

**WINDLEY KEY FOSSIL REEF GEOLOGICAL
STATE PARK**

UNIT MANAGEMENT PLAN

APPROVED

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

MAY 23, 2003



Department of Environmental Protection

Jeb Bush
Governor

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

David B. Struhs
Secretary

May 23, 2003

Ms. BryAnne White
Government Operations Consultant II
Office of Park Planning
Division of Recreation and Parks

Windley Key Fossil Reef Geological State Park

Lease Number: # 3453

Dear Ms. White:

The Division of State Lands has completed the review of the Windley Key Fossil Reef Geological State Park Land Management Plan and find that it fulfills all the requirements of Rule 18-2.021, F.A.C., and ss. 253.034 and 259.032, F.S. Therefore, on May 23, 2003, the Office of Environmental Services, acting as agent for the Board of Trustees of the Internal Improvement Trust Fund approves this plan. The plan's five-year update will be due in May 2008.

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

"More Protection, Less Process"

Printed on recycled paper.

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INTRODUCTION

Windley Key Fossil Reef Geological State Park is located in Monroe County at milemarker 85 on U.S. Highway 1. Access to the park is directly off Route 1 (see Vicinity Map). The vicinity map also reflects significant land and water resources existing near the park.

For this plan, park acreage has been calculated based on the composition of natural communities, in addition to ruderal and developed areas. Currently the park contains approximately 32 acres.

Windley Key Fossil Reef Geological State Park is designated single-use to provide resource-based public outdoor recreation and other related uses (see Addendum 1). There are no legislative or executive directives that constrain the use of this property.

