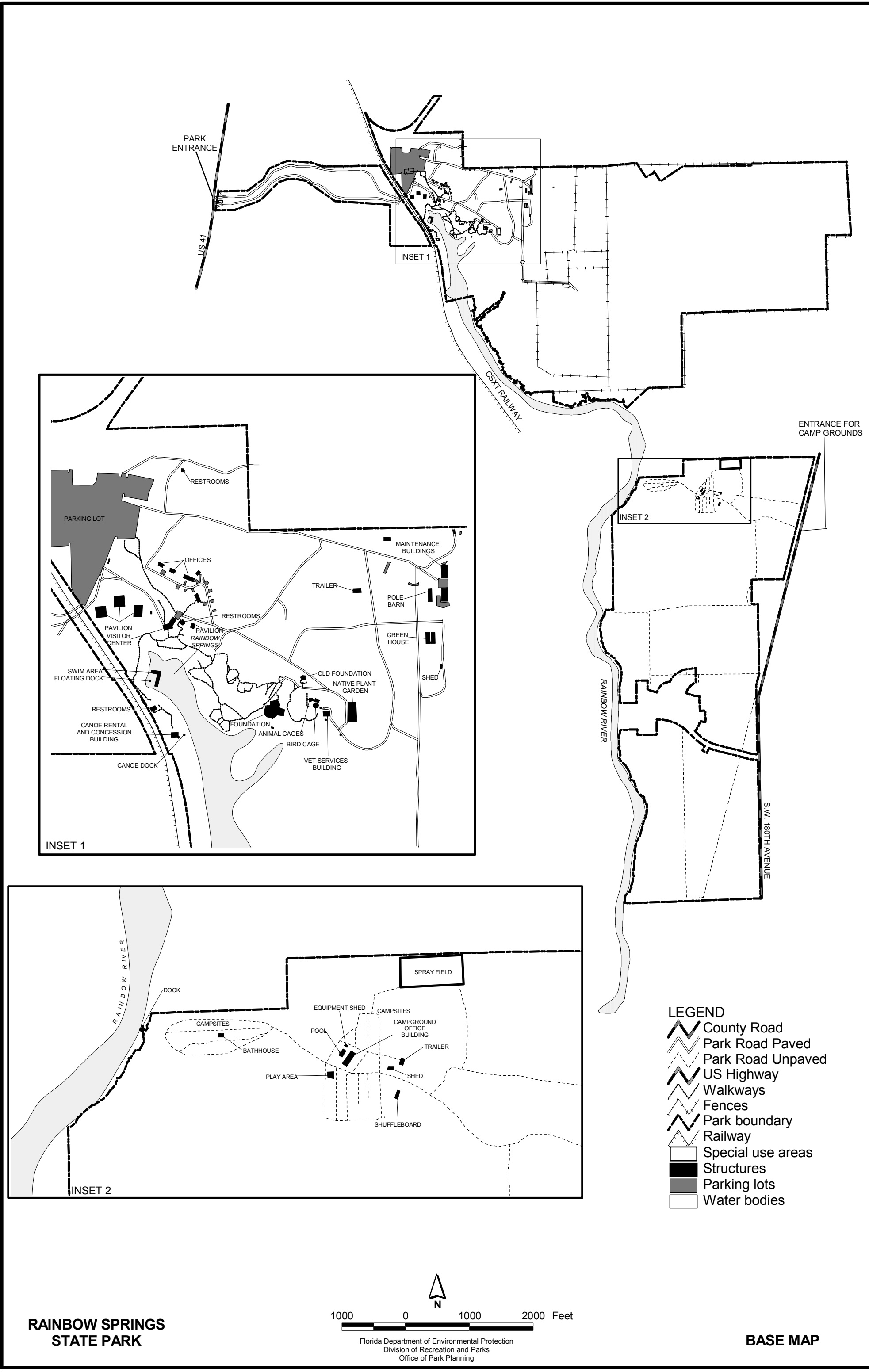
All legal boundaries, significant natural features, structures, facilities, roads, trails and easements existing in the unit are delineated on the base map (see Base Map). Specific uses made of the unit are briefly described in the following sections.

Past Uses

Historic and prehistoric activities on the property date back approximately 10,000 years. Hunting, agriculture and tourism are the past uses having the greatest impact on the natural communities through the alteration and removal of native species, introduction of exotic species, and the construction of structures, paving and water features.

Recreational Uses

Swimming, snorkeling, canoeing, picnicking, interpretive programs, special events and sightseeing are the recreational activities occurring in the headspring area of Rainbow Springs State Park. Activities outside the park on the Rainbow River include swimming, snorkeling, canoeing, boating, tubing, fishing and sightseeing. Canoeing, kayaking and the use of other human-powered boats are allowed in the reach of the spring run stream managed by the Division. Motorboating is banned within the upper spring-run stream because of impacts to the natural and cultural resources of the park and aquatic preserve, and for the safety of the park visitors.



PARK
ENTRANCE

US 41

INSET 1

CSXT RAILWAY

ENTRANCE FOR
CAMP GROUNDS

INSET 2

S.W. 180TH AVENUE

RAINBOW RIVER

PARKING LOT

RESTROOMS

OFFICES

MAINTENANCE
BUILDINGS

TRAILER

POLE BARN

GREEN HOUSE

SHED

RESTROOMS

PAVILION
VISITOR
CENTER

PAVILION
RAINBOW
SPRINGS

SWIM AREA
FLOATING DOCK

RESTROOMS

CANOE RENTAL
AND CONCESSION
BUILDING

CANOE DOCK

FOUNDATION

ANIMAL CAGES

BIRD CAGE

VET SERVICES
BUILDING

OLD FOUNDATION

NATIVE PLANT
GARDEN

INSET 1

SPRAY FIELD

DOCK

EQUIPMENT SHED

CAMPSITES

CAMPGROUND
OFFICE
BUILDING

TRAILER

SHED

PLAY AREA

BATHHOUSE

SHUFFLEBOARD

RAINBOW RIVER

INSET 2



1000 0 1000 2000 Feet

On occasion, the approved carrying capacity of the headsprings swimming area is exceeded, due to the popularity and demand for freshwater swimming recreation. The one-time capacity of the swimming area should not be allowed to exceed the approved number of users, in order to appropriately protect the health of the aquatic resources within and immediately surrounding the designated swimming area and to provide a high-quality recreational experience for visitors. Park management will develop appropriate measures to regulate the volume of use that occurs at the swimming area in the future.

The southern parcel of the state park contains the Rainbow River Campground, providing 105 campsites for tents, pop up campers and recreational vehicles. K.P.Hole Park, also operated by Marion County, is located across the river immediately downstream from the campground. The county park has a boat ramp, a concession operation, a swimming area and a canoe launch, and has traditionally been the site for tube launching on the Rainbow River.

Protected Zones

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

At Rainbow Springs State Park, all wetland communities, the sandhill communities and the historic and prehistoric cultural sites have been designated as protected zones. Exceptions have been delineated to allow the continuation of existing recreational facilities and the additional development areas outlined in this management plan.

Existing Facilities

Facilities that remained from the tourist attraction have been restored for park uses. These include: the ornamental gardens, the visitor center/concession and restroom buildings, a concrete block building on the spring-run stream that now houses the park's canoe livery, park offices, and environmental education building, plant nursery and maintenance facilities. Exhibits, a gift shop, offices and a snack bar are currently housed in the visitor center/concession building. A large grassed area north of the headsprings now provides an excellent location for picnics and sunning.

New park development projects have created the swimming area in the headsprings, the canoe launch, a group pavilion near the visitor center, picnic shelters above the headsprings and a restroom adjacent to the swimming and picnic areas. The park is now connected to a central sewer system managed by Rainbow Springs Ltd., the manager of the adjacent residential subdivision. Improvements by Marion County at the Rainbow River Campground created a small universally accessible picnic area near the river shoreline.

A listing of the existing facilities within the park follows.

Recreation Facilities

Headsprings Area

Swimming area and deck
Canoe launch
Canoe rental building
Visitor center/concession building
Environmental education building
Group pavilion
Picnic pavilions (4)
Ornamental gardens

Waterfalls (4)

Downriver Area

Standard campsites (105)
Swimming/picnic area
Fishing pier
Swimming pool
Volleyball and shuffleboard courts

Support Facilities

Headsprings Area

Office buildings (4)
Trailer residences (4)
Storage sheds (4)
Greenhouses (2)
Walkways
Boardwalks (2)
Wood bridges (4)
Parking (400 spaces)
Shop buildings (5)
Restrooms (3)
Pump houses (3)
Sewage lift station

Downriver Area

Campground office, concession and recreation hall
Camping area bathhouse
Residence trailers (2)
Pool pump house
Sewage treatment plant, lift stations and spray field
Equipment shelter

CONCEPTUAL LAND USE PLAN

The following narrative represents the current conceptual land use proposal for this park. As new information is provided regarding the environment of the park, cultural resources, recreational use, and as new land is acquired, the conceptual land use plan may be amended to address the new conditions (see Conceptual Land Use Plan). A detailed development plan for the park and a site plan for specific facilities will be developed based on this conceptual land use plan, as funding becomes available.

During the development of the unit management plan, the Division assesses potential impacts of proposed uses on the resources of the property. Uses that could result in unacceptable impacts are not included in the conceptual land use plan. Potential impacts are more thoroughly identified and assessed through the site planning process once funding is available for the development project. At that stage, design elements, such as sewage disposal and stormwater management, and design constraints, such as designated species or cultural site locations, are more thoroughly investigated. Advanced wastewater treatment or best available technology systems are applied for on-site sewage disposal. Stormwater management systems are designed to minimize impervious surfaces to the greatest extent feasible, and all facilities are designed and constructed using best management practices to avoid impacts and to mitigate those that cannot be avoided. Federal, state and local permit and regulatory requirements are met by the final design of the projects. 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, the park staff monitors conditions to ensure that impacts remain within acceptable levels.

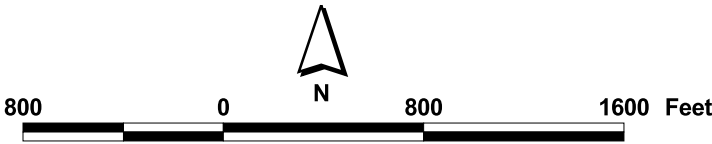
Potential Uses and Proposed Facilities

The existing recreation activities at Rainbow Springs State Park should be continued. The garden restoration plan, now under development, should be completed and implemented. A universal accessibility plan and an interpretive plan should be developed for the park. Unnecessary structures, animal cages, fencing, roads, other paving should be removed, and the antecedent natural communities or ornamental gardens should be restored at each removal site.

Since 1993, the Marion County Parks and Recreation Department has operated the Rainbow River Campground under a sublease agreement with the Division of Recreation and Parks. The Marion County Commission has agreed to terminate this arrangement, returning management of the area to the Division. After the County releases the property, the Division proposes to completely redesign the upland camping area and convert the area along the river into a day use tube launching and picnicking facility. Restoration of the hydric hammock community where campsites are now located should be included in

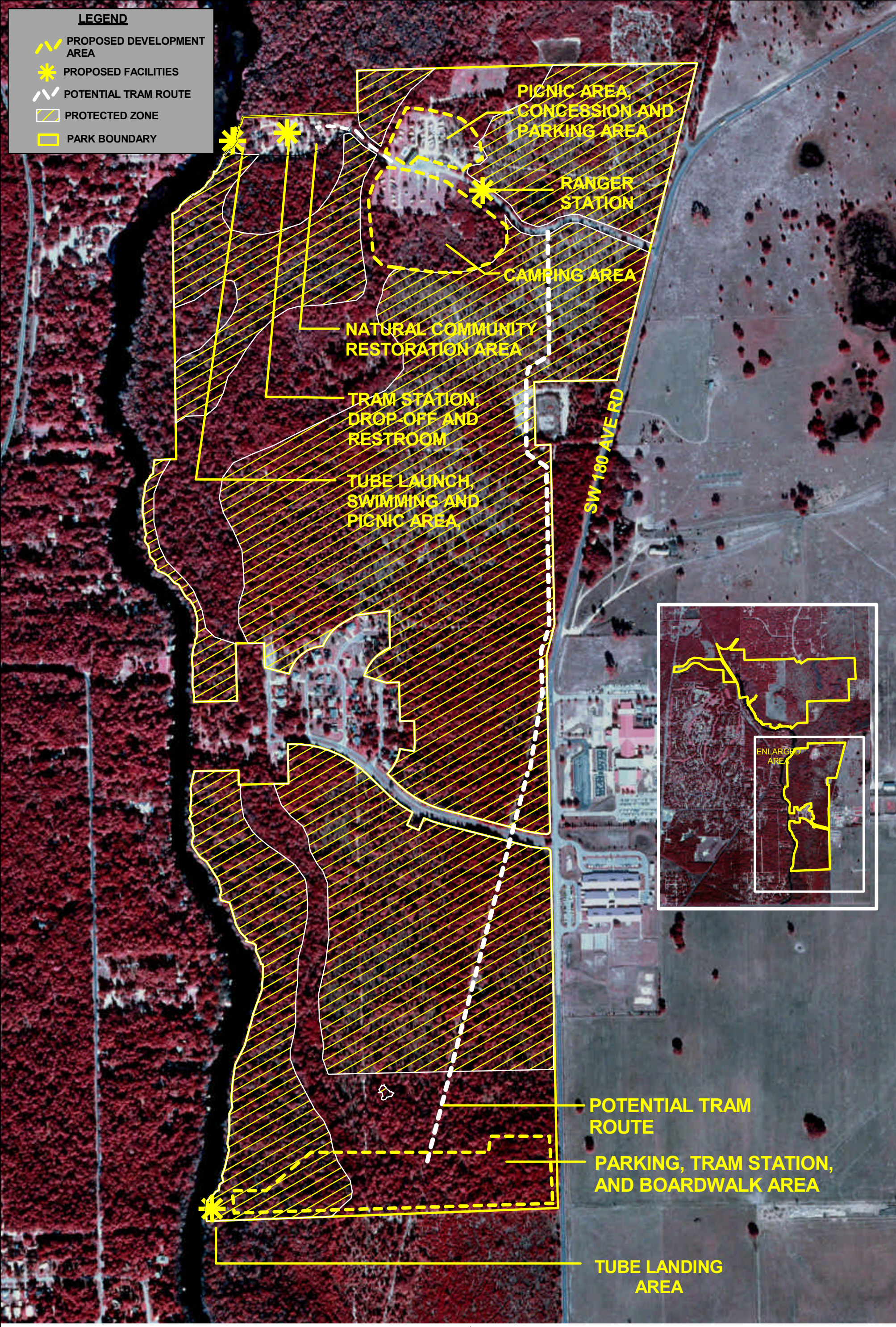


RAINBOW SPRINGS STATE PARK
ENLARGEMENT 1 (SHEET 1 OF 2)
CONCEPTUAL LAND USE PLAN



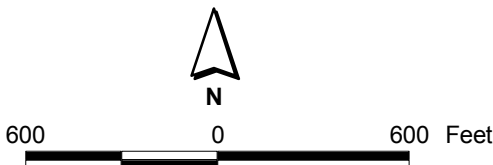
LEGEND

- PROPOSED FACILITIES
- PROTECTED ZONE
- PARK BOUNDARY



LEGEND

- PROPOSED DEVELOPMENT AREA
- PROPOSED FACILITIES
- POTENTIAL TRAM ROUTE
- PROTECTED ZONE
- PARK BOUNDARY



the redevelopment program.

Because of the termination of a private property lease to Marion County for tube landing activities at the County Road 484 bridge, the Division has agreed to provide tube-landing facilities on the southern parcel of the state park. Facilities for ingress to the river for tubing should be developed at the shoreline adjacent to the Rainbow River Campground, and egress facilities should be constructed near the southern state park boundary. This arrangement will allow the Division to provide tubing recreation through a system of parking areas and a tram operation located on the east side of the river.

At this time, a recommended visitor carrying capacity for tubing recreation originating at the state park cannot be determined. Since the length of the tube run will be shortened from the current 5 mile distance from K.P. Hole Park to the County Road 484 bridge to approximately 1.5 miles from the state or county park to the proposed tube landing at the state park, some decrease in the number of tubes allowed to enter the river should be made in order to protect that stretch of the river from unacceptable impacts. Establishing a carrying capacity will require extensive coordination with Marion County, and will be determined, in part, by the County's plans for the future management of K.P. Hole Park. Once agreements have been reached on the future management of tubing recreation at the County park, a determination of the number of tubers entering the river from the state park will be made by Division staff in collaboration with staff of the Rainbow River Aquatic Preserve and Marion County.

A comprehensive baseline data collection and monitoring program will be implemented on the affected section of the Rainbow River, similar to the Division's ongoing carrying capacity study at Ichetucknee Springs State Park. After the new facilities are built, that research and monitoring program will be used to assess the success of the recreational and resource management activities, and will identify impacts from the new recreational use patterns on the river as they occur. The study will alert Division and Aquatic Preserve managers to unacceptable impacts at an early stage, and adjustments to the recreational carrying capacity will be made, as needed, to provide an appropriate level of protection to the river's resources while providing convenient and high quality public recreational uses.

Headsprings area (Northern Parcel). A ranger station should be constructed near the main park entrance to provide a visitor contact point and administrative space for park operations. The existing parking capacity should be reduced through the installation of removable barricades from 400 to approximately 200 spaces in order to limit visitation to the approved carrying capacity of the headsprings area of the park during typical peak use days. This measure is necessary to insure appropriate protection from overuse for the sensitive spring and spring-run stream natural communities and to maintain the high-quality recreational experiences expected in the state park. The extra parking areas will be retained, however, to provide additional parking capacity for special events, and to accommodate potential future expansion of daily parking capacity at the headsprings, in the future.

A hiking trail approximately three miles in length is proposed through the improved pastures and sandhills in the northern parcel of the park. The trail will allow access for hiking, nature study and interpretation of the natural communities, natural community restoration and other resource management efforts in that sector of the park. The history of phosphate mining in the Dunnellon area should also be interpreted at the relict phosphate mines located in the pasture area. Acquisition of additional land southward along the east side of the river may allow a trail connecting the headsprings and the camping area to be constructed, in the future. Primitive campsites should be considered

for overnight hiking opportunities, when that connection becomes a reality.

Operational changes are recommended to allow access that is more convenient to the river for visitors arriving with canoes or kayaks. These may include a drop-off area and non-vehicular gate at the park drive above the headsprings, and possible provision of a few trolley carts to facilitate moving canoes or kayaks the distance from the gate to the canoe launch.

Southern Parcel

Camping area, picnic area and tube launch. The Division plans to renovate the Rainbow River Campground to bring it up to state park standards and to remove campsites from the hydric hammock community adjacent to the river. The upland camping area should be reconfigured to provide up to 60 campsites adjacent to the existing campground office/concession building. Division staff will make every effort to maximize the number of campsites created in the redevelopment design, while assuring appropriate protection of the sandhill community.

A main day use parking area for 40 to 50 vehicles is proposed to be located near the office/ concession building. Two or three large picnic shelters and scattered tables and grills should be provided in this area to support the new day use recreation program.

A tube launch structure is proposed at the river shoreline. A few small shelters and scattered picnic tables should be located adjacent to the shoreline to accommodate tubers and a limited amount of swimming and fishing recreation at the existing fishing pier and swimming area. Motorboat access to this shoreline and motorboat launching at the campground boat launch should be discontinued to allow for primary use of that area as a tube launch and canoe/kayak launch and landing facility.

The existing camping area bathhouse should be renovated to support the tube and canoe access and limited day use activities at the river. One access road terminating near the restroom in a drop-off loop and tram stop and providing a few handicapped parking spaces should provide vehicular and pedestrian access from the upland area. All other campground roads and the 48 existing campsites should be removed. A program of natural community restoration should be implemented as part of the development project to repair the damage to the hydric hammock community caused by the past use of this area use for camping recreation.

Tube landing. A tube landing is proposed to be built on the river near the southern boundary of the park. A parking area for up to 100 vehicles and a restroom should be located close to SW 180th Avenue Road. A boardwalk and an on-grade path will connect the tube landing to a tram station and weather shelter located as close as possible to the river, given environmental constraints. A paved tram road will connect the tram station to the parking area and continue northward along an abandoned railbed and along the park boundary, as shown in the conceptual land use plan, connecting with the upper park entrance road, thence to the tube launch facility described above. This is the preferred route for an in-park tram system, unless environmental or other factors show this route is not feasible. If alternate routing for the tram road is necessary, an alignment along the eastern park boundary or use of the public road will be considered.

As discussed above, entrance and exit facilities for canoes and kayaks should be included in the Division's redesign of the shoreline at the Rainbow River Campground and by operational changes at the headsprings. Staff does not recommend that the proposed tube landing at the southern end of the state park should be designated for egress from the river for canoes and kayaks. This is due to the long distance from the take out to the proposed parking area, the environmental sensitivity of the adjacent habitat and resultant

permitting difficulties anticipated in design and construction of the take out structure on the river shoreline and boardwalk through the hydric hammock.

The Division will initiate collaborative efforts with staff of the Rainbow River Aquatic Preserve, the Marion County Recreation and Parks Department and the Florida Fish and Wildlife Commission to evaluate all potential ingress and egress facilities for canoes and kayaks on the Rainbow River. A combined effort for the purpose of planning and funding improvements will be initiated to make these facilities more amenable to paddling recreation, in the future.