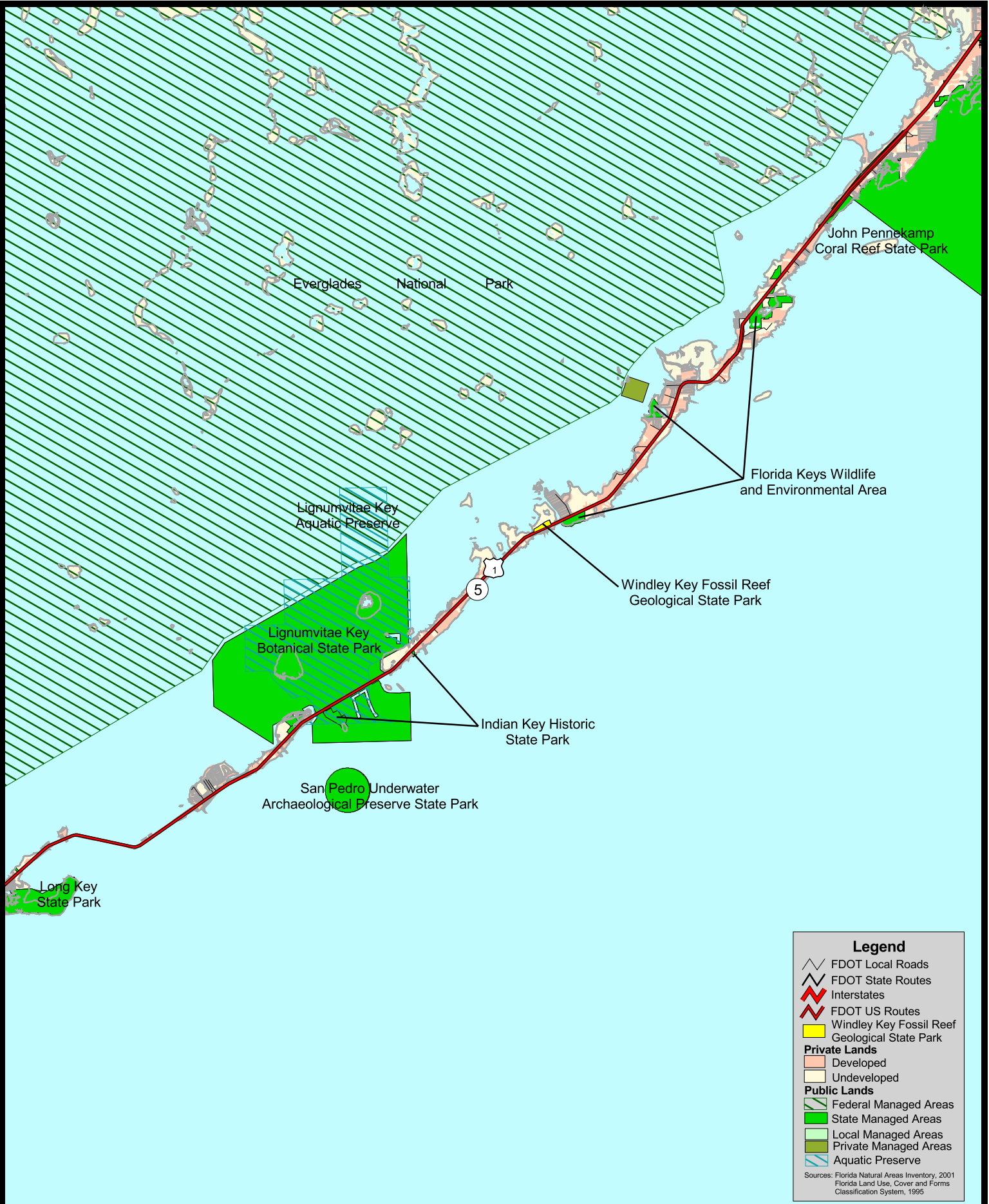
PURPOSE AND SCOPE OF THE PLAN

This plan serves as the basic statement of policy and direction for the management of Windley Key Fossil Reef Geological 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 29, 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 public education and recreation. Uses such as water resource development projects, water supply projects, stormwater management projects, linear facilities and sustainable agriculture and forestry



Legend

- FDOT Local Roads
- FDOT State Routes
- Interstates
- FDOT US Routes
- Windley Key Fossil Reef Geological State Park

Private Lands

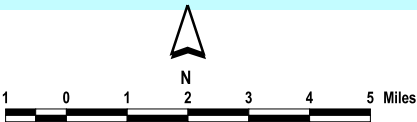
- Developed
- Undeveloped

Public Lands

- Federal Managed Areas
- State Managed Areas
- Local Managed Areas
- Private Managed Areas
- Aquatic Preserve

Sources: Florida Natural Areas Inventory, 2001
Florida Land Use, Cover and Forms Classification System, 1995

**Windley Key Fossil Reef
Geological State Park
Vicinity Map**



(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.

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 (Division) 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 **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.

In the management of Windley Key Fossil Reef Geological 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'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 and Cultural Resources

1. Protect all of the natural communities in the park from habitat fragmentation or human disturbance and provide interpretation of the resources to the public.
2. Remove exotic vegetation on an ongoing basis as it becomes established to eliminate or minimize its presence.
3. Enhance interpretation of geological resources.
4. Inventory and develop a reference collection for fossilized corals and other marine species found in the walls.
5. Seek funding for management, restoration and preservation of the park's cultural resources.
 - A. Develop a cultural resource preservation plan.
 - B. Pursue funding for a comprehensive cultural resource survey of the park.
 - C. Conduct historical research on the settlement, railroad and mining uses of the property.
6. Maintain a Cultural Resource Management File for the park, using Guidelines for Cultural Resources Management Files established by the Bureau of Natural and Cultural Resources.
7. Draft a Scope of Collections Statement; catalog and inventory any permanent collections.
8. Pursue funding to hire a conservation professional to evaluate quarry machinery and produce a conservation plan.
9. Develop an Interpretive Statement for the Park.

Recreational Goals

10. Continue to provide quality resource based outdoor recreational and interpretive programs and facilities at the state park.
11. Seek funding to expand recreational and interpretive opportunities through the improvement of programs and the development of new use areas and facilities, as outlined in this management plan.

Park Administration/Operations

12. Seek funding for planned enhancement of facilities.

- A. Observation towers
 - B. Amphitheater
 - C. Shop/storage facility
13. Promote volunteer and community support through active involvement and participating with the park's cost.
 14. Pursue optimum boundary acquisitions.
 15. Seek funding for staff (education and training specialist) for program implementation.
 16. Coordinate the use of facilities for resource-based educational programming for schools.
 17. Develop educational programs to meet course requirements for schools.

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 Wetland Resources 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.

Public Participation

The Division provided an opportunity for public input by conducting a public workshop and an advisory group meeting. A public workshop was held on Thursday, March 20, 2003. The purpose of this meeting was to present this draft management plan to the public. A DEP Advisory Group meeting was held on Friday, March 21, 2003. The purpose of this meeting was to provide the Advisory Group members the opportunity to discuss this draft management plan. Addendum 1 contains the list of advisory group members and meeting staff report.

Other Designations

Windley Key Fossil Reef Geological State Park is within an Area of Critical State Concern as defined in section 380.05, Florida Statutes. The park is a component of the Florida Greenways and Trails System.

Windley Key Fossil Reef Geological State Park is not designated as an aquatic preserve under provision of the Florida Aquatic Preserve Act of 1975 (Section 258.35, Florida Statutes). However, the unit is located within three nautical miles of Lignumvitae Key State Aquatic Preserve.

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

Windley Key is part of the physiographic region of High Coral Keys, the southernmost continuation of the Atlantic Barrier Island Chain. The edges of the Floridan Platform parallel the Keys, approximately seven miles offshore to the east and many times that distance to the west. Maximum elevations on Windley Key reach approximately 18 feet, one of the highest in the Florida Keys. Water depths of the submerged areas generally do not exceed 5 feet below mean sea level.

The topography of the site, both on upland and submerged land, has been altered by human activity. The use of this property for quarries, where Key Largo Limestone was mined for building material, left exposed the fossil reef structures that represent the geological history of the Upper Keys. These disturbances to the natural topography of the site are the reason the property was acquired and made a unit of the state park system.

Geology

The geological formation underlying the upper Florida Keys is Key Largo limestone, a fossil Pleistocene coral reef. Due to a lowering of sea level 100 to 125 thousand years ago, and subsequent fluctuations, portions of this ancient reef emerged from the sea, forming islands. This limestone of fossilized coral is white to grey, permeable and pitted with solution holes, generally lined with iron-stained calcrete. Many voids contain crystalline calcite. The so-called "Keystone" has become a much-desired decorative stone in construction, since the fossilized coral colonies display beautiful patterns of various

colonial species.

According to a description by Pauline A. Bond of the Florida Geological Survey, the Key Largo limestone is remarkably homogeneous throughout the Florida Keys. It consists of a framework of reef-forming corals that act as a trap for fragmented skeletal materials of many marine organisms. Virtually all of the coral species found today in the patch reefs of the Florida reef tract occur in the Key Largo Limestone. A panel from Windley Key quarry was analyzed by Steven M. Stanley in 1966. Stanley's analysis identified five main frame-building corals: *Montastrea annularis*, *Porites astreoides*, *Diploria strigosa*, *D. clivosa*, and *D. labyrinthiformis*. These frame-builders make up approximately 30 percent of the formation's volume and *Montastrea annularis* comprises approximately half of that. The outcrops of the Key Largo Limestone exhibit no vertical or horizontal organic zonation.

The coral framework of the Key Largo Limestone is enclosed within a calcarenite that may be divided into a dominant poorly sorted facies and a subordinate well-sorted facies, according to Stanley. Both facies are poorly consolidated and friable. The poorly sorted calcarenite consists of Halimeda with lesser amounts of mollusks, corals, coralline algae, and foraminifera. The well-sorted calcarenite crops out as scattered patches of rock up to several yards across. It is devoid of organic framework material and is thought to represent a series of anastomosing channels that occurred between reef build-ups.

Soils

There are three soil types identified at this unit (see Soils Map). On the vegetated uplands, the limestone is covered with a layer of organic soil and leaf litter of varying thickness. In low intertidal areas, the surface between solution holes and depressions has weathered into smooth caprock. In the intertidal areas along the west boundary, the depressions in the limestone are covered with a layer of marl deposited by high tides and storms. The marl consists of fine calcium carbonate particles, remnants of marine organisms. Submerged shallow banks are also accretions of calcareous sediments. A thick layer of organic muck covers the limestone in the mangrove swamps. Complete soils descriptions are contained in Addendum 3.

Minerals

Other than Key Largo Limestone, there are no known minerals of commercial value in this park.