The Division will seek a partnership with a private business to provide tram services between the tube landing and the main day use parking area and tube launch. Additional visitor services, such as tube rentals, canoe rentals and park-related retail sales may also be provided by the private sector at Rainbow Springs State Park.

Facilities Development

Preliminary cost estimates for the following list of proposed facilities are provided in Addendum 9. These cost estimates are based on the most cost-effective construction standards available at this time. The preliminary estimates are provided to assist the Division in budgeting future park improvements, and may be revised as more information is collected through the development planning and design processes.

Headsprings Area (Northern Parcel)

Hiking trail (3 miles)
Ranger station (small)

Downriver Area (Southern Parcel)

Camping/Tube Launch Area

Small picnic shelters (2)
Large picnic shelters (3)
Tube launch
Boardwalk (100 feet)
Restroom renovation
Tram waiting shelter
Road and drop-off (700 ft.)
Natural community restoration (4.7 ac.)

Downriver Area (Southern Parcel)

Standard 30 site camping areas
w/bathhouses (2)
Ranger station (large)
Parking area (50 cars)

Tube Landing Area

Tube landing
Boardwalk (400 ft.)
Path (200 ft.)
Tram road (1.25 mi.)
Tram waiting shelter
Restroom
Parking area (100 cars)

Existing Use and Optimum Carrying Capacity

Carrying capacity is an estimate of the number of users a recreation resource or facility can accommodate and still provide a high quality recreational experience and preserve the natural values of the site. The carrying capacity of a unit is determined by identifying the land and water requirements for each recreation activity at the unit, and then applying these requirements to the unit's land and water base. Next, guidelines are applied which estimate the physical capacity of the unit's natural communities to withstand recreational uses without significant degradation. This analysis identifies a range within which the carrying capacity most appropriate to the specific activity, the activity site, and the unit's classification is selected (see Table 1).

The optimum carrying capacity for this park is a preliminary estimate of the number of users the unit could accommodate after the current conceptual development program has been implemented. When developed, the proposed new facilities would approximately increase the unit's carrying capacity as shown in Table 1.

Table 1--Existing Use And Optimum Carrying Capacity

Activity/Facility	Existing Capacity		Proposed Additional Capacity		Estimated Optimum Capacity	
	One Time	Daily	One Time	Daily	One Time	Daily
Swimming/snorkeling	200	400			200	400
Tubing*						
Picnicking	240	480	40	80	280	560
Canoeing/kayaking	30	60	30	60	60	120
Guided tours	5	15			5	15
Hiking			25	100	25	100
Camping	420	420	(180)	(180)	240	240
Visitor center/ Ornamental gardens	80	320			80	320
Environmental center	20	80			20	80
TOTAL (excluding tubing)	995	1,775	(85)	60	910	1,835

* As discussed under Potential Uses and Proposed Facilities a recommended carrying capacity for tubing recreation cannot be determined at this time.

Optimum Boundary

As additional needs are identified through park use, development, research, and as adjacent land uses change on private properties, modification of the unit's optimum boundary may occur for the enhancement of natural and cultural resources, recreational values, and management efficiency. Identification of lands on the optimum boundary map is solely for planning purposes and not for regulatory purposes. A property's identification on the optimum boundary map is not meant to be used by any party or other government body to reduce or restrict the lawful right of private landowners. Identification on the map does not empower or require any government entity to impose additional or more restrictive environmental land use or zoning regulations. Identification is not meant to be used as the basis for permit denial or the imposition of permit conditions.

The optimum boundary map reflects lands identified as desirable for direct management by the Division as part of Rainbow Springs State Park. These parcels may include public as well as privately owned lands that improve the continuity of existing park lands, provide additional natural and cultural resource protection, and/or allow for future expansion of recreational activities. At this time, no lands are considered surplus to the needs of the park.

Three major parcels of land are identified for addition to the boundaries of the Rainbow Springs property. These include approximately 374 acres northwest, approximately 1,064 acres northeast, and approximately 375 acres south of the boundaries of the park. The first parcel would help protect the headsprings recharge area and could provide a suitable site for future park development. The second parcel contains sandhill community that would improve the buffer and the habitat protection potential of the park, connect the current northern and southern parcels of the park, and expand recreational trail opportunities. The third parcel would bring remaining out parcels of a large portion of

undeveloped shoreline along the eastern side of the river into state ownership, and provide a connection to property that is currently managed by the DEP's Office of Greenways and Trails. These acquisitions will enhance the resource base and the recreational potentials of the park and improve operational efficiency.

Addendum 1--Acquisition History and Advisory Group Report

Rainbow Springs State Park Acquisition History

Purpose and Sequence of Acquisition

The Board of Trustees of the Internal Improvement Trust Fund of the State of Florida (Trustees) acquired Rainbow Springs State Park to protect, develop, operate, and maintain the property for public outdoor recreation, park, conservation, historic and related purposes.

The Trustees purchased the property constituting Rainbow Springs State Park on October 24, 1990. The purchase was funded under the CARL program. Since this initial purchase, the Trustees have acquired several individual parcels and added them to the Park. Currently the park contains approximately 1,084.58 acres; this acreage is based on the Division of Recreation and Parks Jurisdiction Report, July 2002.

On March 19, 1991, the Trustees leased the property to the Division of Recreation and Parks (DRP) under Lease No. 3900. The lease is for a period of fifty (50) years and will expire on March 19, 2041.

According to the lease, Rainbow Springs State Park will be managed for conservation and protection of natural, historic and cultural resources and provide resource-based public outdoor recreation which is compatible with the conservation and protection of the property.

Title Interest

The Trustees hold fee simple title to Rainbow Springs State Park.

Special Conditions on Use

Rainbow Springs State Park is designated single-use to provide resource-based public outdoor recreation and other related uses. Uses such as water resource development projects, water supply projects, storm-water management projects, and 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 and will be discouraged.

Outstanding Reservations

Following is a listing of outstanding rights, reservations, and encumbrances related to Rainbow Springs State Park.

Instrument:	Warranty Deed
Instrument Holder:	Rainbow Springs Limited
Beginning Date:	October 24, 1990
Ending Date:	There is no specific ending date given.
Outstanding rights, uses, etc.	The warranty deed is subject to a number of easements.

**Rainbow Springs State Park
Advisory Group List**

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9065 South West 190th Avenue Road
Dunnellon, FL 34432

Mr. Art Ross and Ms. Edda Ross
18258 Southwest 99th Lane
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Mr. Randy Harris
Marion County Board of County
Commissioners
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Ocala, FL 34471

Steve Stackhouse, Acting Manager
Rainbow Springs State Park
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Dunnellon, FL 34432

Mr. Don Coyner
Florida Fish and Wildlife Conservation
Commission
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**Rainbow Springs State Park
Advisory Group Meeting Staff Report**

The advisory group meeting for Rainbow Springs State Park was held at the park on May 23, 2002. Don Winkler (Marion County Parks and Recreation) was present on behalf of Commissioner Randy Harris, Sherri Goldsmith represented Steve Goldsmith (Dragonfly Watersports), Adam Munson attended on behalf of Martin Kelly (SWFWMD), and Jackie Leonard (Community Development Director, City of Dunnellon) attended on behalf of Mayor John Taylor. All other Advisory Group members attended. Steve Appel (Rainbow River Conservation), Art Ross (Sateke Village), and Marylou Klein (Friends of Rainbow Springs) also attended the meeting. Division staff attending included Bobby Wilson, Steve Stackhouse, Craig Parenteau, Dan Pearson, Susie Hetrick, Lew Scruggs and K.C. Bloom.

Summary Of Advisory Group Comments

Ms. Leonard commented that the city should continue to work with the Division. She was concerned about economic impacts on the city and urged the Division to consider that when looking at the recreational opportunities at the park. She also stated that tuber complaints come to the city for resolution and that the city is working on a redevelopment plan, some of which will be connected to the operation of RSSP.

Mr. Coyner had no comment.

Ms. Driggers had no comment.

Mr. Cunningham stated that the Ichetucknee example of tuber management is enlightening. He encouraged the development of a carrying capacity on the river but stated that it would take much cooperation to make one work. He was concerned about boaters and divers overcrowding the river.

Mr. Nelson encouraged the Division to leave the parking lot as is. He recommended the closure of swimming when the swim area has reached capacity, and that, when the swim area is closed, people should be referred to KP Hole. He stated that the reduction of campsites will affect the city economically and that it is his hope that 90 sites could be developed. He also would like the Division to conduct studies before and after the southern takeout is developed and that the Division should develop some interpretive exhibits which demonstrate the impact of swimming on the headsprings to help the public understand the need for a carrying capacity.

Staff explained that the problem with the redevelopment of the campground is that it occurs in an area where sandhill exists. Staff stated that sandhill is becoming an increasingly endangered environment. Consequently, the Division avoids development that significantly alters this natural community.

Ms. Brown stated that the reduction of camping sites will create an image of the Division "taking away" recreational opportunities. She stressed the need for the Division to educate the local community to avoid a public relations backlash. She encouraged the state to keep the parking lots since they are filled during special events and future new activities may increase the demand for parking. She also stated that the current staff is stretched and recommended that with the addition of more recreational activities and responsibilities that more staff be added to the park so that the quality of visitor services and resource management does not decline. She encouraged the Division to do more interpretive programming at the park and to develop new exhibits such as ones about the history of the area (city of Juliette) and the World War II era.

Mr. Samek stated that the development and enforcement of a tuber/swimming carrying capacity is needed and that areas should be closed when the capacity is reached. He believes that photopoint studies would have shown that the impact of the swimming area is unacceptable and that swimming should be closed in the headsprings and possibly moved to the camping area. He stated that there is a need for an advisory group for the comprehensive management of the river. He also

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believes that the Griffis acquisition should be pursued. He expressed that, because the number of commercial dive groups entering the river is increasing, a carrying capacity and permitting system should be developed for that activity. He stated that increasing the number of staff at the park is critical.

Staff explained that the Division made a policy decision when the park was initially developed that one of the main public activities would be swimming. They stated that swimming in a flowing portion of the river such as by the campground is not necessarily better than having it at the headsprings due to safety concerns and other impacts to the river shoreline that the activity would create. Staff also explained that carrying capacity at the swimming area will be better enforced in the future to minimize impacts to the designated area.

Mr. Gaitanis stated that he is concerned about the recreation opportunities on the river being reduced. He suggested that the swimming area impacts are balanced by the reduction of impacts outside the designated swim area and that this sort of balance occurs when there are shifts in other activities or changes in access. He stated concern that the plan is going to concentrate activities to a smaller portion of the river and that any current problems will be exacerbated. He is pleased that the Division is looking to increase day use at the shoreline of the camping area. He suggested that the Division consider camping on the north side of the road to the campground while using the Dunnellon High School parking lot for overflow parking. He suggested that sandhill elsewhere in the park should be restored to allow camping area redevelopment without reducing the number of sites.

Mr. Thomason commended the Division on a thorough plan. He recommended including a staffing request as the workload on a stretched staff will be increased by the proposed new development and management changes. He suggested that more research should be done on the history of the park and vicinity, and more interpretive programming should be developed especially on the town of Juliette and the phosphate boom. He stated that parking should not be removed but that the Division should look at the redevelopment of the entrance roads to reduce impervious surface. He also recommended that there should be multiple tube access points like the Ichetucknee River.

Mr. Sleszynski stated that the plan tackles many difficult issues. He commented that a major difference between the Ichetucknee and the Rainbow rivers is presence of hydrilla and that hydrologic systems are difficult to restore. He said that the Division should be conscious of the problems occurring throughout the river in order to effectively manage it.

Mr. Barton commented the plan does not address educating the public about the value of prescribed burning in managing natural communities. He recommended notifying the public in the communities surrounding the park before a prescribed burn and working to educate them on the benefits of fire. He stated that timbering to interdict pine beetle outbreaks needs to be addressed in the plan. He suggested that natural community condition statements need more definition. He noted that the plan has no schedule for restoration work.

Ms. Goldsmith voiced her concern about decreases in recreational opportunities on the river. She stated that paddlers will be displaced if the tube landing is a dock and that they would prefer a ramped take-out. She also stated that the plan should provide for a canoe and kayak put-in at the headsprings and a take-out downstream. She recommended that staffing at the park be increased and that the campground should not be decreased by 45 sites. She agreed that parking should not be eliminated. She requested that she be involved in the development of the tuber and paddler carrying capacities.

Staff responded that the Division would address canoe/kayak access along the Rainbow River in the plan, and noted that the state park may not be capable of providing the level of service

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requested, but that County or other state facilities might do so. Staff pointed out that the distance from the proposed tube landing to the potential parking area is approximately ½ mile, and that accommodating canoes and kayaks at that site would require a larger boardwalk through the wetland community. Therefore, a greater impact on the protected resources of the park might result if the facility is designated for the second purpose, rather than for a tube exit only.

Mr. Munson had no comment.

Mr. Winkler stated that the Division should not eliminate campsites. He commented that it would be critical to increase staffing at the park and recommended that paddlers should be accommodated at the take-out. He also recommended that visitors should be informed of operational changes in advance, to avoid public relations impacts.

Summary Of Public Comments

Mr. Appel stated that swimming at the park has benefited the whole river. He disagreed with the proposed parking lot reduction since a rail connection between the park and Dunnellon could occur in the future and stimulate increased visitation. He commented that the tuber take-out should be a ramp. He agreed that staffing should be addressed in the plan. He agreed that historic interpretive programs should be developed at the park. He stated concern about the economic impact that the state's tubing program will have on K.P. Hole. Mr. Appel recommended that emergency exit points should be located on the river.

Mr. Ross stated that tubers cause more damage than kayaks and canoes and that boats will injure tubers. He recommended the Division do an in-depth study of the environmental parameters of the tubing take-out before implementation. He also recommended that signage be put up on highway 41 when the swimming area is closed.

Staff Recommendation

A number of excellent suggestions were received from the Advisory Group and at the public workshop the previous evening that will improve the management plan for Rainbow Springs State Park. Division staff responsible for the various components of the management plan will make revisions as needed. A specific addition to the Resource Management Component will be mention of the potential implementation of emergency pine harvesting operations to allow a quick response by Division staff to future pine beetle outbreaks at the state park. A new first goal and objective statement will be added to the Park Goals and Objectives section of the Introduction. The statements will outline a new goal recommending the addition of an appropriate number of new staff positions concurrently with the opening of new facilities for tubing recreation and the assumption of operation of the camping area by the Division of Recreation and Parks.

No major revisions to the proposed land use concept for the state park will result from the input received during the planning review meetings. Division staff agrees with Advisory Group and public recommendations that removal of parking areas from the park should not be planned at this time. The plan will be revised to indicate that parking areas not needed in the day-to-day operation of the park will be cordoned off to aid staff in management of the approved carrying capacity of the headsprings area. Existing paved parking areas will remain as overflow parking for use during special events, and to accommodate future growth of activities and allowable visitor capacity at the upper parcel of the state park, in the future.

As explained at the Advisory Group meeting, the nature of the surrounding natural community in the area recommended for camping area development will likely limit the size of the camping area to no more than 60 campsites. Although the idea that the park could operate with shared parking on

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off-site facilities located at the Dunnellon High School is interesting, staff does not believe that it would be a viable option for operating what will be a very busy state park facility. A reduction in the number of campsites available at the park is not a preferred option for the Division or for businesses in the Dunnellon area. However, it appears that is what will be necessary if appropriate sensitivity to the environment of the park is to be maintained and if the state park is to manage tubing recreation on the river.

Regarding the need for facilities on the Rainbow River that safely accommodate the demand for paddling recreation, the management plan will mention operational changes that will make the upper spring run stream more conveniently accessible through the park entrance. This may include a drop-off area and non-vehicular gate at the park drive above the headsprings, and possible provision of a few trolley carts to facilitate moving canoes or kayaks the distance from the gate to the park canoe launch area. Entrance and exit facilities for canoes and kayaks should be included in the Division's redesign of the shoreline at the Rainbow River Campground. Staff does not recommend that the proposed tube landing at southern end of the state park should be designated for egress from the river for canoes and kayaks. This recommendation is due to the long distance from the take out to the proposed parking area, the environmental sensitivity of the adjacent habitat and permitting difficulties anticipated in design and construction of the take out structure and a connecting boardwalk through the hydric hammock.

The management plan will recommend collaborative efforts by the Division, the Marion County Recreation and Parks Department and the Florida Fish and Wildlife Commission to evaluate all potential ingress and egress facilities on the Rainbow River. A combined effort for planning and funding improvements will be initiated to make these facilities more amenable to paddling recreation, in the future.

With these changes, staff recommends approval of the draft management plan.

Addendum 2--References Cited

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Addendum 3--Soil Descriptions

Rainbow Springs State Park Soil Descriptions

(AdB) Adamsville sand, 0 to 5 percent slopes - This is a nearly level to gently sloping, somewhat poorly drained soil that occurs as small and large areas in the flatwoods and along the lower slopes of the sandy uplands. The water table rises to within 10 to 20 inches of the surface for less than 2 weeks during wet periods, but remains at 20 to 40 inches for cumulative periods of 2 to 6 months during most years. It recedes to a depth of more than 40 inches during dry periods.

Included with this soil in mapping are a few areas of a similar soil that is fine sand, is extremely acid or has a slope of 5 to 8 percent. Also included are small areas of Candler, Pomana, Pompano, and Tavares soils. Included soils make up about 15 percent of any one mapped area.

(Ae) Anclote sand - This is a very poorly drained soil that occurs as small areas on low flats, in depressions, and along poorly defined drainageways in the flatwoods. It has the profile described as representative of the series. Slopes are 0 to 2 percent. The water table is within a depth of 10 inches for more than 6 months, and in depressions the surface is covered with about 4 to 20 inches of water for 6 months or more during most years. Areas along the Oklawaha River are subject to flooding.

Included with this soil in mapping are small areas of Holopaw, Okeechobee, Placid, Bluff, and Tomoka soils; small areas where the surface layer is 8 to 16 inches thick and is more than 20 percent organic matter; and a few small areas of a similar soil that has a sandy clay loam subsoil at a depth of 50 to 80 inches. Included soils make up about 20 percent of any one mapped area.

(ApB) Apopka sand, 0 to 5 percent slopes - This is a nearly level to gently sloping, well drained soil that generally occurs as small areas in the uplands. It has the profile described as representative of the series. The water table is at a depth of more than 72 inches.

In representative profile the surface layer is dark gray sand about 6 inches thick. The subsurface layer is about 49 inches of sand, many grains of which are uncoated. The upper 22 inches is light yellowish brown, and the lower 27 inches is yellow. The subsoil is about 26 inches thick. The upper 5 inches is yellowish red sandy clay loam having a few lenses of sandy loam, the next 9 inches is yellowish red sandy clay loam, mottled yellowish red and red light sandy clay loam. The underlying material to a depth of 88 inches is mottled strong brown, yellowish red, yellowish brown, and white, partly weathered sandy loam and sandy clay loam.

Included with this soil in mapping are small areas of similar soils, where the sandy surface and subsurface layer combined are less than 40 inches thick, the slope is 5 to 8 percent, or the surface layer is fine sand and small areas of Candler, Jumper, and Tavares soils. Also included, in the western part of the county, are a few areas where 35 to 60 inches of strongly acid to slightly acid fine sand overlies a slightly acid to neutral subsoil and calcareous limestone. Included soils make up about 15 percent of any one mapped area.

(ArB) Arrendondo sand, 0 to 5 percent slopes - This is a nearly level to gently sloping, well drained soil that occurs as both small and large areas in the upland. This soil occurs as broad rolling areas of the upland. It has the profile described as representative of the series. The water table is at a depth of more than 72 inches.

In a representative profile the surface layer is dark grayish brown sand about 7 inches thick. The subsurface layer is mixed yellowish brown and dark yellowish brown sand about 11 inches thick. The subsoil extends to a depth of 90 inches or more. In sequence downward, it is 28 inches of yellowish brown sand mottled with strong brown, 19 inches of strong brown sand having a few white mottles, 5 inches of strong brown loamy sand, and 20 inches of strong brown fine sandy loam.

Included with this soil in mapping are small areas of Candler, Kendrick, Hague, Gainesville, and Sparr soils; a few small areas where the surface layer is fine sand, loamy sand, and loamy fine sand; a few areas of a similar soil, where the slope is 5 to 8 percent; and, in the south-central part of

Rainbow Springs State Park Soil Descriptions

the county, spots where 35 to 65 inches of strongly acid to medium acid fine sand overlies limestone. Also included are rock outcrop sinkholes, and a few small depressions where a very dark gray or black surface layer 8 to 24 inches thick overlies ray sand. Included soils make up about 20 percent of any one mapped area.

(ArC) Arrendondo sand, 5 to 8 percent slopes - This is a sloping, well drained soil that occurs as small areas on sharp-breaking slopes and on long slopes of the upland. In places a few rills have formed as a result of erosion. The water table is at a depth of more than 72 inches.