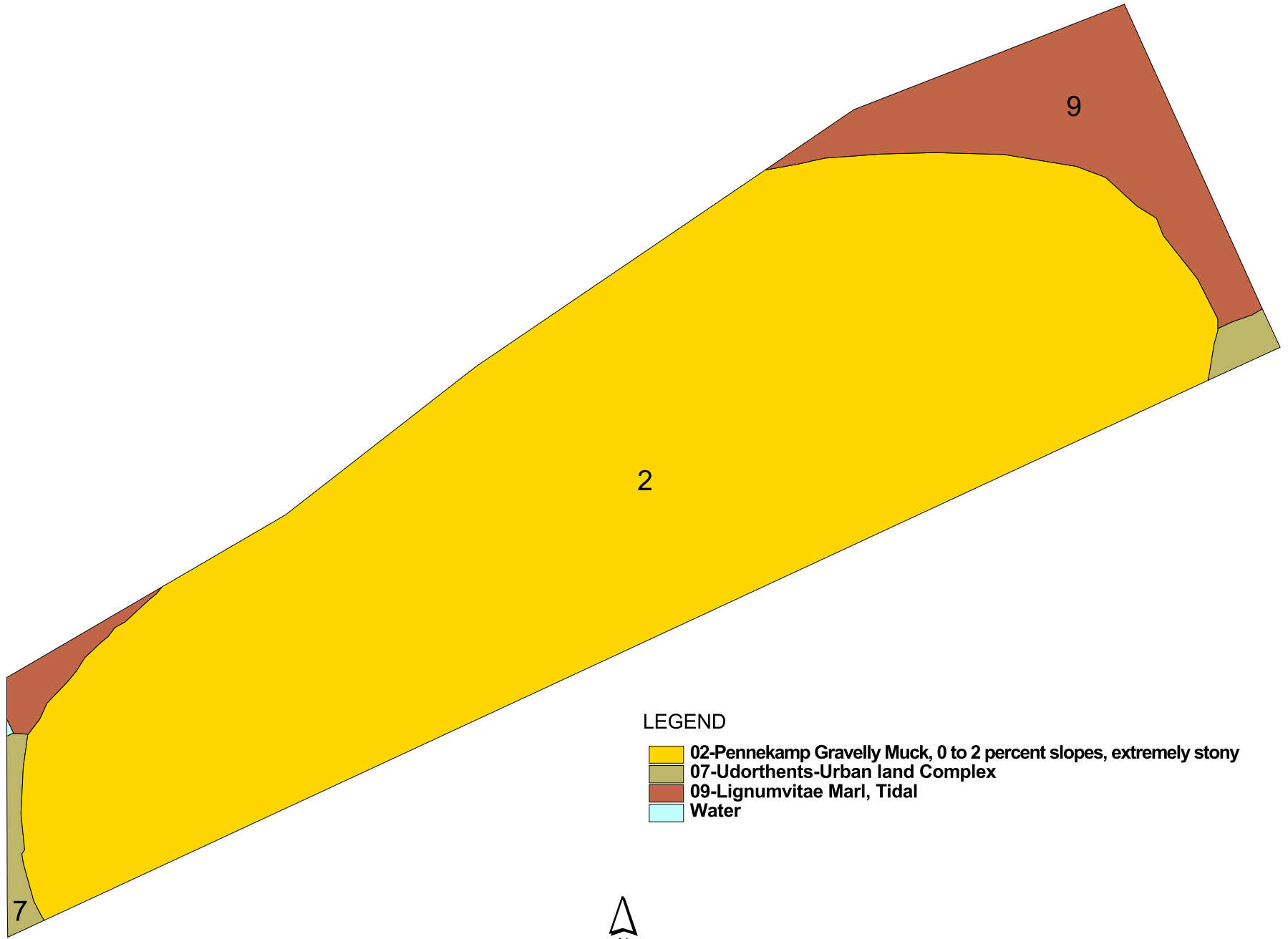
Hydrology

The only natural source of fresh water in the Florida Keys is rain. Historically, early settlers collected rainwater in cisterns or used water from wells that tapped the small fresh water lenses. Smaller keys, like Lower Matecumbe and Windley Keys, had adequate water retention for a limited local water source, thus explaining the existence of the historic well located in the Russel Quarry. Canalization of the southeast Florida mainland and subsequent salt water intrusion into the Biscayne Aquifer has changed the regional hydrology. Only on the larger islands such as Big Pine Key is the rainwater retained for an extended period, and becomes a limited local water source. This does not occur on Windley Key.

Drainage of the upland areas of the Keys, including Windley Key, consists of immediate rainwater runoff into the adjacent marine environment, and seepage through the permeable limestone. Because of the high permeability of the substrate, retention time of rainwater in the limestone is short.

Natural Communities

The system of classifying natural communities employed in this plan was developed by the Florida Natural Areas Inventory (FNAI) **FNAI Descriptions**. The premise of this system is



LEGEND

- 02-Pennekamp Gravelly Muck, 0 to 2 percent slopes, extremely stony
- 07-Udorthents-Urban land Complex
- 09-Lignumvitae Marl, Tidal
- Water



Florida Department of Environmental Protection
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**WINDLEY KEY FOSSIL REEF
 GEOLOGICAL STATE PARK**

SOILS MAP

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 four distinct natural communities (see Natural Communities Map) in addition to ruderal and developed areas. Park specific assessments of the existing natural communities are provided in the narrative below. A list of plants and animals occurring in the unit is contained in Addendum 4.

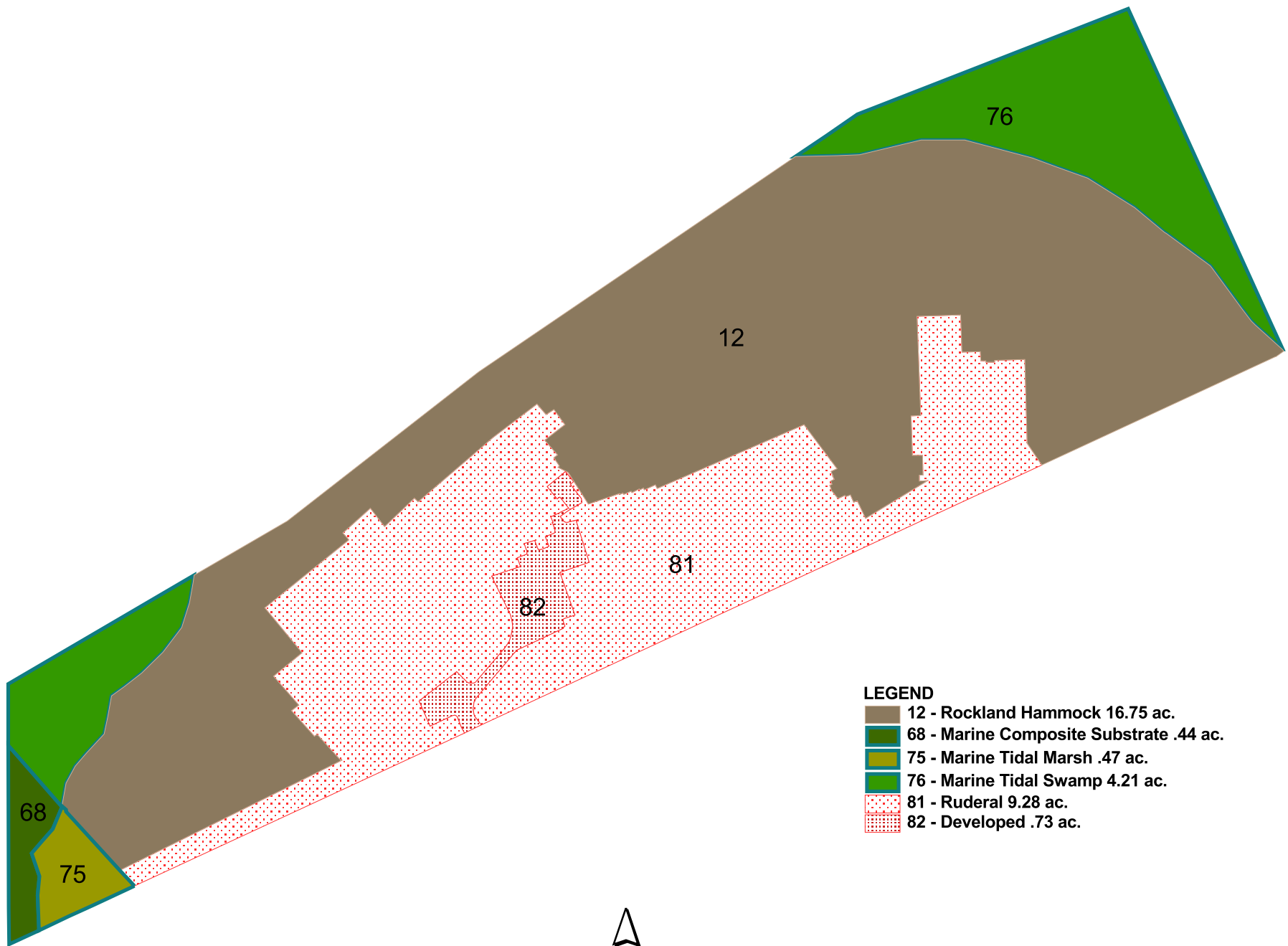
The uplands of Windley Key Fossil Reef Geological State Park support rockland hammock on the highest elevations and a narrow transition zone of more salt-tolerant species near the low-lying areas.

Rockland hammock. The rockland hammock at Windley Key Fossil Reef Geological State Park is hardwood forest on upland sites in regions where limestone is very near the surface and is often exposed. It is tropical, with high species diversity, dominated by mature trees. It occurs on high ground that does not normally flood, but is dependent upon high seasonal rainfall to maintain reservoirs in solution features of the limestone and to keep humidity levels high. The hammock's rounded profile deflects winds, limits desiccation and reduces interior storm damage.

The hammock at the site is located in the eastern half of the park, and smaller sections adjacent to U.S. Highway 1, as well as north and west of the quarries. Overall, this community is in good condition. Hammock located northeast and east of the quarries is in excellent condition. Hammock in the western part of the park, and next to the quarries is in good to fair condition because of man-made disturbances. The hammock in best condition is part of the most mature portion in the east. A narrow strip of hammock north of the westernmost quarry, is less mature, grading into hammock of lower elevation to the west. The hammock on the highest ground is particularly mature, and comparable to the forest on North Key Largo. Although relatively frequent hurricanes, a thin layer of soil, and lack of fresh water have limited the height of the canopy, many trees on Windley Key exceed 30 feet in height. Among these is the very rare ironwood, which is found in few locations in the Keys. A large ironwood in the park may be a champion tree. Among the many other species are mastic, mahogany, Florida thatch palm, gumbo limbo, torchwood, Jamaica dogwood, Spanish stopper, geiger, Bahama strongbark, and paradise tree, to name some. They form a dense canopy over a sparser understory of shade-tolerant shrubs and small trees. The prickly apple cactus is present in the park. It is endangered, as is the butterfly orchid, which can still be seen in some of the mature hammock trees. Air plants occur in large numbers along the northern boundary.

A narrow strand of transition vegetation is found along the hammock margins. Cacti, shrubs and some palms are prevalent in the areas of slightly lower elevation, along with buttonwood just above tidal reach. Among the plants are joewood, prickly pear, poisonwood, and seven-year apple. By necessity, these species along the hammock's margin are more salt-tolerant than those of the interior.

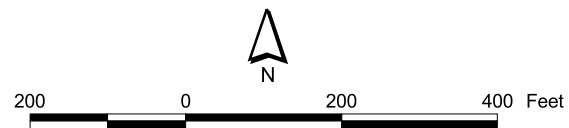
Because of intensive development on Windley Key, the park's hammock is a rare community that requires protection from fire, canopy disruption and ground water



LEGEND

- 12 - Rockland Hammock 16.75 ac.
- 68 - Marine Composite Substrate .44 ac.
- 75 - Marine Tidal Marsh .47 ac.
- 76 - Marine Tidal Swamp 4.21 ac.
- 81 - Ruderal 9.28 ac.
- 82 - Developed .73 ac.

**WINDLEY KEY FOSSIL REEF
GEOLOGICAL STATE PARK**



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

**NATURAL COMMUNITIES
MAP**

reduction. Many hammock plants and animals, in particular orchids and butterflies, must be protected from collectors.