Included with this soil in mapping are small areas of Candler, Kendrick, and Hague soils; a few small depressions where a black surface layer 8 to 24 inches thick overlies yellowish brown to grayish brown sandy material; and a few areas, of a similar soil, where the slope is 0 to 5 or 8 to 12 percent. Also included are a few small areas where the surface layer is fine sand, loamy sand, and loamy fine sand. Rock outcrops and sinkholes occur in places. Included soils make up about 15 percent of any one mapped area.

(CaB) Candler sand, 0 to 5 percent slopes - This is a nearly level to gently sloping, excessively drained sandy soil that has thin lamellae of loamy sand within a depth of 60 to 80 inches. It occurs as small and large areas on sandy ridges in the uplands. It has the profile described as representative of the series. The water table is at a depth of more than 72 inches.

In a representative profile the surface layer is dark gray sand about 5 inches thick. It is underlain by 62 inches of yellow sand. The next 42 inches is very pale brown sand that is mottled with white and has thin lamellae of yellowish brown loamy sand. Below this is 6 inches of brownish yellow sandy loam.

Included with this soil in mapping are small areas of Arredondo, Apopka, Astatula, Adamsville, and Tavares soils. Also included are small areas of a similar soil having no thin lamellae of loamy sand and a few areas of a similar soil having slope of 5 to 12 percent. Included soils make up about 15 percent of any one mapped area.

(CaC) Candler sand, 5 to 12 percent slopes - This is a sloping to strongly sloping, excessively drained sandy soil that has thin lamellae of loamy sand within a depth of 60 to 80 inches. It occurs as small and large areas on sandy ridges in the uplands. The hazard of erosion is slight during periods of high rainfall. The water table is at a depth of more than 72 inches.

Included with this soil in mapping are small areas of Apopka, Arredondo, Tavares, Adamsville, and Pompano soils. Also included are spots, of a similar soil, where the slope is 0 to 5 percent and small areas of a similar soil having no thin lamellae of loamy sand. Included soils make up about 20 percent of an on e mapped area.

(CwA) Candler clay, overwash, 0 to 2 percent slopes - This is a nearly level, well drained soil that generally occurs as small areas along the lower parts of slopes and in slight depressions in the uplands of the southwestern part of the survey area. It has a profile similar to the one described as Candler Sand, but the upper 10 to 20 inches is mixed clayey mine wash from the mining of phosphate. The water table is at a depth of more than 72 inches.

Available water capacity is high in the clayey material, very low in the sandy material to a depth of about 78 inches, and low below. Permeability is slow in the clayey material, very rapid in the sandy material to a depth of about 78 inches, and rapid below. Natural fertility is medium in the clayey material and low in the sandy material. Organic-matter content is low.

Included with this soil in mapping are about 30 acres, of a similar soil, where the mine wash is 20 to 36 inches deep over the sandy soil, small areas where the mine wash is only 3 to 10 inches deep, and small areas where the water table is within a depth of 72 inches. Also included is about 10 acres where 20 to 30 inches of mine wash overlies a poorly drained sandy soil that has a loamy subsoil. Included soils make up about 20 percent of any one mapped area.

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(GaB) Gainesville loamy sand, 0 to 5 percent slopes - This is a nearly level to gently sloping, well drained soil that occurs as small and large areas in the upland. This soil occurs in broad, undulating areas of the upland. It has the profile described as representative of the series. The water table is at a depth of more than 72 inches.

In a representative profile the surface layer is loamy sand about 10 inches thick. The upper 5 inches is very dark grayish brown, and the lower 5 inches is dark brown. The underlying material to a depth of more than 90 inches is loamy sand. The upper 13 inches is brown, and the lower 67 inches is strong brown.

Included with this soil in mapping are small areas, of a similar soil, where the texture is fine sand to a depth of more than 80 inches and a few spots, also of a similar soil, here the slope is 5 to 8 percent. Also included are small areas of Arredondo, Hague, Kendrick, and Zuber soils. Included soils make up less than 15 percent of any one mapped area.

(GaC) Gainesville loamy sand, 5 to 8 percent slopes - This is a sloping, well drained soil that generally occurs as small areas on sharp-breaking slopes in the upland. Surface runoff is slow, and the erosion hazard is slight. The water table is at a depth of more than 72 inches.

Included with this soil in mapping are a few small areas of Arredondo, Hague, and Kendrick soils and areas of a well drained soil that is fine sand to a depth of 80 inches or more. Also included are a few spots of a similar soil, where the slope is 0 to 5 or 8 to 12 percent of any one mapped area.

(HaC) Hague sand, 5 to 8 percent slopes - This is a sloping, well drained soil that occurs as small areas in the upland. It has the profile described as representative of the series. Surface runoff is medium, and the hazard of erosion is moderate. A few rills and shallow gullies have formed. The water table is at a depth of more than 72 inches.

In a representative profile the surface layer is mixed very dark grayish brown and dark grayish brown sand about 6 inches thick. The subsurface layer is sand about 16 inches thick. The upper 9 inches is light yellowish brown, and the lower 7 inches reddish yellow. The subsoil extends to a depth of 74 inches. It is, in sequence downward, 3 inches of strong brown sandy loam, 13 inches of yellowish red sandy clay loam, 9 inches of yellowish red sandy loam, and 25 inches of strong brown loamy sand. The underlying material to a depth of 82 inches is strong brown loamy sand.

Included with this soil in mapping are small areas of Kendrick, Zuber, and Gainesville soils; spots where the soil is less than 60 inches deep over bedrock; and a few areas of a similar soil that has a slope of 8 to 12 percent. Also included are small areas, of a similar soil, where the surface layer is fine sand and loamy fine sand and spots of a moderately eroded soil. Rock outcrops and sinkholes occur in some areas. Included soils make up about 15 percent of any one mapped area.

(JuB) Jumper fine sand, 0 to 5 percent slopes - This is a nearly level to gently sloping, somewhat poorly drained soil that occurs as small areas in the flatwoods and along gentle slopes of the sandy uplands. The water table fluctuates between approximately 30 and 60 inches for 2 to 4 months during most years. For brief periods of about 2 weeks to 2 months, it is within a depth of 30 inches.

Included with this soil in mapping are a few areas of a similar soil that has a loamy sand surface layer, small areas of a similar soil that has a sandy clay subsoil or is less than 5 percent plinthite within a depth of 60 inches, and small areas of a somewhat poorly drained soil that has a sandy surface layer less than 20 inches thick. Also included are small areas of Apopka, Sparr, and Lynne soils and a few small areas where the slope is 5 to 8 percent. Included soils make up about 15 percent of any one mapped area.

(KaB) Kanapaha fine sand, 0 to 5 percent slopes - This is a nearly level to gently sloping, poorly drained soil that occurs as small areas in the upland. The water table is within about 10 inches of

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the surface for periods of 1 month to 3 months during most years.

Included with this soil in mapping are a few small areas of a similar soil that is more than 5 percent plinthite within a depth of 60 inches and a few small areas where the subsurface layer and the upper 20 inches of the subsoil are, by volume, 5 to more than 35 percent rock fragments one-quarter inches to 3 inches in size. Also included are spots of Arredondo, Blichton, and Sparr soils and a few small areas, of a similar soil, where the slope is 5 to 8 percent. The rock outcrop and sinkholes that occur in some areas are identified by spot symbols on the soil map. Included soils make up less than 25 percent of any one mapped area.

(MP) Mine pit -

Martel Variant - The Martel variant consists of nearly level, very poorly drained soils that formed in thick beds of loamy marine sediments. These soils occur as small ponded flatwoods. They are covered with water for 8 months or more during most years. The water table is within 10 inches of the surface, except during extended dry periods.

In a representative profile a layer of black, well decomposed muck about 11 inches thick is at the surface. The mineral surface layer is black sand about 16 inches thick. The mineral subsurface layer, to a depth of 31 inches, is sand. The upper 3 inches is dark gray, and the lower 12 inches is grayish brown. The subsoil is 31 inches thick. The upper 17 inches is gray heavy sandy clay loam, and the lower 14 inches is gray sandy clay.

Available water capacity is high in the organic and mineral surface layers, low in the subsurface layer, and medium in the subsoil. Permeability is rapid in the organic and mineral surface layers and the subsurface layer and moderately slow to slow in the subsoil. Natural fertility is medium in the organic and mineral surface layers, low in the subsurface layer, and medium in the subsoil. Organic-matter content is high in the organic and mineral surface layers and low in the subsurface layer and the subsoil.

The Martel variant in this survey area is mapped only with Pamlico soils.

(PB) Pamlico-Martel association - This mapping unit consists of very poorly drained organic and mineral soils. It occurs as small ponded areas and as areas in large swamps within the broad flatwoods. Slopes are 0 to 2 percent. These soils are commonly covered with water for 8 months or more during most years and are so densely vegetated that they cannot be mapped separately. The water table is within 10 inches of the surface, except during extended dry periods.

About 38 percent of this mapping unit is the Pamlico soil. The organic surface layer is underlain by 10 to 35 inches of sand over sandy clay loam or sandy clay. In about 8 percent of the mapped areas, the sandy clay loam or sandy clay is within a depth of 51 inches.

About 32 percent of this mapping unit is the Martel variant and similar soils. The Martel variant is described under the heading Martel Variant.

About 15 percent of this mapping unit is a soil that has a black, brown, or dark reddish brown, well decomposed organic layer 6 to 15 inches deep over 10 to 20 inches of black or very dark gray sand, loamy sand, or loamy fine sand. The subsoil to a depth of 60 inches or more is gray or dark gray sandy clay loam or sandy clay.

Included in this unit in mapping are areas where the muck is more than 50 inches deep over sandy material and sandy clay loam, some areas where the mucky peat and peat are 16 to 50 inches deep over sandy and loamy material, and spots where the soil is 16 to 30 inches of sand over clayey material. Also included are some areas of Placid and Pompano soils and a few areas of a slightly acid to moderately alkaline soil that has a black loamy sand or sandy loam surface layer 10 to 15 inches deep over a sandy clay or clay subsoil. Included soils make up about 15 percent of the unit.

(Pm) Placid sand - This is a very poorly drained soil in small depressions and along poorly

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defined drainageways of the flatwoods and in shallow depressions on sandy ridges. It has the profile described as representative of the series. Slopes are 0 to 2 percent. The water table is within 10 inches of the surface for more than 6 months during most years. Most depressions are covered with water for 6 months or more annually. Surface water is usually 2 to 18 inches deep, but in places is as deep as 18 to 30 inches during wet periods.

In a representative profile the surface layer is sand about 19 inches thick. The upper 12 inches is black, the next 4 inches is very dark gray, and the lower 3 inches is dark gray. Below this to a depth of 92 inches is light gray sand mottled with gray and dark gray.

Included with this soil in mapping are small areas of Adamsville, Pompano, and Pomona soils; small areas where organic material is 10 to 24 inches deep over sandy material, and some areas of a very poorly drained soil where a thick, dark colored surface layer is underlain by sandy clay loam at a depth below 40 to 80 inches. Also included are small areas of a very poorly drained soil where a black or very dark gray sandy surface layer 24 to 32 inches thick is underlain by gray sandy material to a depth of more than 80 inches. Included soils make up about 20 percent of any mapped area.

(Pn) Placid-Pompano-Pomona complex - This mapping unit consists of poorly drained and very poorly drained soils. It is on broad flats adjacent to large ponds and swamps in the flatwoods and in shallow depressions of the sandy uplands. It is mostly on the broad flats in the northeastern part of the survey area and in the poorly drained and very poorly drained areas adjacent to the swamps. It is 37 percent Placid soils, 31 percent Pompano soils, and 26 percent Pomona soils. Pomona soils are slightly higher on the landscape than Placid and Pompano soils. Slopes are 0 to 2 percent.

The water table is within 10 inches of the surface for about 4 to 8 months during most years. Slight depressions, mostly in the southwestern part of the survey area, are covered with water for 3 to 6 months during most years.

Included in this unit in mapping are areas of Lynne soils and small areas of a poorly drained soil where a sandy surface layer is underlain by sandy loam and sandy clay loam at a depth of 40 to 60 inches. Also included are areas of a poorly drained sandy soil having a weakly cemented layer at a depth below 30 inches. Included soils make up 10 percent or less of this unit.

(Po) Pomona sand - This is a poorly drained soil that occurs as small and large areas in the flatwoods and as small areas adjacent to wet depressions on sandy ridges. Slopes are 0 to 2 percent. During most years the water table is within 10 inches of the surface for 1 month to 3 months and fluctuates between 10 and 40 inches for 6 months or more. During dry periods it recedes to a depth of more than 40 inches.

Included with this soil in mapping are small areas of a similar soil, where the surface layer is fine sand or a weakly cemented layer is at a depth of 30 to 40 inches. Also included are small areas of Electra, Lynne, Pompano, and Placid soils. Included soils make up about 20 percent of any one mapped area.

(Pr) Pompano sand, ponded - This is a very poorly drained soil in shallow depressions and sloughs of the flatwoods and sandy ridges. It is similar to Pompano sand, but the water table is within 10 inches of the surface for more than 6 months during most years. The surface is covered with water for more than 4 months annually. Slopes are 0 to 2 percent.

Included with this soil in mapping are a few small areas, of a similar soil, where the dark colored surface layer is 5 to 10 inches thick or the texture is fine sand. Also included are spots of Ancloste, Pomona, and Placid soils. Included soils make up about 20 percent of any one mapped area.

(TaB) Tavares sand, 0 to 5 percent slopes - This is a nearly level to gently sloping, moderately well drained sandy soil that occurs as small and large areas in the broad sandy flatwoods and along the lower slopes of the deep sandy uplands. The water table fluctuates between 40 to 60 inches for

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cumulative periods of 6 months or more during most years. During wet periods it may rise to within 30 to 40 inches of the surface for periods of less than 60 days. It recedes to a depth of more than 60 inches during droughty periods.

Included with this soil in mapping are a few small areas of a similar soil, where the slope is 5 to 8 percent. Also included are small areas of Adamsville, Candler, Apopka, and Pompano soils. Included soils make up about 15 percent of any one mapped area.

(UaF) Udalfic arents, 15 to 60 percent slopes - This mapping unit is well drained mixed soil material and unconsolidated material that has been excavated from and piled adjacent to mine pits. These materials remain in the position in which they were deposited. Areas are generally small. The water table is at a depth of more than 72 inches.

Included in this unit in mapping are a few small areas of Udalfic Arents, 0 to 5 percent slopes. In a few areas the mixed soil material is dominantly pale brownish sandy material. Included soils make up less than 12 percent of any one mapped area.

Addendum 4--Hydrological Data

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Hydrological Data**

**Water Quality Data for Rainbow Springs Run Collected During Spring Seasons 1969-1989
USGS Station # 02313100 at County Road 484, Marion County, Florida**

Year	pH	Conductivity	DO	Total N	NO₃	NH₄	TP	Turbidity	Color
1969	7.5	134	7.2	0.4	0.18	0	0.02	--	3
1974	7.8	121	6	0.32	0.16	0.02	0.03	1	0
1979	7.6	115	--	0.25	0.21	0.02	0.03	1	0
1984	8.2	120	7.5	0.6	0.3	0.11	0.03	0.5	3
1989	7.2	206	5.9	1.1	1	0.01	0.03	--	3

**Mean Constituent Concentrations for Individual Springs
within Rainbow Springs State Park Boundary (Jones et al. 1996)**

Spring	pH	Conductivity	HCO₃	Cl	SO₄	Ca	TDS	NO₃
Rainbow Seep #1	7.8	162	72	3.5	5.4	27	98	0.88
East Seep	7.9	197	79	3.7	5.3	33	110	1.03
Bridge Seep North	8.4	125	51	3.0	4.5	20	74	0.49
Rainbow Spring #1	8.3	158	64	3.4	5.0	25	90	0.89
Rainbow Spring #2	8.0	195	87	3.9	6.7	35	124	1.03
Rainbow Spring #3	8.1	219	97	3.9	5.2	38	130	1.03
Rainbow Spring #4	7.9	236	102	4.0	4.9	41	132	1.22
Waterfall Spring	7.7	267	129	4.2	5.9	47	147	1.13
Bubbling Spring	7.6	317	141	4.5	7.3	56	174	1.06
Rainbow Spring #5	7.9	202	94	3.8	6.8	35	108	0.45

Addendum 5--Natural Community Descriptions

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(8) Mesic flatwoods. - (synonyms: pine flatwoods, pine savannahs, pine barrens). Mesic Flatwoods are characterized as an open canopy forest of widely spaced pine trees with little or no understory but a dense ground cover of herbs and shrubs. Several variations of Mesic Flatwoods are recognized, the most common associations being longleaf pine - wiregrass - runner oak and slash pine - gallberry - saw palmetto. Other typical plants include: St. Johns-wort, dwarf huckleberry, fetterbush, dwarf wax myrtle, stagger bush, blueberry, gopher apple, tar flower, bog buttons, blackroot, false foxglove, white-topped aster, yellow-eyed grass, and cutthroat grass. Typical animals of Mesic Flatwoods include: oak toad, little grass frog, narrowmouth toad, black racer, red rat snake, southeastern kestrel, brown-headed nuthatch, pine warbler, Bachman's sparrow, cotton rat, cotton mouse, black bear, raccoon, gray fox, bobcat, and white-tailed deer.

Mesic Flatwoods occur on relatively flat, moderately to poorly drained terrain. The soils typically consist of 1-3 feet of acidic sands generally overlying an organic hardpan or clayey subsoil. The hardpan substantially reduces the percolation of water below and above its surface. During the rainy seasons, water frequently stands on the hardpan's surface and briefly inundates much of the flatwoods; while during the drier seasons, ground water is unobtainable for many plants whose roots fail to penetrate the hardpan. Thus, many plants are under the stress of water saturation during the wet seasons and under the stress of dehydration during the dry seasons.

Another important physical factor in Mesic Flatwoods is fire, which probably occurred every 1 to 8 years during pre-Columbian times. Nearly all plants and animals inhabiting this community are adapted to periodic fires; several species depend on fire for their continued existence. Without relatively frequent fires, Mesic Flatwoods succeed into hardwood-dominated forests whose closed canopy can essentially eliminate the ground cover herbs and shrubs. Additionally, the dense layer of litter that accumulates on unburned sites can eliminate the reproduction of pines which require a mineral soil substrate for proper germination. Thus, the integrity of the Mesic Flatwoods community is dependent on periodic fires. However, fires that are too frequent or too hot would eliminate pine recruitment and eventually transform Mesic Flatwoods into Dry Prairie.

Mesic Flatwoods are closely associated with and often grade into Wet Flatwoods, Dry Prairie, or Scrubby Flatwoods. The differences between these communities are generally related to minor topographic changes. Wet Flatwoods occupy the lower wetter areas, while Scrubby Flatwoods occupy the higher drier areas.

Mesic Flatwoods are the most widespread biological community in Florida, occupying an estimated 30 to 50% of the state's uplands. However, very few undisturbed areas of Mesic Flatwoods exist because of habitat mismanagement and silvicultural, agricultural, or residential development. Mesic Flatwoods are often fairly resilient, and with proper management they can generally be restored.

(13) Sandhill.- (synonyms: longleaf pine - turkey oak, longleaf pine - xerophytic oak, longleaf pine - deciduous oak, high pine). Sandhills are characterized as a forest of widely spaced pine trees with a sparse understory of deciduous oaks and a fairly dense ground cover of grasses and herbs on rolling hills of sand. The most typical associations are dominated by longleaf pine, turkey oak, and wiregrass. Other typical plants include bluejack oak, sand post oak, sparkleberry, persimmon, winged sumac, pinewoods dropseed, Indian grass, wild buckwheat, queen's delight, yellow foxglove, bracken fern, runner oak, goats rue, partridge pea, milk pea, dollarweeds, wild indigo, gopher apple, and golden-aster. Typical animals include tiger salamander, barking treefrog, spadefoot toad, gopher frog, gopher tortoise, worm lizard, fence lizard, mole skink, indigo snake, coachwhip snake, pine snake, short-tailed snake, crowned snake, eastern diamondback rattlesnake, bobwhite, ground dove, red-headed woodpecker, rufous-sided towhee, fox squirrel and

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pocket gopher.

Sandhills occur on hilltops and slopes of gently rolling hills. Their soils are composed of deep, marine-deposited, yellowish sands that are well-drained and relatively sterile. The easily leached soil nutrients are brought back to the surface by the burrowing habits of some sandhill animals. Sandhills are important aquifer recharge areas because the porous sands allow water to move rapidly through with little runoff and minimal evaporation. The deep sandy soils help create a xeric environment that is accentuated by the scattered overstory, which allows more sunlight to penetrate and warm the ground. The absence of a closed canopy also allows Sandhills to cool more rapidly at night and to retain less air moisture. Thus, temperature and humidity fluctuations are generally greater in Sandhills than in nearby closed canopy forests.

Fire is a dominant factor in the ecology of this community. Sandhills are a fire climax community, being dependent on frequent ground fires to reduce hardwood competition and to perpetuate pines and grasses. The natural fire frequency appears to be every 2 to 5 years. Without frequent fires, Sandhills may eventually succeed to Xeric Hammock. Unburned or cutover Sandhills may be dominated by turkey oak.