Marine tidal marsh. On the west side of the park, low-lying hammock grades into a small salt marsh, that is in excellent condition. This community includes buttonwood, glasswort, sea blite, saltwort, beach orach, Key grass, prickly cordgrass and dropseed. The marsh at Windley Key is an uncommon sight for the Florida Keys, since tidal marshes are most abundant and best developed north of Florida's frost line. The marsh attracts wading birds and waterfowl to the park, providing a much-needed feeding ground and habitat.

Marine tidal swamp. This community is in excellent condition. The three predominant species are the red mangrove, mainly found along the shore, the black mangrove, which prefers the sheltered locations and is frequently found landward from a belt of red mangroves, and the white mangrove, which occurs in many locations together with the black mangroves, as well as on slightly higher ground. The soil of the mangrove swamp is a thick layer of moisture-saturated peat and muck that is inundated at high tide. Strongly influenced by tidal fluctuations, salinity, temperature and storms, the mangroves at the park nevertheless protect the inland communities from the brunt of hurricanes.

The lack of protection from development for the mangrove areas adjacent to the park's boundaries is an important concern at this park. Both the mangrove areas and shallows north of U.S. Highway 1 need to be acquired, in order to attain the park's optimum boundaries.

Marine composite substrate. Much of this type of marine community at the park extends along the shore of Florida Bay and is in excellent condition. This biological community consists mainly of limestone bedrock, with a thin layer of calcareous sediment in sheltered areas and depressions, which allows algae and primarily turtle grass to grow. Small fishes and crustaceans hide in the rocky crevices, attracting many predatory species. This area is part of a cove popular with sport-fishermen who mainly fish for bonefish.

Ruderal and developed areas. This includes a short access road, and three quarries. The middle and easternmost quarries had been colonized by Australian pines and Brazilian peppers, along with native shrubs and some trees, but these exotics have been removed. The westernmost quarry was mined until 1962, and is less vegetated.

A small, low-lying area in the southwest corner of the main quarry retains puddles of standing water of varying salinity, depending on the rainfall and tidal stage. It supports marsh vegetation such as saltmeadow and cordgrass, as well as mangroves.

The quarries are ruderal. Exotics previously dominated this area, but they have been removed. A new environmental center, restrooms, storage shed and parking facility have been installed in this area since the last plan was written in 1992.

The quarries, which are the geological features after which the site is named, are the main attraction in the park.

Designated Species

Designated species are those that 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. Addendum 5 contains a list of the designated species and their designated status for this park. Management measures will be addressed later in this plan.

Typical of the Florida Keys, the number of designated species at this unit is considerable.

Rapid development has resulted in the loss of much natural habitat and the number of listed species has increased substantially since the previous list was compiled in 1992. Two plant species, which occur in the hammock, deserve special consideration. Simpson's prickly apple cactus is becoming less common because of habitat destruction. This park contains one of the few remaining sites where the cactus survives. This species is listed as endangered.

The white ironwood tree is one of the rarest tropical hardwood trees in North America. The species is adapted to a few areas in Dade and Monroe counties, and is listed as endangered. It occurs only from Key Largo to Big Pine Key, with one small population in Everglades National Park. This tree has been found in fair abundance on Windley Key. By comparison, only a few occur in most of the other locations. Other designated species of plants are: golden leather fern, Blodgett's wild-mercury, Mexican hibiscus, milkbark, red stopper, lignumvitae, decumbent indigo, sky-blue clustervine, joewood, wild dilly, yellowwood (Florida boxwood), mahogany, brittle thatch palm, Florida thatch palm and banded wild-pine.

A number of listed bird species are found in the park. The tidal ponds and shallow flats near the park are feeding grounds for many designated species of wading birds. Those species that use the park extensively include the white crowned pigeon, little blue heron, reddish egret, snowy egret and tricolored heron. Roseate spoonbill, peregrine falcon, southeastern American kestrel, bald eagle, osprey, brown pelican and least tern have also been found in the park. The Florida Keys mole skink occur in the hammock. Both are animal species of special concern.

Special Natural Features

The fossilized coral reef and the mature rockland hammock are considered the special natural features of this park.

Cultural Resources

Evaluating the condition of cultural resources is accomplished using a three part evaluative scale, expressed as good, fair, and 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.

The Florida Master Site File (FMSF) lists one archaeological site within the park boundary: the Windley Key quarry, which has been recorded as site 8MO1961. This site was determined by the recorder to be eligible for inclusion to the National Register of Historic Places. Two other sites are adjacent to the boundary of the park: 8MO2098, the Windley Key Shell Scatter site, and 8MO3433, Old State Road 4A/ Old US 1. Other cultural resources exist at the park, but are currently not recorded on the FMSF (i.e. the "Conch House") or are in need of further research and detailed documentation.

According to the Florida Keys Coastal Zone Management Study, a prehistoric Indian midden lies to the north near the park boundary. There is a possibility that other prehistoric sites may be located within or near the park because of its high elevation that offered shelter from storms and floods.

Early settlers named Windley Key and the adjacent key to the south, the "Umbrella Keys". A family of settlers, the Russells, sold the property to Florida East Coast Railroad and both islands became one during the construction of Flagler's railroad. At that time, the quarries were started to provide rock for Flagler's railroad bed and a stop of the railroad, "Quarry Station", was located at the quarries. After the 1935 hurricane and the destruction of the railroad, the rock from the quarries was sold for construction of such projects as the Dade County Post Office in downtown Miami, the Coral Gables City Hall and the Coral Gables Police and Fire Department, and other buildings throughout the United States.

Remnants of these activities still can be seen today. Among them are a well, ruins of a conch house, railroad ties, quarry cutting machinery and tools and above all, the quarries themselves.

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.

A timber management analysis was not conducted for this park. The total acreage for the unit is below the 1,000-acre threshold established pursuant to Florida Statutes. Timber management will be reevaluated during the next 5-year revision of this management plan.

Additional Considerations

Windley Key is the only geological state park in south Florida. The geological features will be managed in such a manner that their continued existence is assured. Towards this goal, the advice of professional geologists and other specialists is obtained imperative. Similarly, the historical value of the various artifacts needs to be determined by experts, and preservation methods with proper storage and exhibition will be used.

The quarry walls, the dominant features of the site, will be preserved. The quarry walls have been altered in the past by the removal of geological specimens. Visitors must be educated on the importance of not removing any specimen at the site. No collection of stone from the quarry walls will legally occur, except as allowed through the Division's system for permitting collection of specimens for scientific research.

Ideal conservation of the walls would require that they be kept vegetation free. Vegetation releases weak acids that break down rock into soil. This is particularly true of colonial plants such as lichens and ferns. The use of herbicides should be avoided since herbicides generally contain weak acids and lime based stone is particularly prone to attack by acids. It can be expected that, over geological time, some degradation of the walls will be experienced from the combined effects of acid rain and acids formed by decaying vegetation on the upland hammocks areas above the walls.

Management Needs and Problems

An important part of park management is the protection of the resource from outside threats. In the case of Windley Key Fossil Reef Geological State Park, this means

preparing a land use plan, opening the park to visitors, and removing the effects of past destructive activities, such as trash dumping. The site's resources should be protected from overuse, vandalism, and poaching.

Exotic plant removal has largely been accomplished in the park. Australian pines in the hammock and quarries, and Brazilian pepper trees scattered throughout the unit have been removed. The park is now in a control phase, consisting of monitoring and removing re-growth as it occurs.

Management Objectives

The resources administered by the Division are divided into two principal categories: natural resources and cultural resources. The Division 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.

Documentation, stabilization, restoration and interpretation of the property's historical resources are important objectives for park management. The main management objective, however, is to allow visitors access to the unique geological features, and to provide proper interpretive programs and facilities. The placement and use of facilities will determine future needs. Another important objective is the restoration of the park's natural environment through continued exotics control, and the protection of the hardwood hammock. Finally, expansion of the park to include the adjacent wetlands, which extend into Florida Bay, is important for the integrity of the natural resources in the park, and to protect habitat and feeding grounds for many species of birds.

Management Measures for Natural Resources

Hydrology

Ground water management is not a significant concern at this park. Surface water management in the area proposed for development will be addressed through the facilities design and permit review process.

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, 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.

There are no fire-adapted communities in the park.

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 that 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.

Poaching of rare plants of any designated status is common in the Florida Keys. Measures will continue to minimize this problem at the park. Habitat destruction, such as expansion of adjacent developments into the wetlands, must not be allowed. Habitat enhancement

through exotics removal will enhance the chances of continued survival of designated species in the park.

Providing a protected environment for animals of designated status is important for their survival. Feeding unmolested, nesting or roosting in protected areas, with any luck will contribute to the survival of animals threatened by habitat loss.

Exotic Species Control

Exotic species are those plants or animals that are not native to Florida, but were introduced because 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. Thus, the policy of the Division is to remove exotic species from native natural communities.

The plan for the control of exotic species involves removing Australian pine and Brazilian pepper re-growth from the park as it appears.

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.

No problem species have been located in this unit.

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 (see **DHR Cultural Management Statement**).

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.

Windley Key Quarry was essential to the development of Flagler's Overseas Railroad, and later contributed to the development of U.S. Highway 1 through the Keys. Stone facing for several buildings in the surrounding area, which are listed on the National Register of Historic Places, is thought to have come from Windley Key Quarry. This quarry has been informally determined to be eligible for listing on the National Register of Historic Places. It therefore falls under Chapter 267 of the Florida Statutes. All actions need to be carefully reviewed to avoid any negative impacts on cultural resources.

Since quarrying Keystone was much different than quarrying other, harder, types of stone, much of the machinery is unique. Many pieces of this machinery may be one of a kind, over forty-five years of age, and considered historic under Florida Statutes. All quarry machinery will be evaluated by a conservator and a long-term preservation plan will be developed for those pieces having historic value.