Sandhills are often associated with and grade into Scrub, Scrubby Flatwoods, Mesic Flatwoods, Upland Pine Forest, or Xeric Hammock. Sandhills were widespread throughout the Coastal Plain, but most have been degraded by timbering, overgrazing, plowing, fire exclusion, and other disturbances. Much of Florida's Sandhill communities have been converted to citrus groves, pastures, pine plantations, or residential and commercial developments. Thus, the importance of properly managing the remaining tracts is accentuated.

(15) Scrubby flatwoods.- (synonyms: xeric flatwoods, dry flatwoods). Scrubby Flatwoods are characterized as an open canopy forest of widely scattered pine trees with a sparse shrubby understory and numerous areas of barren white sand. The vegetation is a combination of Scrub and Mesic Flatwoods species; Scrubby Flatwoods often occupy broad transitions or ecotones between these communities. Typical plants include longleaf pine, slash pine, sand live oak, Chapman's oak, myrtle oak, scrub oak, saw palmetto, staggerbush, wiregrass, dwarf blueberry, gopher apple, rusty lyonia, tarflower, golden-aster, lichens, silkbay, garberia, huckleberry, goldenrod, runner oak, pinweeds, and frostweed.

Scrubby Flatwoods generally occur intermingled with Mesic Flatwoods along slightly elevated relictual sandbars and dunes. The white sandy soil is several feet deep and drains rapidly. However, the water table is unlikely to be very deep. Scrubby Flatwoods normally do not flood even under extremely wet conditions. Temperatures and humidities of air and soil in Scrubby Flatwoods fluctuate substantially more than in most other communities because the scattered overstory, sparse understory, and barren sands of Scrubby Flatwoods do not ameliorate daily and seasonal changes very well.

Although the elevated, deeper sandy soils of scrubby flatwoods engender a drier environment than the surrounding mesic flatwoods, the general sparsity of ground vegetation and the greater proportion of relatively incombustible scrub-oak leaf litter reduces the frequency of naturally occurring fires. Only after a long absence of fire and during periods of drought does the leaf litter become sufficiently combustible and concentrated enough to support an ecological burn. Several species of plants in Scrubby Flatwoods are typical scrub plants which endure only when long intervals between fires occur. Thus, a periodicity of approximately 8 to 25 years between fires appears to be natural for this community.

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Scrubby Flatwoods are associated with and often grade into Mesic Flatwoods, Scrub, Dry Prairie or Sandhills. This community is essentially a Mesic Flatwoods with a Scrub understory.

(17) Sinkhole. - (synonyms: lime sink, sink, solution pit, cenote, grotto, doline, chimney hole, banana hole). Sinkholes are generally characterized as cylindrical or conical depressions with steep limestone walls. Those which drain readily and only contain standing water during or for short periods following heavy rains are considered to be Sinkholes, while those which contain water throughout most of the year and dry down only during extreme droughts are considered to be Sinkhole Lakes. The differences between these two communities are often subtle. They may occur together if the upper portions of the limestone are typically above water level, while the lower portions are typically below water level.

The vegetative structure of Sinkholes may be that of a well-developed forest where sands cover the rock and/or the sides of the Sinkholes are moderately sloped. These conditions are typically confined to the upper portions and around the rim of the Sinkhole. Steeper rock walls are generally more or less covered by mosses, liverworts, and ferns with occasional herbs and shrubs in crevices. Typical plants include southern magnolia, sweetgum, wax myrtle, wild grape, Virginia creeper, poison ivy, partridgeberry, greenbrier, water oak, flowering dogwood, horse sugar, sparkleberry, diamond-leaf oak, live oak, hophornbeam, tupelo, white ash, Florida maple, pignut hickory, beautyberry, and gum bumelia. Steep rock walls are more or less covered by a variety of mosses, liverworts, ferns and sometimes herbs, including such rare and threatened species as Venus'-hair fern and halberd fern. Sinkholes provide habitat for relictual populations of many species of salamanders and invertebrates that would be unable to survive in otherwise drier areas.

Sinkholes are most common in karst areas where the underlying limestone has been riddled with solution cavities by the chemical and physical actions of underground waters. As these cavities enlarge and become interconnected, large underwater caverns develop. When water tables drop, the cavern roof is no longer supported by the hydrostatic pressure and portions of it may collapse, leaving a deep cylindrical or conical surface depression known as a Sinkhole. The organic and mineral debris that collapsed into the cavity may partially occlude, but generally does not completely block, the Sinkhole's connections with the underground water table. Thus, Sinkholes frequently function as aquifer recharge areas. Some Sinkholes are the relics of ancient springs or swallowholes, flow having ceased because of lower water tables. The relic stream bed may still be discernible, but has been obliterated in most cases.

Steep limestone walls generally restrict soils to organic accumulations in cracks and crevices. Where the sides of a sinkhole have collapsed, sands may have slumped over the limestone, creating conditions similar to a Slope Forest.

Sinkholes generally have a very moist microclimate. The depression itself helps protect the Sinkhole from drying winds, while the fringe of trees surrounding the Sinkhole often form a nearly complete canopy which shelters the Sinkhole from intensive insolation. Additionally, seepage from the surrounding uplands may slowly moisten the walls, while the frequent presence of standing water contributes to high humidity. These conditions may also buffer temperature extremes, allowing a unique mixture of tropical and temperate flora to exist in many Florida Sinkholes.

Sinkholes and Sinkhole Lakes are often the antecedents of other Lacustrine and Palustrine communities, including Dome Swamp; Depression Marsh; and Sandhill Upland, Flatwoods and Prairie Lakes. When several Sinkholes coalesce, Basin Marsh or Swamp and Clastic Upland,

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Marsh or Swamp Lakes may eventually develop. Thus, the distinctions between Sinkhole communities and other related communities are frequently subtle, as one very gradually succeeds to another. The limestone dissolution processes that initiated their development continue, and subsequent droughts which lower ground water tables could renew the Sinkhole development process.

Sinkholes are extremely fragile communities. Their popularity as recreational areas subjects their flora to trampling and their steep walls to severe erosion from foot traffic and, in some cases, from dirt bikes. Sinkhole Lakes attract swimmers and divers whose activities may disturb the aquatic community as well. The unique flora of many Sinkholes has made them additionally vulnerable to overcollection.

Sinkholes are frequently used as dump sites. These activities will degrade water quality in the Sinkhole and eventually the underground aquifer. Thus, litter and refuse should be removed promptly when they occur. Similarly, pollution of the water supplies (aquifer and seepage sources) should be avoided. Chemical applications, waste treatments, and spills on the surrounding upland should be closely monitored to determine their potential impacts and mitigation requirements.

The delicate microclimate of Sinkholes may also be easily disturbed by activities in the surrounding areas. Logging of the surrounding canopy will increase both insolation and sedimentation levels, while major soil disturbances in the surrounding uplands could disrupt seepage water sources. Large withdrawals of groundwater nearby could substantially lower water tables and reduce the hydroperiods of Sinkhole Lakes. Any of these activities could significantly alter the microclimate and induce deleterious vegetational responses. Likewise, the invasion of exotic plant species is also a concern in these important communities.

(20/21) Upland hardwood forest and upland mixed forest. - (synonyms: mesic hammock, climax hardwoods, upland hardwoods, beech-magnolia climax, oakmagnolia climax, pine-oak-hickory association, southern mixed hardwoods, clay hills hammocks, Piedmont forest). Upland Hardwood Forests and Upland Mixed Forests are characterized as well-developed, closed-canopy forests of upland hardwoods on rolling hills. These communities have quite similar physical environments and share many species, including southern magnolia, pignut hickory, sweetgum, Florida maple, devil's walking stick, American hornbeam, redbud, flowering dogwood, Carolina holly, American holly, eastern hophornbeam, spruce pine, loblolly pine, live oak, and swamp chestnut oak, among others. The primary difference between these communities is that Upland Mixed Forests generally lack shortleaf pine, American beech and other more northern species that typically occur in Upland Hardwood Forests. This is predominantly a result of minor climatic differences, Upland Hardwood Forests being most common in Northern panhandle Florida, and Upland Mixed Forests being most common in northern and central peninsula Florida. Other typical plants include gum bumelia, hackberry, persimmon, red cedar, red mulberry, wild olive, redbay, laurel cherry, black cherry, bluff oak, water oak, cabbage palm, basswood, winged elm, Florida elm, sparkleberry, Hercules' club, slippery elm, beautyberry, partridgeberry, sarsaparilla vine, greenbrier, trilliums, beech drops, passion flower, bedstraw, strawberry bush, silverbell, caric sedges, fringe tree, horse sugar, white oak, and blackgum. Typical animals include slimy salamander, Cope's gray treefrog, bronze frog, box turtle, eastern glass lizard, green anole, broadhead skink, ground skink, red-bellied snake, gray rat snake, rough green snake, coral snake, woodcock, barred owl, pileated woodpecker, shrews, eastern mole, gray squirrel, wood rat, cotton mouse, gray fox, and white-tailed deer.

Upland Hardwood and Mixed Forests occur on rolling hills that often have limestone or

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phosphatic rock near the surface and occasionally as outcrops. Soils are generally sandy-clays or clayey sands with substantial organic and often calcareous components. The topography and clayey soils increase surface water runoff, although this is counterbalanced by the moisture retention properties of clays and by the often thick layer of leaf mulch which helps conserve soil moisture and create decidedly mesic conditions. Furthermore, the canopy is densely closed, except during winter in areas where deciduous trees predominate. Thus, air movement and light penetration are generally low, making the humidity high and relatively constant. Because of these conditions Upland Hardwood and Mixed Forests rarely burn.

Upland Hardwood Forests and Upland Mixed Forests are climax communities for their respective geographic locations. They are often associated with and grade into Upland Pine Forest, Slope Forest or Xeric Hammock. Occasionally, Upland Mixed Forests may also grade into Maritime Hammock or Prairie Hammock. During early stages of succession, Upland Hardwood and Mixed Forest may be difficult to distinguish from Upland Pine Forests that have not been burned for several years. Disturbed sites may require hundreds of years to reach full development with species compositions representative of climax conditions.

Silvicultural, agricultural, industrial, and residential developments have already eliminated the vast bulk of these communities. These activities are continuing at an accelerated pace in many areas, such that the few remnant mature examples are in urgent need of protection and proper management.

(25) Basin swamp. - (synonyms: gum swamp, bay, bayhead, swamp). Basin Swamp is generally characterized as a relatively large and irregularly shaped basin that is not associated with rivers, but is vegetated with hydrophytic trees and shrubs that can withstand an extended hydroperiod. Dominant plants include blackgum, cypress, and slash pine. Other typical plants include red maple, swamp redbay, sweetbay magnolia, loblolly bay, Virginia willow, fetterbush, laurel greenbrier, Spanish moss, wax myrtle, titi, sphagnum moss, and buttonbush. Typical animals include southern dusky salamander, cricket frog, little grass frog, chicken turtle, striped mud turtle, ringneck snake, scarlet kingsnake, crayfish snake, cottonmouth, wood duck, hawks, turkey, great horned owl, barred owl, pileated woodpecker, songbirds, gray squirrel, black bear, raccoon, mink, river otter, bobcat, and white-tailed deer.

Soils in Basin Swamps are generally acidic, nutrient poor peats, often overlying a clay lens or other impervious layer. The resulting perched water table may act as a reservoir releasing groundwater as adjacent upland water tables drop during drought periods. The typical hydroperiod is approximately 200-300 days. Basin Swamps are thought to have developed in oxbows of former rivers or in ancient coastal swales and lagoons that existed during higher sea levels.

Infrequent fire is essential for the maintenance of cypress dominated Basin Swamps. Blackgum and hardwood dominated Basin Swamps burn less often, while pine dominated Basin Swamps burn more frequently. Without fire, hardwood invasion and peat accumulation will eventually create a Bottomland Forest or Bog. Typical fire intervals in Basin Swamps may be anywhere from 5 to 150 years. Cypress and pines are very tolerant of light surface fires, but muck fires burning into the peat can kill the trees, lower the ground surface, and transform a swamp into a pond or lake.

Small Basin Swamps may be difficult to distinguish from large Dome Swamps. Basin Swamps are often associated with and may grade into Wet Flatwoods, Hydric Hammock, or Bottomland Forest. The species composition of Basin Swamps frequently overlaps with Floodplain Swamp, Strand Swamp, and Baygall.

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Like other wetland communities, normal hydroperiods must be maintained in Basin Swamps. If water levels must be artificially manipulated, somewhat deeper than normal water is not likely to do much harm, but extended hydroperiods will limit tree growth and prevent reproduction. Shortened hydroperiods will permit invasion of mesophytic species and change the character of the understory or will allow a devastating fire to enter which would drastically alter the community. Occasional fires are necessary to maintain the cypress and pine components.

Basin Swamps are unsuitable for construction because of their extended hydroperiods and peaty soils. Most have been degraded by timber harvests, and many have been drained or polluted. Thus, very few pristine examples of Basin Swamp communities exist. Those that remain should be adequately protected and properly managed.

(29) Depression marsh. - (synonyms: isolated wetland, flatwoods pond, St. John's wort pond, pineland depression, ephemeral pond, seasonal marsh). Depression Marsh is characterized as a shallow, usually rounded depression in sand substrate with herbaceous vegetation often in concentric bands. Depression Marshes are similar in vegetation and physical features to, but are generally smaller than, Basin Marshes. Typical plants include St. John's wort, spikerush, yellow-eyed grass, chain fern, willows, maidencane, wax myrtle, swamp primrose, bloodroot, buttonbush, fire flag, pickerelweed, arrowheads, and bladderwort.

Larger and more permanent Depression Marshes may have many of the same plants and animals listed as typical of Basin Marshes. However, because of their isolation and small size, many Depression Marshes support a very different assemblage of species than that found in larger, more permanent wetlands. Depression Marshes are considered extremely important in providing breeding or foraging habitat for such species as the flatwoods salamander, mole salamander, tiger salamander, dwarf salamander, striped newt, oak toad, cricket frog, pinewoods treefrog, barking treefrog, squirrel treefrog, little grass frog, southern chorus frog, ornate chorus frog, narrowmouth toad, eastern spadefoot toad, gopher frog, white ibis, wood stork and sandhill crane. Depression Marshes occurring as isolated wetlands within larger upland ecosystems are of critical importance to many additional wetland and upland animals.

Depression Marshes are typical of karst regions where sand has slumped around or over a sinkhole and thereby created a conical depression subsequently filled by direct rain fall, runoff, or seepage from surrounding uplands. The substrate is usually acid sand with deepening peat toward the center. Some depressions may have developed or be maintained by a subsurface hardpan. Hydrological conditions vary, with most Depression Marshes drying in most years. Hydroperiods range widely from as few as 50 days or less to more than 200 days per year.

Fire is important to maintaining this community type by restricting invasion of shrubs and trees and the formation of peat. Fire frequency is often greatest around the periphery of the marsh and least toward the center. A severe peat fire can lower the ground surface and create a pond at the center of the marsh.

Depression Marshes are often associated with and grade into Wet Prairie, Seepage Slope, Wet Flatwoods, Mesic Flatwoods, Dome Swamp or Bog. They also may occur in association with various types of lakes, such as Sandhill Lake or Flatwoods Lake.

Depression Marshes are threatened by drainage, agriculture, pollution, fire suppression, and invasion of exotic species. Depression Marshes may be filled and converted to other uses. A regional lowering of the water table as a result of overuse may eliminate many Depression

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Marshes. Depression Marshes on some public lands have been deepened by explosives to allow for stocking with game fish. By preying upon the eggs and larvae of frogs and salamanders, these fish may eliminate the amphibians that depend on such seasonal wetlands for successful reproduction. Likewise, many species of invertebrates not adapted to predation by fishes may be eliminated.

(33) Floodplain swamp. - (synonyms: river swamp, bottomland hardwoods, seasonally flooded basins of flats, oak-gum-cypress, cypress-tupelo, slough, oxbow, back swamp). Floodplain Swamps occur on flooded soils along stream channels and in low spots and oxbows within river floodplains. Dominant trees are usually buttressed hydrophytic trees such as cypress and tupelo; the understory and ground cover are generally very sparse. Other typical plants include ogeechee tupelo, water tupelo, swamp titi, wax myrtle, dahoon holly, myrtle-leaved holly, large galberry, possumhaw, hurrah-bush, white alder, lizard's tail, leather fern, royal fern, marsh fern, soft rush, laurel greenbrier, hazel alder, hawthorn, and swamp privet.

Floodplain Swamps harbor a diverse array of animals including both temporary and permanent residents. Typical animals include marbled salamander, mole salamander, amphiuma, Alabama waterdog, Southern dusky salamander, two-lined salamander, three-lined salamander, dwarf salamander, slimy salamander, rusty mud salamander, southern toad, cricket frog, bird-voiced treefrog, gray treefrog, bullfrog, river frog, Southern leopard frog, alligator, river cooter, stinkpot, Southeastern five-lined skink, broadhead skink, mud snake, rainbow snake, redbelly water snake, brown water snake, glossy crayfish snake, black swamp snake, cottonmouth, yellow-crowned night-heron, wood duck, swallowtail kite, Mississippi kite, redshouldered hawk, woodcock, barred owl, chimney swift, hairy woodpecker, pileated woodpecker, Acadian flycatcher, Carolina wren, veery, white-eyed vireo, red-eyed vireo, parula warbler, prothonotary warbler, hooded warbler, Swainson's warbler, cardinal, towhee, opossum, southeastern shrew, short-tailed shrew, beaver, wood rat, rice rat, cotton mouse, golden mouse, bear, raccoon, and bobcat.

Soils of Floodplain Swamps are highly variable mixtures of sand, organic, and alluvial materials, although some sites, especially within sloughs or on smaller streams, may have considerable peat accumulation. Floodplain Swamps are flooded for most of the year, with sites along channels inundated by aerobic flowing water while those of sloughs and backswamps are flooded with anerobic water for extensive periods of time. Soils and hydroperiods determine species composition and community structure. Seasonal and often prolonged inundations restrict the growth of most shrubs and herbs, leaving most of the ground surface open or thinly mantled with leaf litter. Floods redistribute detrital accumulations to other portions of the floodplain or into the main river channel. This rich organic debris is essential to the functional integrity of downriver ecosystems such as estuaries. These swamps are usually too wet to support fire.

Floodplain Swamps are often associated with and grade into Floodplain Forest or Hydric hammock, and occasionally Baygall. The species composition of Floodplain Swamps is frequently similar to the Slough, Strand Swamp, Dome Swamp, and Basin Swamp communities.

Alteration of the hydroperiod by impoundments or river diversions and the disruption of floodplain communities by forestry or agriculture have devastating consequences to entire river and bay systems. Many plant and animal species, both onsite and down river, depend upon the presence and natural fluctuations of these swamps for survival and reproduction.

(35) Hydric hammock. - (synonyms: wetland hardwood hammock, wet hammock). Hydric Hammock is characterized as a well developed hardwood and cabbage palm forest with a variable understory often dominated by palms and ferns. Typical plants include cabbage palm, diamond-

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leaf oak, red cedar, red maple, swamp bay, sweetbay, water oak, southern magnolia, wax myrtle, saw palmetto, bluestem palmetto, needle palm, poison ivy, dahoon holly, myrsine, hackberry, sweetgum, loblolly pine, Florida elm, swamp chestnut oak, American hornbeam, Walter viburnum, royal fern, peppervine, rattanvine, yellow jessamine, and Virginia creeper. Typical animals include green anole, flycatchers, warblers, and gray squirrel.

Hydric Hammock occurs on low, flat, wet sites where limestone may be near the surface and frequently outcrops. Soils are sands with considerable organic material that, although generally saturated, are inundated only for short periods following heavy rains. The normal hydroperiod is seldom over 60 days per year. Because of their generally saturated soils and the sparsity of herbaceous ground cover, Hydric Hammocks rarely burn.

Hydric Hammock occurs as patches in a variety of lowland situations, often in association with springs or karst seepage, and in extensive forests covering lowlands just inland of coastal communities. Hydric Hammock generally grades into Floodplain Swamp, Strand Swamp, Basin Swamp, Baygall, Wet Flatwoods, Coastal Berm, Maritime Hammock, Slope Forest, Upland Mixed Forest, or Upland Hardwood Forest. Hydric Hammock is often difficult to differentiate from Bottomland Forest, Prairie Hammock, and Floodplain Forest.

The normal hydrological regime must be maintained in Hydric Hammock. If the water table is lowered, Hydric Hammock will gradually change to mesic conditions. If the hammock is flooded, many trees will die and eventually be replaced by more hydrophytic species.

(55) Spring-run stream. - (synonyms: calcareous stream, spring, or creek). Spring-run Streams are characterized as perennial water courses which derive most, if not all, of their water from artesian openings in the underground aquifer. Waters issuing from the aquifer are generally clear, circumneutral to slightly alkaline (pH = 7.0 - 8.2), and perennially cool (66 - 75F). These conditions saturate the water with important minerals, allow light to penetrate deeply, and reduce the limiting effects of environmental fluctuations, all of which are conducive for plant growth. Thus, Spring-run Streams are among the most productive aquatic habitats. Typical plants include tape grass, wild rice, giant cutgrass, arrowheads, southern naiads, pondweeds, and chara. Typical animals include mollusks, stoneflies, mayflies, caddisflies, simuliids, chironomids, American alligator, alligator snapping turtle, Suwannee cooter, loggerhead musk turtle, rainbow snake, red-belly watersnake, brown watersnake, and many fishes.

Spring-run Streams generally have sand bottoms or exposed limestone along their central channel. Calcareous silts may form thick deposits in quiet shallow zones, while leaf drift and other debris collect around fallen trees and quiet basins. The latter, along with limestone outcrops and rock debris, form important aquatic habitats for many small aquatic organisms. When undisturbed, submerged aquatic vegetation clothes most of the spring-run stream bottom and provides shelter and an abundant food source for the extensive web of life.

The water emanating from the aquifer is generally clear because of the filtering and absorbing actions of the soils and aquifer limestones through which the water percolates and flows. When the water is deep, it may appear bluish because of light-refraction characteristics that are similar to those which cause the sky to be blue on clear days. If the water sources for the aquifer are substantially influenced by nearby swamps or flatwoods, the spring-run may temporarily become stained with tannins and other dissolved organics during or following periods of heavy rains. When extensive underground cavities connect the spring caverns with nearby sinks and swallow holes, the spring-run may become turbid with suspended particulates during and following heavy rains and floods. Conversely during periods of low rainfall, the aquifer can become supersaturated

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with calcium, carbonates, and other ions. These chemicals readily precipitate when water reaches the surface, causing the spring head or boil to appear milky.

Human activities affect flow rates by withdrawing water from the aquifer through deep wells. When withdrawal is substantial within the recharge area, spring flow is reduced or, in some cases, ceases entirely. Normal flow rates may return when excessive withdrawals are eliminated.

People can also substantially affect the quality of spring waters. Agricultural, residential, and industrial pollutants may readily leach through soils, especially when they are improperly applied or disposed. If polluted groundwater infiltrates the deep aquifer feeding a Spring-run Stream, recovery may not be possible. Applications of herbicides to control aquatic plant growth are also detrimental, because their use often induces eutrophication of the stream.

Other human-related impacts to Spring-run Streams include the destruction of aquatic vegetation by overuse or misuse, and the introduction and proliferation of exotic plants and animals. Both of these impacts may be very difficult to control. Overuse is likely to increase because of the limited number of publicly-owned springs and the desires of an increasing population to enjoy their clean, cool, aesthetic qualities and unique recreational opportunities. Exotic species are often severely detrimental to native species, and they may also disrupt recreational activities. A delicate balance between recreation and preservation must be sought.

(79/80) Aquatic and terrestrial cave. - (synonyms: cave, cavern grotto, chamber, chimney, sink, swallow hole, spring rise). Aquatic and Terrestrial Caves are characterized as cavities below the surface of the ground in karst areas of the state. A cave system may contain portions classified as Terrestrial Caves and portions classified as Aquatic Caves. The latter vary from shallow pools highly susceptible to disturbance, to more stable, totally submerged systems. Because all caves initially develop under aquatic conditions, Terrestrial Caves can be considered essentially dry Aquatic Caves. The limestone aquifers that underlie the entire state of Florida could be considered vast Aquatic Cave communities. Troglobites (also called phreatobites) are organisms specially evolved to survive in deep cave habitats. The occasional observation of various species of troglobites in deep water wells from several regions in the state suggests that this community could be widespread. However, the dependence of troglobites on detrital inputs and other nutrients imported from the surface generally limits the distribution of well developed Aquatic Cave communities to karst areas with surface connections.

The area around cave entrances may be densely vegetated with species from the surrounding Natural Community. Within the cave, however, illumination levels and, thereby, vegetation densities drop rapidly with increased distance from the entrance. Within the limits of light penetration, called the twilight zone, species of algae, mosses, liverworts, and an occasional fern or herbaceous plant may grow. Beyond the twilight zone, plants are generally absent or limited to a few inconspicuous species of fungi that grow on guano or other organic debris. Thus, Subterranean Natural Communities differ from most other Natural Communities in that living plants are not dominant elements.

Animals inhabiting Subterranean Natural Communities are generally divided into three groups according to their cave adaptations: troglloxenes, trogllophiles, and troglobites. Troglloxenes spend much of their time in caves, but they must periodically return to the surface to feed or breed. Woodrats, harvestmen, cave crickets, some salamanders, and many species of bats are typical examples of troglloxenes. Trogllophiles may regularly live in caves, but their conspecifics also inhabit surface communities with moist microhabitats. Cave orb spiders, and some crickets, fish and salamanders are typical examples of trogllophiles. Troglobites are obligatory cave dwellers

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with special adaptations for living in complete darkness. Blind cave crayfish, blind cave salamander, cave amphipods, cave shrimp, cave snail, and cave isopods are typical troglobites in Florida's Aquatic Caves; cave mites, some cave spiders and springtails, and a cave earwig are typical troglobites in some Terrestrial Caves in north Florida. Even though they never leave their cave environments, troglobites and troglophiles depend on outside energy sources, such as detritus that washes in through sinkholes and other cave entrances. Fecal materials derived from troglonexes which feed outside the cave are also important nutrients for troglobites. Without these energy subsidies, the troglobitic elements could not exist.

Two geologic processes are predominantly responsible for the development of caves: phreatic and vadose. Phreatic processes occur below the aquifer's surface where ground water is confined and subjected to hydrostatic pressure. Vadose processes occur at the top or above the aquifer, where air enters the passageways and water flows freely under the influence of gravity. In both processes, the dissolution and corrosion of limestone play active roles in enlarging cave passageways. These forces differ primarily in the slopes of the passageways which result. Phreatic passageways are generally circular or elliptic, while vadose passageways are more triangular with the broad base of the triangle at the bottom. All limestone caves begin development under phreatic conditions in the aquifer. As water tables drop, vadose conditions eventually replace phreatic conditions. If the water table then rises, another reversal of processes occurs. Because water tables have fluctuated substantially with fluctuating sea levels during the Pleistocene and other geologic epochs, most caves in Florida exhibit both phreatic and vadose characteristics.

Since limestone caves initially develop in the aquifer, they are frequently associated with aquifer-related surface features. Thus, a Spring Run Stream issues from an Aquatic Cave, while Sinkhole Lakes and occasionally Blackwater Streams lead into Aquatic Caves. Similarly, Terrestrial Caves may occur at the bottoms of dry sinkholes or be associated with ancient springs, swallow holes or Aquatic Caves that have since been exposed by lower water tables. Typically, Terrestrial Caves may also exhibit aquatic conditions during periods of heavy rainfall, or vice versa during droughts. Additionally, Terrestrial Caves may harbor relatively permanent pools or lakes that are formed in natural depressions in the floor of the cave from the buildup of rimstone, or where the aquifer inundates the lower cavities. Thus, Terrestrial and Aquatic Caves often occur together.

Cave waters are generally clear, with deep water appearing bluish. The water may become stained brown from tannins leached from decaying plant matter nearby and carried in with rainwater. The water may also become milky white if fine limestone mud from the bottom of the Aquatic Cave is suspended in the water column following disturbance. A bottom substrate of organic silts can also muddy the water with suspended particles. Waters are generally circumneutral to alkaline with a high mineral content (particularly calcium bicarbonate and magnesium) and with constant temperature. Flowing water within Aquatic Caves generally has a lower pH, is often undersaturated with respect to carbonates, and has a relatively richer fauna. Contrastingly, pools that are fed by seepage or dripping water are generally characterized by a high pH, high concentration of dissolved carbonates, low content of organic matter suitable for food, and a sparse fauna. Cave water characteristics may also vary seasonally because of fluvial inputs from interconnected surface streams, or because of detrital pulses and other surface inputs during periods of substantial aquifer recharge. In general, however, Aquifer Caves are very stable environments with relatively constant physical and chemical characteristics.

Terrestrial Caves also are very stable environments, having relatively constant temperatures and humidities. Within the cave, however, these factors may vary with location. For example, the twilight zone (nearest to the light source) is generally warmer and experiences more temperature

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and humidity fluctuations than does the middle zone, a dark zone that is subject to air circulation due to "cave breathing" phenomena. The deep zone, when it occurs, is the most stable zone of a Terrestrial Cave, because the air in it is essentially static. Terrestrial Cave faunas often partition their distributions according to these zones, with troglloxenes being more common in the twilight and middle zones and troglobites being more common in the deep zone.

Subterranean Natural Communities are extremely fragile. Their faunas are adapted to very stable environments and have a limited ability to survive even minor environmental perturbations. Terrestrial Caves are threatened by disturbances of spelunkers. The mere entry into a bat roosting, maternity, or hibernation cave is often sufficient to cause abandonment by bats, thereby causing a major reduction in an important energy source for the remainder of the cave ecosystem.

Alterations in or around cave entrances will often upset detrital input levels and may also induce significant changes in air circulation patterns and the cave microclimate. Aquatic Caves are threatened by pollution of ground and surface waters from agricultural, industrial, and residential sources, as well as by disturbances from divers. The unique troglobitic species generally have very low population levels and can be severely impacted by overcollection or by changes in nutrient input levels that result from surface manipulations or hydrological alterations. Thus, special precautions and management procedures must be invoked to protect these unique, fragile communities from deleterious activities.

(81/82) Ruderal and developed. - Ruderal areas are characterized by having the natural substrate or the natural community overwhelmingly altered as a result of human activity. Native vegetation is sparse and is often replaced by weedy or exotic species. These areas require a long-term restoration effort.

Developed areas consist of natural biological communities that have been replaced or nearly replaced by structures or permanently cleared areas such as roads, visitor facilities, campgrounds, recreation areas, parking lots or concessions.

Addendum 6--Plant And Animal List

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Plants

Common Name	Scientific Name	Primary Habitat Codes (for designated species)
PTERIDOPHYTES		
Golden polypody	<i>Acrostichum aureum</i>	35
Ebony spleenwort	<i>Asplenium platyneuron</i>	
Japanese climbing fern *	<i>Lygodium japonicum</i>	
Tuberous sword fern *	<i>Nephrolepis cordifolia</i>	
Cinnamon Fern	<i>Osmunda cinnamomea</i>	35
Royal fern	<i>Osmunda regalis</i>	35
Resurrection fern	<i>Polypodium polypodioides</i>	
Bracken fern	<i>Pteridium aquilinum</i>	
Ladder brake *	<i>Pteris vittata</i>	
Netted chain fern	<i>Woodwardia areolata</i>	
Virginia chain fern	<i>Woodwardia virginica</i>	
GYMNOSPERMS		
Southern red cedar	<i>Juniperus silicicola</i>	
Sand pine	<i>Pinus echinata</i>	
Slash pine	<i>Pinus elliottii</i>	
Longleaf pine	<i>Pinus palustris</i>	
Loblolly pine	<i>Pinus taeda</i>	
Pond cypress	<i>Taxodium ascendens</i>	
Bald cypress	<i>Taxodium distichum</i>	
Coontie	<i>Zamia pumila</i>	82
ANGIOSPERMS		
Monocots		
Splitbeard bluestem	<i>Andropogon ternarius</i>	
Broomsedge	<i>Andropogon virginicus</i>	
Greendragon	<i>Arisaema dracontium</i>	
Jack-in-the-pulpit	<i>Arisaema triphyllum</i>	
Wiregrass	<i>Aristida beyrichiana</i>	
European fan palm *	<i>Chamaerops humilis</i>	
----- *	<i>Chryptocoryne wendtii</i>	
Sawgrass	<i>Cladium jamaicense</i>	
Wild taro *	<i>Colocasia esculentum</i>	
Pampas grass *	<i>Cortaderia selloana</i>	
Bermuda grass *	<i>Cynodon dactylon</i>	
Sedge	<i>Cyperus sp.</i>	
Papyrus sedge *	<i>Cyperus papyrus</i>	
Air-potato *	<i>Dioscorea bulbifera</i>	
Spikerush	<i>Eleocharis sp.</i>	
Greenfly orchid	<i>Epidendrum conopseum</i>	21
Centipede grass *	<i>Eremochloa ophiuroides</i>	
Tenangle pipewort	<i>Eriocaulon decangulare</i>	
Longhorn false reinorchid	<i>Habenaria quinqueseta</i>	
Yellow-star grass	<i>Hypoxis juncea</i>	
Hydrilla *	<i>Hydrilla verticillata</i>	
Cogon grass *	<i>Imperata cylindrica</i>	
Carolina redroot	<i>Lachnanthes caroliana</i>	
Bog-buttons	<i>Lachnocaulon anceps</i>	
Duckweed	<i>Lemna minor</i>	

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Plants

Common Name	Scientific Name	Primary Habitat Codes (for designated species)
Border grass *	<i>Liriope muscari</i>	
Panicum	<i>Panicum sp.</i>	
Maidencane	<i>Panicum hemitomon</i>	
Egyptian Paspalidium	<i>Paspalidium geminatum</i>	
Bahiagrass *	<i>Paspalum notatum</i>	
Common reed	<i>Phragmites australis</i>	
Water-lettuce *	<i>Pistia stratiotes</i>	
Curled pondweed *	<i>Potamogeton crispus</i>	
Pondweed	<i>Potamogeton illinoensis</i>	
Pickernelweed	<i>Pontederia cordata</i>	
Clustered beakrush	<i>Rhynchospora fascicularis</i>	
Cabbage palm	<i>Sabal palmetto</i>	
-----	<i>Sagittaria graminea</i>	
-----	<i>Sagittaria lancifolia</i>	
Wapato	<i>Sagittaria latifolia</i>	
Spring-tape	<i>Sagittaria subulata</i>	
Saw palmetto	<i>Serenoa repens</i>	
Greenbrier	<i>Smilax auriculata</i>	
Catbrier	<i>Smilax bona-nox</i>	
Wild sarsaparilla	<i>Smilax glauca</i>	
Catbrier	<i>Smilax laurifolia</i>	
Smutgrass	<i>Sporobolus indicus</i>	
Pineywoods dropseed	<i>Sporobolus junceus</i>	
Yellow hatpins	<i>Syngonanthus flavidulus</i>	
Wild pine	<i>Tillandsia bartramii</i>	35
Ball moss	<i>Tillandsia recurvata</i>	21
Spanish moss	<i>Tillandsia usneoides</i>	
Wandering jew *	<i>Tradescantia fluminensis</i>	
Cattail	<i>Typha sp.</i>	
Tape-grass	<i>Vallisneria americana</i>	
Spanish bayonet *	<i>Yucca aloifolia</i>	
Elephant-ear *	<i>Xanthosoma sagittifolium</i>	
Bear-grass	<i>Yucca flaccida</i>	
Wild rice	<i>Zizania aquatica</i>	
Dicots		
Red maple	<i>Acer rubrum</i>	
Hammock snakeroot	<i>Ageratina jucunda</i>	
Mimosa *	<i>Albizia julibrissin</i>	
Alligator-weed *	<i>Alternanthera philoxeroides</i>	
Ragweed	<i>Ambrosia artemisiifolia</i>	
Pepper vine	<i>Ampelopsis arborea</i>	
Bluestar	<i>Amsonia ciliata</i>	
Devil's-walkingstick	<i>Aralia spinosa</i>	
Ardisia *	<i>Ardisia crenata</i>	
-----	<i>Arnoglossum floridanum</i>	
Red chokeberry	<i>Aronia arbutifolia</i>	
Flag pawpaw	<i>Asimina incarnata</i>	
Long-leafed pawpaw	<i>Asimina longifolia</i>	
Flag pawpaw	<i>Asimina obovata</i>	
Dwarf pawpaw	<i>Asimina pygmaea</i>	

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Plants

Common Name	Scientific Name	Primary Habitat Codes (for designated species)
Pawpaw	<i>Asimina reticulata</i>	
Yellow foxglove	<i>Aureolaria flava</i>	
Hairy foxglove	<i>Aureolaria pectinata</i>	
Groundsel bush	<i>Baccharis halimifolia</i>	
Yellow buttons	<i>Balduina angustifolia</i>	
Tarflower	<i>Befaria racemosa</i>	
Wax begonia *	<i>Begonia cucullata</i>	
Greeneyes	<i>Berlandiera subacaulis</i>	
Beggar-ticks	<i>Bidens alba</i>	
Cross vine	<i>Bignonia capreolata</i>	
False nettle	<i>Boehmeria cylindrica</i>	
Paper mulberry *	<i>Broussonetia papyrifera</i>	
Beautyberry	<i>Callicarpa americana</i>	
Trumpet creeper	<i>Campsis radicans</i>	
Vanilla plant	<i>Carphephorus odoratissimus</i>	
Bluebeech	<i>Carpinus caroliniana</i>	
Pignut hickory	<i>Carya glabra</i>	
Coffee senna *	<i>Cassia occidentalis</i>	
-----	<i>Ceanothus microphyllus</i>	
Hackberry	<i>Celtis laevigata</i>	
Coinwort	<i>Centella asiatica</i>	
Button bush	<i>Cephalanthus occidentalis</i>	
Rosemary	<i>Ceratiola ericoides</i>	
Hornwort	<i>Ceratophyllum demersum</i>	
Redbud	<i>Cercis canadensis</i>	
Mexican Tea	<i>Chenopodium ambrosioides</i>	
Camphor-tree *	<i>Cinnamomum camphora</i>	
Thistle	<i>Cirsium horridulum</i>	
Tread softly	<i>Cnidioscolus stimulosus</i>	
Coleus *	<i>Coleus pumilus</i>	
Roughleaf dogwood	<i>Cornus asperifolia</i>	
Dogwood	<i>Cornus florida</i>	
Swamp dogwood	<i>Cornus foemina</i>	
Summer haw	<i>Crataegus flava</i>	
Rabbit-bells	<i>Crotalaria rotundifolia</i>	
Rabbit-bells *	<i>Crotalaria spectabilis</i>	
Silver croton	<i>Croton argyranthemus</i>	
Titi	<i>Cyrilla racemiflora</i>	
Summer farewell	<i>Dalea pinnata</i>	
Climbing hydrangea	<i>Decumaria barbara</i>	
Creeping beggarweed	<i>Desmodium incanum</i>	
Florida beggarweed	<i>Desmodium tortuosom</i>	
Persimmon	<i>Diospyros virginiana</i>	
Pink sundew	<i>Drosera capillaris</i>	
Silver thorn *	<i>Elaeagnus pungens</i>	
Daisy fleabane	<i>Erigeron strigosus</i>	
Wild buckwheat	<i>Erigonum tomentosum</i>	
Cherokee bean	<i>Erythrina herbacea</i>	
Fragrant eryngo	<i>Eryngium aromaticum</i>	
Strawberry bush	<i>Euonymus americanus</i>	
Dog fennel	<i>Eupatorium capillifolium</i>	

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Plants

Common Name	Scientific Name	Primary Habitat Codes (for designated species)
Dog fennel	<i>Eupatorium compositifolium</i>	
-----	<i>Eupatorium mohrii</i>	
Creeping morning-glory	<i>Evolvulus sericeus</i>	
Pineapple guava *	<i>Feijoa sellowiana</i>	
Creeping fig *	<i>Ficus pumila</i>	
Swamp privet	<i>Forestiera acuminata</i>	
Southern gaura	<i>Gaura angustifolia</i>	
Dwarf huckleberry	<i>Gaylussacia dumosa</i>	
Blue huckleberry	<i>Gaylussacia frondosa</i>	
Yellow jessamine	<i>Gelsemium sempervirens</i>	
Gerbera daisy *	<i>Gerbera jamesonii</i>	
Scrub hedge hyssop	<i>Gratiola hispida</i>	
Rock-rose	<i>Helianthemum corybosum</i>	
Narrow-leaved sunflower	<i>Helianthus angustifolius</i>	
Stiff sunflower	<i>Helianthus radula</i>	
Camphorweed	<i>Heterotheca subaxillaris</i>	
Pennywort	<i>Hydrocotyle umbellata</i>	
St. Andrew's cross	<i>Hypericum hypericoides</i>	
-----	<i>Hypericum myrtifolium</i>	
-----	<i>Hypericum tetrapetalum</i>	
Dahoon holly	<i>Ilex cassine</i>	
Chinese holly *	<i>Ilex cornuta</i>	
Gallberry	<i>Ilex glabra</i>	
American holly	<i>Ilex opaca</i>	
Yaupon holly	<i>Ilex vomitoria</i>	
Star anise	<i>Illicium parviflorum</i>	82
Hairy indigo *	<i>Indigofera hirsuta</i>	
Morning-glory	<i>Ipomoea trichocarpa</i>	
Virginia willow	<i>Itea virginica</i>	
Goldenrain tree *	<i>Koeleruteria elegans</i>	
Sand bur	<i>Krameria lanceolata</i>	
Crape myrtle *	<i>Lagerstroemia indica</i>	
Lantana *	<i>Lantana camara</i>	
Poorman's pepper	<i>Lepidium virginicum</i>	
Hairy bush-clover	<i>Lespedeza hirta</i>	
Gopher apple	<i>Licania michauxii</i>	
Japanese privet *	<i>Ligustrum japonicum</i>	
Glossy privet *	<i>Ligustrum lucidum</i>	
Sweetgum	<i>Liquidambar styraciflua</i>	
Cardinal flower	<i>Lobelia cardinalis</i>	
Japanese honeysuckle *	<i>Lonicera japonica</i>	
Coral honeysuckle	<i>Lonicera sempervirens</i>	
Red ludwigia	<i>Ludwigia repens</i>	
Sky-blue lupine	<i>Lupinus diffusus</i>	
Roserush	<i>Lygodesmia aphylla</i>	
Staggerbush	<i>Lyonia ferruginea</i>	
Fetterbush	<i>Lyonia lucida</i>	
Ashe's magnolia	<i>Magnolia ashei</i>	82
Southern magnolia	<i>Magnolia grandiflora</i>	
Sweetbay	<i>Magnolia virginiana</i>	
Ornamental apple *	<i>Malus x purpurea</i>	

Rainbow Springs State Park

Plants

Common Name	Scientific Name	Primary Habitat Codes (for designated species)
Chinaberry *	<i>Melia azedarach</i>	
White sweet clover *	<i>Melilotus alba</i>	
Partridge berry	<i>Mitchella repens</i>	
Horsemint	<i>Monarda punctata</i>	
Red mulberry	<i>Morus rubra</i>	
Wax myrtle	<i>Myrica cerifera</i>	
Water milfoil	<i>Myriophyllum heterophyllum</i>	
Heavenly bamboo *	<i>Nandina domestica</i>	
Watercress *	<i>Nasturtium officinale</i>	
Black gum	<i>Nyssa sylvatica biflora</i>	
Evening primrose	<i>Oenothera biennis</i>	
Evening primrose	<i>Oenothera laciniata</i>	
Prickly pear	<i>Opuntia humifusa</i>	
Eastern hophornbeam	<i>Ostrya virginiana</i>	
Pine wood sorrel	<i>Oxalis corymbosa</i>	
Skunk vine *	<i>Paederia foetida</i>	
Jerusalem thorn *	<i>Parkinsonia aculeata</i>	
Virginia creeper	<i>Parthenocissus quinquefolia</i>	
Passion flower	<i>Passiflora incarnata</i>	
-----	<i>Penstemon multiflorus</i>	
Redbay	<i>Persea borbonia</i>	
-----	<i>Phoebanthus grandiflora</i>	
Mistletoe	<i>Phoradendron serotinum</i>	
Pokeweed	<i>Phytolacca americana</i>	
Yellow butterwort	<i>Pinguicula lutea</i>	8
Pittosporum *	<i>Pittosporum tobira</i>	
Silk-grass	<i>Pityopsis graminifolia</i>	
Rosy camphorweed	<i>Pluchea rosea</i>	
Podocarpus *	<i>Podocarpus macrophyllus</i>	
Painted-leaf	<i>Poinsettia cyathophora</i>	
Wild bachelor's button	<i>Polygala lutea</i>	
Tall jointweed	<i>Polygonella gracilis</i>	
Chickasaw plum	<i>Prunus angustifolia</i>	
Carolina laurel cherry	<i>Prunus caroliniana</i>	
Black cherry	<i>Prunus serotina</i>	
Firethorn *	<i>Pyracantha coccinea</i>	
Southern red oak	<i>Quercus falcata</i>	
Sand live oak	<i>Quercus geminata</i>	
Laurel oak	<i>Quercus hemisphaerica</i>	
Bluejack oak	<i>Quercus incana</i>	
Turkey oak	<i>Quercus laevis</i>	
Diamondleaf oak	<i>Quercus laurifolia</i>	
Myrtle oak	<i>Quercus myrtifolia</i>	
Water oak	<i>Quercus nigra</i>	
Live oak	<i>Quercus virginiana</i>	
Meadow beauty	<i>Rhexia mariana</i>	
Formosa azalea *	<i>Rhododendron simsii</i>	
Winged sumac	<i>Rhus copallina</i>	
One-leaf Rhynchosia	<i>Rhynchosia michauxii</i>	
Tropical Mexican clover *	<i>Richardia brasiliensis</i>	
Castor-bean *	<i>Ricinus communis</i>	

Rainbow Springs State Park

Plants

Common Name	Scientific Name	Primary Habitat Codes (for designated species)
Sand blackberry	<i>Rubus cuneifolius</i>	
Wild-petunia	<i>Ruellia caroliniensis</i>	
Hastate-leaved dock	<i>Rumex hastatulus</i>	
White sabatia	<i>Sabatia brevifolia</i>	
Lyre-leaved sage	<i>Salvia lyrata</i>	
Elderberry	<i>Sambucus canadensis</i>	
Sassafras	<i>Sassafras albidum</i>	
Lizard's tail	<i>Saururus cernuus</i>	
Sensitive briar	<i>Schrankia microphylla</i>	
Indian hemp	<i>Sida rhombifolia</i>	
Rosin weed	<i>Silphium compositum</i>	
Goldenrod	<i>Solidago sp.</i>	
Hedge nettle	<i>Stachys floridana</i>	
Queen's delight	<i>Stillingia sylvatica</i>	
Golden hoary-pea	<i>Tephrosia chrysophylla</i>	
Carolina basswood	<i>Tilia caroliniana</i>	
Poison ivy	<i>Toxicodendron radicans</i>	
Poison oak	<i>Toxicodendron toxicarium</i>	
Marsh St. John's wort	<i>Triadenum virginicum</i>	
Venus' looking-glass	<i>Triodanis perfoliata</i>	
Florida elm	<i>Ulmus americana floridana</i>	
Caesar's weed *	<i>Urena lobata</i>	
Bladderwort	<i>Utricularia gibba</i>	
Sparkleberry	<i>Vaccinium arboreum</i>	
Highbush blueberry	<i>Vaccinium corymbosum</i>	
Lowbush blueberry	<i>Vaccinium darrowii</i>	
Lowbush blueberry	<i>Vaccinium myrsinites</i>	
Deerberry	<i>Vaccinium stamineum</i>	
----- *	<i>Verbena brasiliensis</i>	
-----	<i>Verbena officinalis var. halei</i>	
Small viburnum	<i>Viburnum obovatum</i>	
Sandankwa viburnum *	<i>Viburnum suspensum</i>	
Summer grape	<i>Vitis aestivalis</i>	
Muscadine grape	<i>Vitis rotundifolia</i>	
Creeping oxeye *	<i>Wedelia trilobata</i>	
Chinese wisteria *	<i>Wisteria sinensis</i>	
Hercules'-club	<i>Zanthoxylum clava-herculis</i>	

Rainbow Springs State Park

Animals

Common Name	Scientific Name	Primary Habitat Codes (for all species)
FISH		
Yellow Bullhead	<i>Ameiurus natalis</i>	55
Bowfin	<i>Amia calva</i>	55
Pirateperch	<i>Aphredoderus sayanus</i>	55
Gizzard Shad	<i>Dorosoma cepedianum</i>	55
Okefenokee Pygmy Sunfish	<i>Elassoma okefenokee</i>	55
Lake Chubsucker	<i>Erimyzon sucetta</i>	55
Seminole Killifish	<i>Fundulus seminolis</i>	55
Eastern Mosquitofish	<i>Gambusia affinis holbrooki</i>	55
Least Killifish	<i>Heterandria formosa</i>	55
Longnose Gar	<i>Lepisosteus ossens</i>	55
Florida Gar	<i>Lepisosteus platyrhincus</i>	55
Redbreast Sunfish	<i>Lepomis auritus</i>	55
Warmouth	<i>Lepomis gulosus</i>	55
Bluegill	<i>Lepomis macrochirus mystacalius</i>	55
Redear Sunfish	<i>Lepomis microlophus</i>	55
Spotted Sunfish	<i>Lepomis punctatus</i>	55
Bluefin Killifish	<i>Lucania goodei</i>	55
Inland Silverside	<i>Menedia beryllina</i>	55
Largemouth Bass	<i>Micropterus salmoides floridanus</i>	55
Golden Shiner	<i>Notemigonus crysoleucas</i>	55
Redeye Chub	<i>Notropis harperi</i>	55
Coastal Shiner	<i>Notropis petersoni</i>	55
Tadpole Madtom	<i>Noturus gyrinus</i>	55
Sailfin Molly	<i>Poecilia latipinna</i>	55
Black Crappie	<i>Pomoxis nigromaculatus</i>	55
Sailfin Shiner	<i>Pteronotopis hypselopterus</i>	55
Atlantic Needlefish	<i>Strongylura marina</i>	55
AMPHIBIANS		
Amphiumas & Sirens		
Two-toed amphiuma	<i>Amphiuma means</i>	
Lesser siren	<i>Siren intermedia</i>	
Salamanders		
Mole salamander	<i>Ambystoma talpoideum</i>	8
Striped newt	<i>Notophthalmus perstriatus</i>	25
Peninsula newt	<i>Notophthalmus viridescens</i>	
Slimy salamander	<i>Plethodon glutinosus</i>	21
Frogs & Toads		
Florida cricket frog	<i>Acris gryllus dorsalis</i>	29
Oak toad	<i>Bufo quercicus</i>	8
Southern toad	<i>Bufo terrestris</i>	13
Eastern narrow-mouth toad	<i>Gastrophryne carolinensis</i>	13
Cope's gray treefrog	<i>Hyla chrysoscelis</i>	35
Green treefrog	<i>Hyla cinerea</i>	21
Pinewoods treefrog	<i>Hyla femoralis</i>	8
Barking treefrog	<i>Hyla gratiosa</i>	13
Squirrel treefrog	<i>Hyla squirella</i>	22
Little grass frog	<i>Limnaea ocularis</i>	8
Southern chorus frog	<i>Pseudacris nigrita nigrita</i>	35

Rainbow Springs State Park

Animals

Common Name	Scientific Name	Primary Habitat Codes (for all species)
Little grass frog	<i>Pseudocris ocularis</i>	
Gopher frog	<i>Rana areolata (capito)</i>	13
Bullfrog	<i>Rana catesbeiana</i>	29
Pig frog	<i>Rana grylio</i>	29
Southern leopard frog	<i>Rana sphenoccephala (utricularia)</i>	35
Eastern spadefoot toad	<i>Scaphiopus holbrooki</i>	13
REPTILES		
Crocodylians		
American alligator	<i>Alligator mississippiensis</i>	55
Turtles		
Florida softshell	<i>Apalone ferox</i>	55
Florida snapping turtle	<i>Chelydra serpentina osceola</i>	55
Chicken turtle	<i>Deirochelys reticularia</i>	55
Gopher tortoise	<i>Gopherus polyphemus</i>	22
Striped mud turtle	<i>Kinosternon bauri</i>	29
Florida mud turtle	<i>Kinosternon subrubrum</i>	29
Suwannee cooter	<i>Pseudemys concinna suwanniensis</i>	55
Peninsula cooter	<i>Pseudemys floridana peninsularis</i>	55
Florida redbelly turtle	<i>Pseudemys nelsoni</i>	55
Loggerhead musk turtle	<i>Sternotherus minor</i>	55
Stinkpot	<i>Sternotherus odoratus</i>	55
Red-eared slider	<i>Trachemys scripta elegans</i>	
Yellow-bellied slider	<i>Trachemys scripta scripta</i>	
Lizards		
Brown anole *	<i>Anolis sagrei</i>	
Carolina anole	<i>Anolis carolinensis</i>	22
Six-lined racerunner	<i>Cnemidophorus sexlineatus</i>	13
Peninsula mole skink	<i>Eumeces egregius onocrepis</i>	13
Southeastern five-lined skink	<i>Eumeces inexpectatus</i>	21
Broadhead skink	<i>Eumeces laticeps</i>	21
Eastern slender glass lizard	<i>Ophisaurus attenuatus</i>	13
Southern fence lizard	<i>Sceloporus undulatus undulatus</i>	22
Ground skink	<i>Scincella lateralis</i>	21
Snakes		
Scarlet snake	<i>Cemophora coccinea</i>	8
Southern black racer	<i>Coluber constrictor priapus</i>	13
Southern ringneck snake	<i>Diadophis punctatus</i>	8
Eastern indigo snake	<i>Drymarchon corais couperi</i>	13
Corn snake	<i>Elaphe guttata guttata</i>	13
Yellow rat snake	<i>Elaphe obsoleta quadrivittata</i>	21
Southern hognose snake	<i>Heterodon simus</i>	13
Scarlet kingsnake	<i>Lampropeltis triangulum elapsoides</i>	13
Eastern coachwhip	<i>Masticophis flagellum</i>	13
Eastern coral snake	<i>Micurus fulvius</i>	13
Florida water snake	<i>Nerodia fasciata pictiventris</i>	29
Brown water snake	<i>Nerodia taxispilota</i>	55
Florida pine snake	<i>Pituophis melanoleucus mugitus</i>	13
North Florida swamp snake	<i>Seminatrix pygaea</i>	25
Florida redbelly snake	<i>Storeria occipitomaculata</i>	21

Rainbow Springs State Park

Animals

Common Name	Scientific Name	Primary Habitat Codes (for all species)
Florida crowned snake	<i>Tantilla relicta neilli</i>	13
Peninsula ribbon snake	<i>Thamnophis sauritus sackeni</i>	25
BIRDS		
Grebes		
Pied-billed grebe	<i>Podilymbus podiceps</i>	55
Darters		
Anhinga	<i>Anhinga anhinga</i>	55
Double-crested cormorant		
Hérons & Bitterns		
Great blue heron	<i>Ardea herodias</i>	55
Cattle egret	<i>Bubulcus ibis</i>	81
Green-backed heron	<i>Butorides striatus</i>	55
Great egret	<i>Casmerodius albus</i>	55
Little blue heron	<i>Egretta caerulea</i>	55
Snowy egret	<i>Egretta thula</i>	55
Tri-colored heron	<i>Egretta tricolor</i>	55
Black-crowned night-heron	<i>Nycticorax nycticorax</i>	
Storks		
Wood stork	<i>Mycteria americana</i>	29
Ibis		
White ibis	<i>Eudocimus albus</i>	55
Ducks & Geese		
Mallard	<i>Anas platyrhynchos</i>	55
Green-winged teal	<i>Anas crecca</i>	55
Blue-winged teal	<i>Anas discors</i>	55
Wood duck	<i>Aix sponsa</i>	35
Redhead	<i>Aythya americana</i>	55
American Vultures		
Turkey vulture	<i>Cathartes aura</i>	MTC
Black vulture	<i>Coragyps atratus</i>	MTC
Hawks, Eagles & Kites		
Sharp-shinned hawk	<i>Accipiter striatus</i>	21
Red-tailed hawk	<i>Buteo jamaicensis</i>	13
Red-shouldered hawk	<i>Buteo lineatus</i>	13
Broad-winged hawk	<i>Buteo platypterus</i>	21
Bald eagle	<i>Haliaeetus leucocephalus</i>	55
Swallow-tailed Kite?		
Mississippi Kite		
Southeastern Kestrel		
Ospreys		
Osprey	<i>Pandion haliaetus</i>	55
Falcons		
American kestrel	<i>Falco sparverius</i>	13
Quails		
Northern bobwhite	<i>Colinus virginianus</i>	13

Rainbow Springs State Park

Animals

Common Name	Scientific Name	Primary Habitat Codes (for all species)
Turkeys		
Wild turkey	<i>Meleagris gallopavo</i>	13
Cranes		
Sandhill crane	<i>Grus canadensis</i>	81
Limpkins		
Limpkin	<i>Aramus guarauna</i>	55
Rails, Gallinules & Coots		
Common moorhen	<i>Gallinula chloropus</i>	55
American coot	<i>Fulica americana</i>	55
Plovers		
Killdeer	<i>Charadrius vociferus</i>	81
Snipes & Sandpipers		
American woodcock	<i>Scolopax minor</i>	21
Common snipe	<i>Gallinago gallinago</i>	29
Greater yellowlegs	<i>Tringa melanoleuca</i>	55
Lesser yellowlegs	<i>Tringa flavipes</i>	55
Gulls & terns		
Ring-billed gull	<i>Larus argentatus</i>	55
Laughing gull	<i>Larus atricilla</i>	55
Doves		
Ground dove	<i>Columbina passerina</i>	13
Mourning dove	<i>Zenaida macroura</i>	MTC
Cuckoos		
Yellow-billed cuckoo	<i>Coccyzus americanus</i>	21
Owls		
Screech owl	<i>Otus asio</i>	21
Barred owl	<i>Strix varia</i>	28
Goatsuckers		
Chuck-will's-widow	<i>Caprimulgus vociferus</i>	21
Common nighthawk	<i>Chordeiles minor</i>	13
Swifts		
Chimney swift	<i>Chaetura pelagica</i>	MTC
Hummingbirds		
Ruby-throated hummingbird	<i>Archilochus colubris</i>	21
Kingfishers		
Belted kingfisher	<i>Ceryle alcyon</i>	55
Woodpeckers		
Northern flicker	<i>Colaptes auratus</i>	13
Pileated woodpecker	<i>Dryocopus pileatus</i>	21
Red-bellied woodpecker	<i>Melanerpes carolinus</i>	13
Red-headed woodpecker	<i>Melanerpes erythrocephalus</i>	13
Downy woodpecker	<i>Picoides pubescens</i>	21
Yellow-bellied sapsucker	<i>Sphyrapicus varius</i>	21
Flycatchers		

Rainbow Springs State Park

Animals

Common Name	Scientific Name	Primary Habitat Codes (for all species)
Acadian flycatcher	<i>Empidonax virescens</i>	21
Great crested flycatcher	<i>Myiarchus crinitus</i>	21
Eastern phoebe	<i>Sayornis phoebe</i>	13
Eastern kingbird	<i>Tyrannus tyrannus</i>	13
Swallows		
Tree swallow	<i>Iridoprocne bicolor</i>	MTC
Purple martin	<i>Progne subis</i>	MTC
Jays & Crows		
American crow	<i>Corvus brachyrhynchos</i>	MTC
Fish crow	<i>Corvus ossifragus</i>	MTC
Blue jay	<i>Cyanocitta cristata</i>	21
Titmice		
Tufted titmouse	<i>Parus bicolor</i>	21
Carolina chickadee	<i>Parus carolinensis</i>	21
Nuthatches		
Brown-headed nuthatch	<i>Sitta pusilla</i>	13
Wrens		
Carolina wren	<i>Thryothorus ludovicianus</i>	21
House wren	<i>Troglodytes aedon</i>	21
Thrashers		
Gray catbird	<i>Dumetella carolinensis</i>	21
Northern mockingbird	<i>Mimus polyglottos</i>	MTC
Brown thrasher	<i>Toxostoma rufum</i>	21
Thrushes		
Hermit thrush	<i>Catharus guttatus</i>	21
Eastern bluebird	<i>Sialis sialis</i>	13
American robin	<i>Turdus migratorius</i>	21
European starling *		
Kinglets & Gnatcatchers		
Blue-gray gnatcatcher	<i>Polioptila caerulea</i>	21
Ruby-crowned kinglet	<i>Regulus calendula</i>	21
Waxwings		
Cedar waxwing	<i>Bombycilla cedrorum</i>	MTC
Shrikes		
Loggerhead shrike	<i>Lanius ludovicianus</i>	13
Vireos		
White-eyed vireo	<i>Vireo griseus</i>	21
Yellow-throated vireo	<i>Vireo flavifrons</i>	21
Red-eyed vireo	<i>Vireo olivaceus</i>	21
Solitary vireo	<i>Vireo solitarius</i>	21
Warblers		
Yellow-rumped warbler	<i>Dendroica coronata</i>	8
Prairie warbler	<i>Dendroica discolor</i>	13
Yellow-throated warbler	<i>Dendroica dominica</i>	21
Palm warbler	<i>Dendroica palmarum</i>	13

Rainbow Springs State Park

Animals

Common Name	Scientific Name	Primary Habitat Codes (for all species)
Yellow warbler	<i>Dendroica petechia</i>	21
Pine warbler	<i>Dendroica pinus</i>	13
Blackpoll warbler	<i>Dendroica striata</i>	21
Common yellowthroat	<i>Geothlypis trichas</i>	35
Black-and-white warbler	<i>Mniotilta varia</i>	21
Northern parula	<i>Parula americana</i>	21
Prothonotary warbler	<i>Protonotaria citrea</i>	35
Ovenbird	<i>Seiurus aurocapillus</i>	21
Louisiana waterthrush	<i>Seiurus motacilla</i>	35
American redstart	<i>Setophaga ruticilla</i>	21
Orange-crowned warbler	<i>Vermivora celata</i>	21
Hooded warbler	<i>Wilsonia citrina</i>	21
Meadowlarks, Blackbirds & Orioles		
Red-winged blackbird	<i>Agelaius phoeniceus</i>	MTC
Brown-headed cowbird *	<i>Molothrus ater</i>	MTC
Boat-tailed grackle	<i>Quiscalus major</i>	35
Common grackle	<i>Quiscalus quiscula</i>	MTC
Eastern meadowlark	<i>Sturnella magna</i>	81
Finches		
American goldfinch		
Tanagers		
Scarlet tanager	<i>Piranga olivacea</i>	21
Summer tanager	<i>Piranga rubra</i>	13
Grosbeaks, Sparrows & Buntings		
Bachman's sparrow	<i>Aimophila aestivalis</i>	13
Grasshopper sparrow	<i>Ammodramus savannarum</i>	81
Northern cardinal	<i>Cardinalis cardinalis</i>	21
American goldfinch	<i>Carduelis tristis</i>	21
Dark-eyed junco	<i>Junco hyemalis</i>	21
Swamp sparrow	<i>Melospiza georgiana</i>	29
Song sparrow	<i>Melospiza melodia</i>	13
Savannah sparrow	<i>Passerculus sandwichensis</i>	81
Rufous-sided towhee	<i>Pipilo erythrophthalmus</i>	13
Vesper sparrow	<i>Poocetes gramineus</i>	81
Chipping sparrow	<i>Spizella passerina</i>	13
Field sparrow	<i>Spizella pusilla</i>	13
White-throated sparrow	<i>Zonotrichia albicollis</i>	21
MAMMALS		
Bats		
Eastern pipistrelle	<i>Pipistrellus subflavus</i>	
Didelphids		
Opossum	<i>Didelphis virginiana</i>	MTC
Insectivores		
Short-tailed shrew	<i>Blarina carolinensis</i>	21
Least shrew	<i>Cryptotis parva</i>	13
Southeastern shrew	<i>Sorex longirostris</i>	21
Eastern mole	<i>Scalopus aquaticus</i>	21

* Non-native Species

Rainbow Springs State Park

Animals

Common Name	Scientific Name	Primary Habitat Codes (for all species)
Edentates		
Nine-banded armadillo*	<i>Dasypus novemcinctus</i>	MTC
Lagomorphs		
Eastern cottontail	<i>Sylvilagus floridanus</i>	13
Rodents		
Southern flying squirrel	<i>Glaucomys volans</i>	21
Grey squirrel	<i>Sciurus carolinensis</i>	MTC
Fox squirrel	<i>Sciurus niger</i>	13
Southeastern pocket gopher	<i>Geomys pinetis</i>	13
Golden mouse	<i>Ochrotomys nuttalli</i>	21
Cotton mouse	<i>Peromyscus gossypinus</i>	21
Old field mouse	<i>Peromyscus polionotus</i>	13
Florida mouse	<i>Peromyscus floridanus</i>	13
Cotton rat	<i>Sigmodon hispidus</i>	
Carnivores		
Raccoon	<i>Procyon lotor</i>	MTC
River otter	<i>Lutra canadensis</i>	55
Bobcat	<i>Lynx rufus</i>	MTC
Striped skunk	<i>Mephitis mephitis</i>	
Gray fox	<i>Urocyon cinereoargenteus</i>	
Artiodactyls		
White-tailed deer	<i>Odocoileus virginianus</i>	MTC
Feral hog *	<i>Sus scrofa</i>	MTC

* Non-native Species

Natural Community Habitat Codes

Terrestrial

1. Beach Dune
2. Bluff
3. Coastal Berm
4. Coastal Rock Barren
5. Coastal Strand
6. Dry Prairie
7. Maritime Hammock
8. Mesic Flatwoods
9. Coastal Grasslands
10. Pine Rockland
11. Prairie Hammock
12. Rockland Hammock
13. Sandhill
14. Scrub
15. Scrubby Flatwoods
16. Shell Mound
17. Sinkhole
18. Slope Forest
19. Upland Glade
20. Upland Hardwood Forest
21. Upland Mixed Forest
22. Upland Pine Forest
23. Xeric Hammock

Palustrine

24. Basin Marsh
25. Basin Swamp
26. Baygall
27. Bog
28. Bottomland Forest
29. Depression Marsh
30. Dome
31. Floodplain Forest
32. Floodplain Marsh
33. Floodplain Swamp
34. Freshwater Tidal Swamp
35. Hydric Hammock
36. Marl Prairie
37. Seepage Slope
38. Slough
39. Strand Swamp
40. Swale
41. Wet Flatwoods
42. Wet Prairie

Lacustrine

43. Clastic Upland Lake
44. Coastal Dune Lake
45. Coastal Rockland Lake

Lacustrine—Continued

46. Flatwood/Prairie Lake
47. Marsh Lake
48. River Floodplain Lake
49. Sandhill Upland Lake
50. Sinkhole Lake
51. Swamp Lake

Riverine

52. Alluvial Stream
53. Blackwater Stream
54. Seepage Stream
55. Spring-Run Stream

Estuarine

56. Estuarine Composite Substrate
57. Estuarine Consolidated Substrate
58. Estuarine Coral Reef
59. Estuarine Grass Bed
60. Estuarine Mollusk Reef
61. Estuarine Octocoral Bed
62. Estuarine Sponge Bed
63. Estuarine Tidal Marsh
64. Estuarine Tidal Swamp
65. Estuarine Unconsolidated Substrate
66. Estuarine Worm Reef

Marine

67. Marine Algal Bed
68. Marine Composite Substrate
69. Marine Consolidated Substrate
70. Marine Coral Reef
71. Marine Grass Bed
72. Marine Mollusk Reef
73. Marine Octocoral Bed
74. Marine Sponge Bed
75. Marine Tidal Marsh
76. Marine Tidal Swamp
77. Marine Unconsolidated Substrate
78. Marine Worm Reef

Subterranean

79. Aquatic Cave
80. Terrestrial Cave

Miscellaneous

81. Ruderal
 82. Developed
- MTC** Many Types Of Communities
OF Overflying

Addendum 7--Designated Species List

Rank Explanations For FNAI Global Rank, FNAI State Rank, Federal Status, And State Status

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 Game and Freshwater Fish 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 man-made 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 and local throughout its range (21-100 occurrences or less than 10,000 individuals) or found locally in a restricted range or vulnerable to extinction of other factors.
G4	=	apparently secure globally (may be rare in parts of range)
G5	=	demonstrably secure globally
GH	=	of historical occurrence throughout its range, may be rediscovered (e.g., ivory-billed woodpecker)
GX	=	believed to be extinct throughout range
GXC	=	extirpated from the wild but still known from captivity or cultivation
G#?	=	tentative rank (e.g., G2?)
G#G#	=	range of rank; insufficient data to assign specific global rank (e.g., G2G3)
G#T#	=	rank of a taxonomic subgroup such as a subspecies or variety; the G portion of the rank refers to the entire species and the T portion refers to the specific subgroup; numbers have same definition as above (e.g., G3T1)
G#Q	=	rank of questionable species - ranked as species but questionable whether it is species or subspecies; numbers have same definition as above (e.g., G2Q)
G#T#Q	=	same as above, but validity as subspecies or variety is questioned.
GU	=	due to lack of information, no rank or range can be assigned (e.g., GUT2).
G?	=	not yet ranked (temporary)
S1	=	Critically imperiled in Florida because of extreme rarity (5 or fewer occurrences or less than 1000 individuals) or because of extreme vulnerability to extinction due to some natural or man-made factor.
S2	=	Imperiled in Florida because of rarity (6 to 20 occurrences or less than 3000 individuals) or because of vulnerability to extinction due to some natural or man-made factor.
S3	=	Either very rare and 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).

**Rank Explanations
For FNAI Global Rank, FNAI State Rank, Federal Status,
And State Status**

S? = not yet ranked (temporary)

LEGAL STATUS

N = Not currently listed, nor currently being considered for listing, by state or federal agencies.

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 which 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 which is likely to become an endangered species within the foreseeable 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.

STATE

Animals

(Listed by the Florida Fish and Wildlife Conservation Commission - FFWCC)

LE = Listed as Endangered Species by the FFWCC. Defined as a species, subspecies, or isolated population which is so rare or depleted in number or so restricted in range of habitat due to any man-made or natural factors that it is in immediate danger of extinction or extirpation from the state, or which may attain such a status within the immediate future.

LT = Listed as Threatened Species by the FFWCC. 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 as a consequence is destined or very likely to become an endangered species within the foreseeable future.

LS = Listed as Species of Special Concern by the FFWCC. 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 which, in the foreseeable 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.

Rainbow Springs State Park

Designated Species

Plants

Common Name/ <i>Scientific Name</i>	<u>Designated Species Status</u>		
	FDA	USFWS	FNAI
Golden polypody <i>Acrostichum aureum</i>	LT		G5, S3
Greenfly orchid <i>Epidendrum canopseum</i>	CE		
Star anise * <i>Illicium parviflorum</i>	LE		G2,S2
Ashe's magnolia * <i>Magnolia ashei</i>	LE		G2,S2
Cinnamon fern <i>Osmunda cinnamomea</i>	CE		
Royal fern <i>Osmunda regalis</i>	CE		
Yellow butterwort <i>Pinguicula lutea</i>	LT		
Coontie * <i>Zamia pumila</i>	CE		

* Introduced as ornamentals

Rainbow Springs State Park

Designated Species

Animals

Common Name/ Scientific Name	Designated Species Status		
	FFWCC	USFWS	FNAI
AMPHIBIANS			
Striped newt <i>Notophthalmus perstriatus</i>			G2G3, S2S3
Gopher frog <i>Rana capito</i>	LS		G4,S3
REPTILES			
American alligator <i>Alligator mississippiensis</i>	LS	T(S/A)	G5, S4
Eastern indigo snake <i>Drymarchon corais couperi</i>	LT	LT	G4T3, S3
Gopher tortoise <i>Gopherus polyphemus</i>	LS		G3, S3
Florida pine snake <i>Pituophis melanoleucus mugitus</i>	LS		G5T3?, S3
Suwannee cooter <i>Pseudemys concinna suwanniensis</i>	LS		G5T3, S3
BIRDS			
Bachman's sparrow <i>Aimophila aestivalis</i>			G3, S3
Limpkin <i>Aramus guarauna</i>	LS		G5, S3
Great Egret <i>Ardea alba</i>			G5, S4
Little Blue Heron <i>Egretta caerulea</i>	LS		G5, S4
Snowy Egret <i>Egretta thula</i>	LS		G5, S4
Tricolored Heron <i>Egretta tricolor</i>	LS		G5, S4
Swallow-tailed Kite <i>Elanoides forficatus</i>			G4, S2S3
White ibis <i>Eudocimus albus</i>	LS		G5,S4
Southeastern kestrel <i>Falco sparverius paulus</i>	LT		G5T3T4, S3?
Bald Eagle <i>Haliaeetus leucocephalus</i>	LT	LT	G4, S3
Osprey <i>Pandion haliaetus</i>			G5, S3S4
Wood stork <i>Mycteria americana</i>	LE	LE	G4, S2
Black-crowned night-heron <i>Nycticorax nycticorax</i>			G5, S3?

Rainbow Springs State Park

Designated Species

Animals

Common Name/ <i>Scientific Name</i>	<u>Designated Species Status</u>		
	FFWCC	USFWS	FNAI
MAMMALS			
Florida mouse <i>Podomys floridanus</i>	LS		G3, S3
Sherman's fox squirrel <i>Sciurus niger shermani</i>	LS		G5T2, S2

Addendum 8--DHR Cultural Management Statement

**Management Procedures For
Archaeological And Historical Sites And Properties
On State -- Owned Or Controlled Lands
(Revised August, 1995)**

A. GENERAL DISCUSSION

Archaeological and historic sites are defined collectively in 267.021(3), F.S., as "historic properties" or "historic resources." They have several essential characteristics that must be recognized in a management program.

First of all, they are a finite and non-renewable resource. Once destroyed, presently existing resources, including buildings, other structures, shipwreck remains, archaeological sites and other objects of antiquity, cannot be renewed or revived. Today, sites in the State of Florida are being destroyed by all kinds of land development, inappropriate land management practices, erosion, looting, and to a minor extent even by well-intentioned professional scientific research (e.g., archaeological excavation). Measures must be taken to ensure that some of these resources will be preserved for future study and appreciation.

Secondly, sites are unique because individually they represent the tangible remains of events that occurred at a specific time and place.

Thirdly, while sites uniquely reflect localized events, these events and the origin of particular sites are related to conditions and events in other times and places. Sites can be understood properly only in relation to their natural surroundings and the activities of inhabitants of other sites. Managers must be aware of this "systemic" character of historic and archaeological sites. Also, it should be recognized that archaeological sites are time capsules for more than cultural history; they preserve traces of past biotic communities, climate, and other elements of the environment that may be of interest to other scientific disciplines.

Finally, the significance of sites, particularly archaeological ones, derives not only from the individual artifacts within them, but equally from the spatial arrangement of those artifacts in both horizontal and vertical planes. When archaeologists excavate, they recover, not merely objects, but also a record of the positions of these objects in relation to one another and their containing matrix (e.g., soil strata). Much information is sacrificed if the so-called "context" of archaeological objects is destroyed or not recovered, and this is what archaeologists are most concerned about when a site is threatened with destruction or damage. The artifacts themselves can be recovered even after a site is heavily disturbed, but the context -- the vertical and horizontal relationships -- cannot. Historic structures also contain a wealth of cultural (socio-economic) data that can be lost if historically sensitive maintenance, restoration or rehabilitation procedures are not implemented, or if they are demolished or extensively altered without appropriate documentation. Lastly, it should not be forgotten that historic structures often have associated potentially significant historic archaeological features that must be considered in land management decisions.

B. STATUTORY AUTHORITY

Chapter 253, Florida Statutes ("State Lands") directs the preparation of "single-use" or "multiple-use" land management plans for all state-owned lands and state-owned sovereignty submerged lands. In this document, 253.034(4), F.S., specifically requires that "all management plans, whether for single-use or multiple-use properties, shall specifically describe how the managing agency plans to identify, locate, protect and preserve, or otherwise use fragile non-renewable resources, such as archaeological and historic sites, as well as other fragile resources..."

Chapter 267, Florida Statutes is the primary historic preservation authority of the state. The importance of protecting and interpreting archaeological and historic sites is recognized in 267.061(1)(a), F.S.: The rich and unique heritage of historic properties in this state, representing more than 10,000 years of human presence, is an important legacy to be valued and conserved for present and future generations. The destruction of these nonrenewable historic resources will engender a significant loss to the state's quality of life, economy, and cultural environment. It is

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therefore declared to be state policy to:

1. Provide leadership in the preservation of the state's historic resources; [and]
2. Administer state-owned or state-controlled historic resources in a spirit of stewardship and trusteeship;...

Responsibilities of the Division of Historical Resources in the Department of State pursuant to 267.061(3), F.S., include the following:

1. Cooperate with federal and state agencies, local Governments, and private organizations and individuals to direct and conduct a comprehensive statewide survey of historic resources and to maintain an inventory of such responses.
2. Develop a comprehensive statewide historic preservation plan.
3. Identify and nominate eligible properties to the National Register of Historic Places and otherwise administer applications for listing properties in the National Register of Historic Places.
4. Cooperate with federal and state agencies, local governments, and organizations and individuals to ensure that historic resources are taken into consideration at all levels of planning and development.
5. Advise and assist, as appropriate, federal and state agencies and local governments in carrying out their historic preservation responsibilities and programs.
6. Carry out on behalf of the state the programs of the National Historic Preservation Act of 1966, as amended, and to establish, maintain, and administer a state historic preservation program meeting the requirements of an approved program and fulfilling the responsibilities of state historic preservation programs as provided in subsection 101(b) of that act.
7. Take such other actions necessary or appropriate to locate, acquire, protect, preserve, operate, interpret, and promote the location, acquisition, protection, preservation, operation, and interpretation of historic resources to foster an appreciation of Florida history and culture. Prior to the acquisition, preservation, interpretation, or operation of a historic property by a state agency, the Division shall be provided a reasonable opportunity to review and comment on the proposed undertaking and shall determine that there exists historic authenticity and a feasible means of providing for the preservation, interpretation and operation of such property.
8. Establish professional standards for the preservation, exclusive of acquisition, of historic resources in state ownership or control.
9. Establish guidelines for state agency responsibilities under subsection (2).

Responsibilities of other state agencies of the executive branch, pursuant to 267.061(2), F.S., include:

1. Each state agency of the executive branch having direct or indirect jurisdiction over a proposed state or state-assisted undertaking shall, in accordance with state policy and prior to the approval of expenditure of any state funds on the undertaking, consider the effect of the undertaking on any historic property that is included in, or eligible for inclusion in, the National Register of Historic Places. Each such agency shall afford the division a reasonable opportunity to comment with regard to such an undertaking.
2. Each state agency of the executive branch shall initiate measures in consultation with the division to assure that where, as a result of state action or assistance carried out by such agency, a historic property is to be demolished or substantially altered in a way that adversely affects the character, form, integrity, or other qualities that contribute to [the] historical, architectural, or archaeological value of the property, timely steps are taken to determine that no feasible and prudent alternative to the proposed demolition or alteration exists, and, where no such alternative is determined to exist, to assure that timely steps are taken either to avoid

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or mitigate the adverse effects, or to undertake an appropriate archaeological salvage excavation or other recovery action to document the property as it existed prior to demolition or alteration.

3. In consultation with the division [of Historical Resources], each state agency of the executive branch shall establish a program to locate, inventory, and evaluate all historic properties under the agency's ownership or control that appear to qualify for the National Register. Each such agency shall exercise caution to assure that any such historic property is not inadvertently transferred, sold, demolished, substantially altered, or allowed to deteriorate significantly.
4. Each state agency of the executive branch shall assume responsibility for the preservation of historic resources that are owned or controlled by such agency. Prior to acquiring, constructing, or leasing buildings for the purpose of carrying out agency responsibilities, the agency shall use, to the maximum extent feasible, historic properties available to the agency. Each agency shall undertake, consistent with preservation of such properties, the mission of the agency, and the professional standards established pursuant to paragraph (3)(k), any preservation actions necessary to carry out the intent of this paragraph.
5. Each state agency of the executive branch, in seeking to acquire additional space through new construction or lease, shall give preference to the acquisition or use of historic properties when such acquisition or use is determined to be feasible and prudent compared with available alternatives. The acquisition or use of historic properties is considered feasible and prudent if the cost of purchase or lease, the cost of rehabilitation, remodeling, or altering the building to meet compliance standards and the agency's needs, and the projected costs of maintaining the building and providing utilities and other services is less than or equal to the same costs for available alternatives. The agency shall request the division to assist in determining if the acquisition or use of a historic property is feasible and prudent. Within 60 days after making a determination that additional space is needed, the agency shall request the division to assist in identifying buildings within the appropriate geographic area that are historic properties suitable for acquisition or lease by the agency, whether or not such properties are in need of repair, alteration, or addition.
6. Consistent with the agency's mission and authority, all state agencies of the executive branch shall carry out agency programs and projects, including those under which any state assistance is provided, in a manner which is generally sensitive to the preservation of historic properties and shall give consideration to programs and projects which will further the purposes of this section.

Section 267.12 authorizes the Division to establish procedures for the granting of research permits for archaeological and historic site survey or excavation on state-owned or controlled lands, while Section 267.13 establishes penalties for the conduct of such work without first obtaining written permission from the Division of Historical Resources. The Rules of the Department of State, Division of Historical Resources, for research permits for archaeological sites of significance are contained in Chapter 1A-32, F.A.C.

Another Florida Statute affecting land management decisions is Chapter 872, F.S. Section 872.02, F.S., pertains to marked grave sites, regardless of age. Many state-owned properties contain old family and other cemeteries with tombstones, crypts, etc. Section 872.05, F.S., pertains to unmarked human burial sites, including prehistoric and historic Indian burial sites. Unauthorized disturbance of both marked and unmarked human burial site is a felony.

C. MANAGEMENT POLICY

The choice of a management policy for archaeological and historic sites within state-owned or controlled land obviously depends upon a detailed evaluation of the characteristics and conditions of the individual sites and groups of sites within those tracts. This includes an interpretation of the

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significance (or potential significance) of these sites, in terms of social and political factors, as well as environmental factors. Furthermore, for historic structures architectural significance must be considered, as well as any associated historic landscapes.

Sites on privately owned lands are especially vulnerable to destruction, since often times the economic incentives for preservation are low compared to other uses of the land areas involved. Hence, sites in public ownership have a magnified importance, since they are the ones with the best chance of survival over the long run. This is particularly true of sites that are state-owned or controlled, where the basis of management is to provide for land uses that are minimally destructive of resource values.

It should be noted that while many archaeological and historical sites are already recorded within state--owned or controlled--lands, the majority of the uplands areas and nearly all of the inundated areas have not been surveyed to locate and assess the significance of such resources. The known sites are, thus, only an incomplete sample of the actual resources - i.e., the number, density, distribution, age, character and condition of archaeological and historic sites - on these tracts. Unfortunately, the lack of specific knowledge of the actual resources prevents formulation of any sort of detailed management or use plan involving decisions about the relative historic value of individual sites. For this reason, a generalized policy of conservation is recommended until the resources have been better addressed.

The generalized management policy recommended by the Division of Historical Resources includes the following:

1. State land managers shall coordinate all planned activities involving known archaeological or historic sites or potential site areas closely with the Division of Historical Resources in order to prevent any kind of disturbance to significant archaeological or historic sites that may exist on the tract. Under 267.061(1)(b), F.S., the Division of Historical Resources is vested with title to archaeological and historic resources abandoned on state lands and is responsible for administration and protection of such resources. The Division will cooperate with the land manager in the management of these resources. Furthermore, provisions of 267.061(2) and 267.13, F.S., combined with those in 267.061(3) and 253.034(4), F.S., require that other managing (or permitting) agencies coordinate their plans with the Division of Historical Resources at a sufficiently early stage to preclude inadvertent damage or destruction to known or potentially occurring, presently unknown archaeological and historic sites. The provisions pertaining to human burial sites must also be followed by state land managers when such remains are known or suspected to be present (see 872.02 and 872.05, F.S., and 1A-44, F.A.C.)
2. Since the actual resources are so poorly known, the potential impact of the managing agency's activities on historic archaeological sites may not be immediately apparent. Special field survey for such sites may be required to identify the potential endangerment as a result of particular management or permitting activities. The Division may perform surveys, as its resources permit, to aid the planning of other state agencies in their management activities, but outside archaeological consultants may have to be retained by the managing agency. This would be especially necessary in the cases of activities contemplating ground disturbance over large areas and unexpected occurrences. It should be noted, however, that in most instances Division staff's knowledge of known and expected site distribution is such that actual field surveys may not be necessary, and the project may be reviewed by submitting a project location map (preferably a 7.5 minute U.S.G.S. Quadrangle map or portion thereof) and project descriptive data, including detailed construction plans. To avoid delays, Division staff should be contacted to discuss specific project documentation review needs.
3. In the case of known significant sites, which may be affected by proposed project activities,

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the managing agency will generally be expected to alter proposed management or development plans, as necessary, or else make special provisions to minimize or mitigate damage to such sites.

4. If in the course of management activities, or as a result of development or the permitting of dredge activities (see 403.918(2)(6)a, F.S.), it is determined that valuable historic or archaeological sites will be damaged or destroyed, the Division reserves the right, pursuant to 267.061(1)(b), F.S., to require salvage measures to mitigate the destructive impact of such activities to such sites. Such salvage measures would be accomplished before the Division would grant permission for destruction of the affected site areas. The funding needed to implement salvage measures would be the responsibility of the managing agency planning the site destructive activity. Mitigation of historic structures at a minimum involves the preparation of measured drawings and documentary photographs. Mitigation of archaeological resources involves the excavation, analysis and reporting of the project findings and must be planned to occur sufficiently in advance to avoid project construction delays. If these services are to be contracted by the state agency, the selected consultant will need to obtain an Archaeological Research Permit from the Division of Historical Resources, Bureau of Archaeological Research (see 267.12, F.S. and Rules 1A-32 and 1A-46 F.A.C.).
5. For the near future, excavation of non-endangered (i.e., sites not being lost to erosion or development) archaeological site is discouraged. There are many endangered sites in Florida (on both private and public lands) in need of excavation because of the threat of development or other factors. Those within state-owned or controlled lands should be left undisturbed for the present - with particular attention devoted to preventing site looting by "treasure hunters". On the other hand, the archaeological and historic survey of these tracts is encouraged in order to build an inventory of the resources present, and to assess their scientific research potential and historic or architectural significance.
6. The cooperation of land managers in reporting sites to the Division that their field personnel may discover is encouraged. The Division will help inform field personnel from other resource managing agencies about the characteristics and appearance of sites. The Division has initiated a cultural resource management training program to help accomplish this. Upon request the Division will also provide to other agencies archaeological and historical summaries of the known and potentially occurring resources so that information may be incorporated into management plans and public awareness programs (See Management Implementation).
7. Any discovery of instances of looting or unauthorized destruction of sites must be reported to the agent for the Board of Trustees of the Internal Improvement Trust Fund and the Division so that appropriate action may be initiated. When human burial sites are involved, the provisions of 872.02 and 872.05, F. S. and Rule 1A-44, F.A.C., as applicable, must also be followed. Any state agent with law enforcement authority observing individuals or groups clearly and incontrovertibly vandalizing, looting or destroying archaeological or historic sites within state-owned or controlled lands without demonstrable permission from the Division will make arrests and detain those individuals or groups under the provisions of 267.13, 901.15, and 901.21, F.S., and related statutory authority pertaining to such illegal activities on state-owned or controlled lands. County Sheriffs' officers are urged to assist in efforts to stop and/or prevent site looting and destruction.

In addition to the above management policy for archaeological and historic sites on state-owned land, special attention shall be given to those properties listed in the National Register of Historic Places and other significant buildings. The Division recommends that the Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings (Revised 1990) be followed for such sites.

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The following general standards apply to all treatments undertaken on historically significant properties.

1. A property shall be used for its historic purpose or be placed in a new use that requires minimal change to the defining characteristics of the building and its site and environment.
2. The historic character of a property shall be retained and preserved. The removal of historic materials or alterations of features and spaces that characterize a property shall be avoided.
3. Each property shall be recognized as a physical record of its time, place and use. Changes that create a false sense of historical development, such as adding conjectural features or architectural elements from other buildings, shall not be undertaken.
4. Most properties change over time; those changes that have acquired historic significance in their own right shall be retained and preserved.
5. Distinctive features, finishes, and construction techniques or examples of craftsmanship that characterize a historic property shall be preserved.
6. Deteriorated historic features shall be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature shall match the old in design, color, texture, and other visual qualities and, where possible, materials. Replacement of missing features shall be substantiated by documentary, physical, or pictorial evidence.
7. Chemical or physical treatments, such as sandblasting, that cause damage to historic materials shall not be used. The surface cleaning of structures, if appropriate, shall be undertaken using the gentlest means possible.
8. Significant archaeological resources affected by a project shall be protected and preserved. If such resources must be disturbed, mitigation measures shall be undertaken.
9. New additions, exterior alterations, or related new construction shall not destroy materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment.
10. New additions and adjacent or related new construction shall be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired. (see Secretary of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings [Revised 1990]).

Divisions of Historical Resources staff are available for technical assistance for any of the above listed topics. It is encouraged that such assistance be sought as early as possible in the project planning.

D. MANAGEMENT IMPLEMENTATION

As noted earlier, 253.034(4), F.S., states that "all management plans, whether for single-use or multiple-use properties, shall specifically describe how the managing agency plans to identify, locate, protect and preserve, or otherwise use fragile non-renewable resources, such as archaeological and historic sites..." The following guidelines should help to fulfill that requirement.

1. All land managing agencies should contact the Division and send U.S.G.S. 7.5 minute quadrangle maps outlining the boundaries of their various properties.
2. The Division will in turn identify site locations on those maps and provide descriptions for known archaeological and historical sites to the managing agency.
3. Further, the Division may also identify on the maps areas of high archaeological and historic site location probability within the subject tract. These are only probability zones, and sites may be found outside of these areas. Therefore, actual ground inspections of project areas

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may still be necessary.

4. The Division will send archaeological field recording forms and historic structure field recording forms to representatives of the agency to facilitate the recording of information on such resources.
5. Land managers will update information on recorded sites and properties.
6. Land managers will supply the Division with new information as it becomes available on previously unrecorded sites that their staff locate. The following details the kind of information the Division wishes to obtain for any new sites or structures that the land managers may report:

A. Historic Sites

- (1) Type of structure (dwelling, church, factory, etc.).
- (2) Known or estimated age or construction date for each structure and addition.
- (3) Location of building (identify location on a map of the property, and building placement, i.e., detached, row, etc.).
- (4) General Characteristics: (include photographs if possible) overall shape of plan (rectangle, "L" "T" "H" "U", etc.); number of stories; number of vertical divisions of bays; construction materials (brick, frame, stone, etc.); wall finish (kind of bond, coursing, shingle, etc.); roof shape.
- (5) Specific features including location, number and appearance of:
 - (a) Important decorative elements;
 - (b) Interior features contributing to the character of the building;
 - (c) Number, type, and location of outbuildings, as well as date(s) of construction;
 - (d) Notation if property has been moved;
 - (e) Notation of known alterations to building.

B. Archaeological Sites

- (1) Site location (written narrative and mapped location).
- (2) Cultural affiliation and period.
- (3) Site type (midden, burial mound, artifact scatter, building rubble, etc.).
- (4) Threats to site (deterioration, vandalism, etc.).
- (5) Site size (acreage, square meters, etc.).
- (6) Artifacts observed on ground surface (pottery, bone, glass, etc.).
- (7) Description of surrounding environment.
7. No land disturbing activities should be undertaken in areas of known archaeological or historic sites or areas of high site probability without prior review by the Division early in the project planning.
8. Ground disturbing activities may proceed elsewhere but land managers should stop disturbance in the immediate vicinity of artifact finds and notifies the Division if previously unknown archaeological or historic remains are uncovered. The provisions of Chapter 872, F.S., must be followed when human remains are encountered.
9. Excavation and collection of archaeological and historic sites on state lands without a permit from the Division are a violation of state law and shall be reported to a law enforcement officer. The use of metal detectors to search for historic artifacts shall be prohibited on state lands except when authorized in a 1A-32, F.A.C., research permit from the Division.
10. Interpretation and visitation which will increase public understanding and enjoyment of archaeological and historic sites without site destruction or vandalism is strongly encouraged.
11. Development of interpretive programs including trails, signage, kiosks, and exhibits is encouraged and should be coordinated with the Division.
12. Artifacts found or collected on state lands are by law the property of the Division. Land

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(Revised August, 1995)**

managers shall contact the Division whenever such material is found so that arrangements may be made for recording and conservation. This material, if taken to Tallahassee, can be returned for public display on a long term loan.

E. ADMINISTERING AGENCY

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

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

Contact Person:

Susan M. Harp
Historic Preservation Planner
Telephone (850) 487-2333
Suncom 277-2333
FAX (850) 922-0496

Addendum 9--Priority Schedule And Cost Estimates

Rainbow Springs State Park
Priority Schedule And Cost Estimates

Estimates are developed for the funding and staff resources needed to implement the management plan based on goals, objectives and priority management activities. Funding priorities for all state park management and development activities are reviewed each year as part of the Division's legislative budget process. The Division prepares an annual legislative budget request based on the priorities established for the entire state park system. The Division also aggressively pursues a wide range of other funds and staffing resources, such as grants, volunteers, and partnerships with agencies, local governments and the private sector for supplementing normal legislative appropriations to address unmet needs. The ability of the Division to implement the specific goals, objectives and priority actions identified in this plan will be determined by the availability of funding resources for these purposes.

Natural Resources

1. Design and implement a comprehensive baseline data collection and monitoring study of the environmental impacts of tubing recreation on the river that may result from management and development recommendations of this plan, in cooperation with CAMA staff and others:
Initial surveys and monitoring program design: \$100,000; ongoing monitoring and database management: \$40,000 annually.
2. Develop ongoing monitoring plan for the headsprings; Protect and restore native aquatic plants in headsprings; Control spread of hydrilla in disturbed areas of headsprings. 0-5 years.
Estimated Cost (in cooperation with CAMA staff): \$10,000.
3. Continue to remove invasive exotic plants and animals; increase outreach programs to educate neighbors and visitors. 0-5 years. **Estimated Cost: \$100,000.**
4. Continue to renovate the ornamental gardens. 0-5 years. **Estimated Cost: \$200,000**
5. Continue active prescribed burning program averaging 5-6 burns (250 - 300 acres) per year. 0-5 years. Average of \$6,800/year for personnel and \$5,500/year for equipment. **Estimated Cost: \$61,500.**
6. Initiate sandhill restoration in pasture and nursery areas. 0-5 years. **Estimated Cost: \$50,000.**
7. Design and implement erosion control measures. Includes use of designated access points, vegetation plantings, and shoreline access structures along riverbanks. 0-5 years. **Estimated Cost: \$20,000.**
8. Improve stormwater management in developed areas of the headsprings and campground; restore natural hydrology of hydric hammock adjacent to campground. 0-5 years. **Estimated Cost: \$100,000.**
9. Remove non-essential structures and scrap piles; restore natural vegetation in these areas. 0-5 years. **Estimated Cost: \$25,000.**

Natural Resources Total: **\$826,500.**
(includes 4 years of tubing recreation monitoring study)

Cultural Resources

1. Preserve and monitor archaeological and historic sites for vandalism, unauthorized digging, erosion, or other encroachments; implement cyclical maintenance and monitoring programs; stabilize historic structures. 0-5 years. **Estimated Cost: \$75,000.**
2. Formalize and properly curate park collections; develop a formal Scope of Collections Statement. 0-5 years. **Estimated Cost: \$2,000.**
3. Document unrecorded cultural sites and pursue funding for a Phase II archaeological survey. 0-5 years. **Estimated Cost: \$50,000.**

Cultural Resources Total: **\$127,000.**

Rainbow Springs State Park
Priority Schedule And Cost Estimates

Operational

1. Pursue two additional staff to provide support for new park operations, specifically the 100+ site campground currently operated by Marion County. 1-5 years. \$80,000 per year. Estimated Cost: \$320,000.
2. Pursue two additional staff to provide supervisory and operational support for new park operations, specifically a new tube launch, tube takeout and tram system. 2-5 years. \$80,000 per year. Estimated Cost: \$240,000.
3. Maintain secure park boundary. Includes posting and fencing boundaries as well as any necessary boundary surveys. 0-5 years. **Estimated Cost: \$15,000.**
4. Continue the development and distribution of interpretive materials and displays. Includes updating and continuing all publications and programs 0-5 years. **Estimated Cost: \$20,000.**

Operational Total: **\$595,000.**

**Rainbow Springs State Park
Priority Schedule And Cost Estimates**

Item	Quantity	Unit	Unit Price	Multiplier	Amount
Headsprings Area					
Nature Trail	15840.000	LF	\$2.00	1.00	\$31,680.00
Small Ranger Station	1.000	ea.	\$45,000.00	1.00	\$45,000.00
Southern Parcel					
Tram Road	1.250	mile	\$70,000.00	1.00	\$87,500.00
Southern Parcel Camping/Day Use Area					
6 Ft. Elevated Boardwalk	100.000	LF	\$165.00	1.00	\$16,500.00
Campsite Restroom	2.000	ea.	\$200,000.00	1.00	\$400,000.00
Large Picnic Shelter	3.000	ea.	\$60,000.00	1.00	\$180,000.00
Large Ranger Station	1.000	ea.	\$115,000.00	1.00	\$115,000.00
New Paved Parking (10 Car)	5.000	per 10	\$12,000.00	1.00	\$60,000.00
Shuttle Station	1.000	ea.	\$75,000.00	1.00	\$75,000.00
Small Picnic Shelter	2.000	ea.	\$21,000.00	1.00	\$42,000.00
Standard Camping Area	2.000	ea.	\$500,000.00	1.00	\$1,000,000.00
Tube Launch	1.000	LS	\$20,000.00	1.00	\$20,000.00
Southern Parcel Tube Landing Area					
6 Ft. Asphalt Path	200.000	LF	\$10.00	1.00	\$2,000.00
6 Ft. Boardwalk	400.000	LF	\$75.00	1.00	\$30,000.00
New Paved Parking (10 Car)	10.000	per 10	\$12,000.00	1.00	\$120,000.00
Paved Road & Clearing	0.100	mile	\$320,000.00	1.00	\$32,000.00
Tram Station w/ Restroom	1.000	ea.	\$250,000.00	1.00	\$250,000.00
Tube Takeout	1.000	LS	\$70,000.00	1.00	\$70,000.00
Sub-Total					\$2,576,680.00
20 % Contingency Fee					\$515,336.00
Total					\$3,092,016.00

NOTE: These preliminary cost estimates, based on Divisions standards, do not include costs for site-specific elements not evident at the conceptual level of planning. Additional costs should be investigated before finalizing budget estimates.

Addendum 10--Final Land Management Review Report
LMR Review Date--August 23, 2000

**Rainbow Springs State Park
Final Land Management Review Report
LMR Review Date--August 23, 2000**

Agency Represented	Team Member Appointed	Team Member In Attendance
DEP/DRP	Mr. Dan Pearson	Mr. Dan Pearson
DEP District Beck	Ms. Dianne McCommons-Beck	Ms. Dianne McCommons-
DACS/DOF	Mr. Bill Korn	Mr. Bill Korn
FWC	Ms. Nancy Dwyer	Ms. Nancy Dwyer
Marion County Commission	Ms. Rebecca Bitter	Ms. Rebecca Bitter
Private Land Manager	Mr. Bob Cubbage	No Show
Private Conservation Org.		
Friends of Rainbow Springs	Martha Vest	Martha Vest
Marion County Soil and Water Conservation District	Dr. Ed Anderson	No Show

Process for Implementing Regional Management Review Teams

Legislative Intent and Guidance:

Chapter 259.036, F. S. was enacted in 1997 to determine whether conservation, preservation, and recreation lands owned by the state Board of Trustees of the Internal Improvement Trust Fund (Board) are being managed properly. It directs the Department of Environmental Protection (DEP) to establish land management review teams to 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, and archaeological features. The teams 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. If a land management plan has not been adopted, the review shall consider 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 are in compliance with the management policy statement and management prospectus for that property. If the land management review team determines that reviewed lands are not being managed for the purposes for which they were acquired or in compliance with the adopted land management plan, management policy statement, or management prospectus, DEP shall provide the review findings to the Board, and the managing agency must report to the Board its reasons for managing the lands as it has. A report of the review findings are given to the managing agency under review, the Acquisition and Restoration Council (ARC), and to the Division of State Lands. Also, DEP shall report the annual review findings of its land management review teams to the Board no later than the second board meeting in October of each year.

Review Site

The management review of the Rainbow Springs State Park considered approximately 1,019 acres in Marion County that are managed by the Division of Recreation & Parks. The team evaluated the extent to which current management actions are sufficient, whether the land is being managed for the purpose for which it was acquired, and whether actual management practices, including public access, are in compliance with the management plan. The Division of State Lands approved the management plan on October 25, 1996 and the management plan update is due October 25, 2001.

Review Team Determination

- 1. Is the land being managed for the purpose for which it was acquired?** All team members agreed that Rainbow Springs State Park is being managed for the purpose for which it was acquired.

**Rainbow Springs State Park
Final Land Management Review Report
LMR Review Date--August 23, 2000**

2. **Are actual management practices, including public access, in compliance with the management plan?** All team members agreed that actual management practices, including public access, were in compliance with the management plan for this site.

Commendations To The Managing Agency

The following commendations resulted from a discussion and vote of review team members

1. The team commends the park staff for providing a high caliber of visitor services under a high level of duress.
2. The team commends the park staff and volunteers for their initial efforts to control exotics and for cleaning up what had been an abandoned site for many years.

Exceptional Management Actions

The following items received high scores on the review team checklist which indicates that management actions exceeded expectations.

1. Non-native and invasive species control (Plants)

Recommendations And Checklist Findings

Recommendations

The following recommendations resulted from a discussion and vote of review team members.

1. The team recommends that DRP collect and monitor biological data in order to evaluate impacts of human use at headspring/swimming area and adjust their public use practices and/or carrying capacities to minimize degradation.

Response: Agree. District and park staff will expand existing photo point monitoring of headspring vegetation within and adjacent to the swimming area. A series of line transects will also be initiated to quantitatively track vegetation changes. Impacts to the existing vegetation within the boundaries of the swimming area were expected to occur once the swimming area became active. We will continue to coordinate our monitoring efforts with those conducted by the Aquatic Preserve staff.

2. The team recommends that the Park Service include the pastures in their control burning program.

Response: Agree. The pastures have always been included within a prescribed burn zone; however, they have been a lower priority for burning than adjacent areas that retain high quality native groundcovers. The pastures will be burned as soon as is practical given their priority within the park's burn plan.

3. The team recommends that a more detailed, follow up, recreational use study be performed on the river to include: navigability issues, carrying capacity, user conflicts and economic impact.

Response: Disagree. While a follow up study on the recreational use of the Rainbow River would be useful, management of the Rainbow River downstream of the headspring area more properly falls to the Office of Coastal and Aquatic Managed Areas and to Marion County and not DRP. If it is determined that a follow up study is needed, it should be handled by those two entities with the cooperation of the DRP.

4. The team recommends that DRP bring FTE Staff in the park up to levels recommended in the unit management plan.

Response: Agree. Additional staffing is recommended in the UMP. However, no new staff can be assigned to this or any park unit unless the new positions are appropriated by the Legislature or reassigned from other units. Additional staff is needed by our parks

Rainbow Springs State Park
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statewide which is why we regularly seek positions, volunteers, and partners to help us overcome staff deficiencies.

5. The team recommends that the Division of State Lands and DRP more aggressively pursue acquisition of the properties indicated on the parks optimum boundary map to protect lands from development and to establish a wildlife corridor that connect's to the Cross Florida Greenway and lands to the north of SR 40.

Response: Agree. The DRP has aggressively pursued lands within the park's Optimum Boundary with some level of success. Unfortunately, acquisition of the lands required to form a public land connection to the Cross Florida Greenway has not been possible despite DRP efforts. Efforts to bridge the gap between the two halves of the park have also not been as successful as had been hoped. DRP will continue to pursue acquisition of lands within the Optimum Boundary, including the undeveloped lands that extend to the north of the park.

Checklist Findings

The following items received low scores on the review team checklist (see attachment 1), Which indicates that management actions were insufficient (f) or that the issue was not sufficiently addressed in the management plan (p). These items need to be addressed in the management plan update.

1. Prescribed fire (natural community maintenance): Area being burned, frequency & quality. (p)

Response: Agree. The next updated UMP will include additional information concerning the prescribed fire program at the park. The current UMP does not adequately address the prescribed fire needs of the properties added to the park boundaries since development of the existing plan.

2. Management resources: Staff and funding. (f)

Response: Agree. The park would benefit from increased staffing and funding. Additional staffing is recommended in the UMP. However, no new staff can be assigned to this or any park unit unless the new positions are appropriated by the Legislature or reassigned from other units. Additional staff is needed by our parks statewide which is why we regularly seek positions, volunteers, and partners to help us overcome staff deficiencies. Funding is determined annually by the Florida Legislature and the Governor and Cabinet.