The stonecutter at the geological state park was left at the end of a cut and needs to be preserved in its current position. This cutter is unique in that it used a series of steel rods apparently dropped repeatedly by gravity to make a continuous cut. The stone was split out

by driving wedges into the vertical cuts. The cutter was rail mounted and rolled along a series of prefabricated sections of track that could be easily moved and reassembled. In addition, a large winch from the overhead cable system used to move the quarried stone remains at the site, along with the base of the central mast used in this cable system. These objects need to receive periodic treatment to prevent corrosion.

Specialists in the field of industrial and technological history will be consulted for evaluation of the machinery remaining on site and during design of the park's artifact conservation and interpretive programs.

Interpretive signs should be placed on the property that includes warnings against collecting artifacts on state lands and the need to discourage casual trails.

While the park is geological in interest, the history of the park is interpreted as a secondary theme. This contributes to the visitor's understanding of how the site came into being, and explains the broad settlement patterns in the Florida Keys since 1908.

Concrete foundations for a water tank and railroad ties on the ground, are what remain of the Quarry Siding Station. The railroad ties are the last known ties left from the railroad in the Keys. The Quarry Station remnants and the water tank foundations need to be stabilized.

Research Needs

Natural Resources

Any research or other activity that involves the collection of plant or animal species on park property 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.

Consideration should be given to designating a section of quarry wall, away from the areas to be viewed by the public, where geological specimens may be collected by qualified researchers. Within the framework of the Division's collection policy, geological research at the geological state park should provide a valuable source of information for management of the feature and for education of park visitors in general, and amateur and professional geologists specifically.

The effects of weathering and plant growth on the exposed quarry rock may need to be researched. Inventories of the coral species and other marine species fossilized in the quarry walls and floors have been compiled by geology students in the past. These should be collected, checked and expanded if necessary. A botanical inventory has been completed. Mapping of endangered species, and the studies of the recurrence of exotics according to treatment methods, by species, is also needed. Other studies and research topics will be considered as they are proposed by agencies and individuals outside the Division of Recreation and Parks.

Cultural Resources

An archaeological study of this unit is needed. The exact boundaries of the known midden area, site 8MO2098, should be established, and a preliminary assessment of the value of the site should be made, as current knowledge of this site is based on second hand information. A survey of the park should be conducted to determine if other aboriginal sites exist. Historical research should be done on the development of the quarry and related activities. An evaluation of the remaining quarry machinery should be conducted by specialists in the field of industrial and technological history. Such organizations include the Society for Industrial Archeology and the Historic American Engineering Record.

Documentation of the machinery judged significant should be accomplished using Historic American Engineering Record standards. A study of how the quarry operated should be accomplished at the same time. A graphic reconstruction or model of the quarry should be produced.

Resource Management Schedule

A priority schedule for conducting all management activities that is based on the purposes for which these lands were acquired, and to enhance the resource values, is contained in Addendum 6. Cost estimates for conducting priority management activities are based on the most cost effective methods and recommendations currently available (see Addendum 6).

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 Improving 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.

Windley Key Fossil Reef Geological State Park has not been subject to a land management review.

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, and then proceeds through the creation of a conceptual land use plan that culminates in the actual design and construction of park facilities. Input to the plan is provided by experts in environmental sciences, cultural resources, park operation and management, through public workshops, and environmental groups. With this approach, the Division 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

Adjacent lands are primarily in mixed commercial and residential land uses on Windley Key and the islands north and south. An aquatic theme park and a major resort are located less than one mile south of the park.

Planned Use of Adjacent Lands

There are no major changes in land uses expected for the adjacent properties. Traffic congestion along U.S. Highway 1, air and noise pollution are the main impacts of adjacent uses on the state geological state park. Untreated stormwater runoff may enter the park from the U.S. Highway 1 right of way. Design and construction of remediation measures should be included in any future work on the highway. The Florida Keys Overseas Heritage Trail is planned for the right of way across the state park frontage. When that project is completed, non-vehicular access to the state park will be greatly enhanced. Increases in park visitation may be a result of the trail project in the future. Unfortunately, the Windley Key portion of the trail project is not funded or scheduled for design and construction at this time.

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 upland area at the park contains one of the finest hardwood hammocks in the Keys. It also has one of the highest elevations in the Keys, reported to be 18 feet above sea level. Undisturbed wetlands and transition areas border three sides of the property. An unexcavated, but heavily disturbed area between the Windley Quarry and the federal highway, provides approximately two acres of disturbed land within which the park's major improvements for educational and interpretive activities have been located.

Natural Scenery

Although the tropical hardwood hammock of this property is aesthetically pleasing, the sheer faces of fossil coral revealed along the quarry walls are the outstanding visual attraction of this park.

Significant Wildlife Habitat

The park's hardwood hammock is considered one of the highest-quality examples of that community in the Florida Keys. Several listed plant and animal species occupy or visit the state park. Although the sightings of rare plants and animals are an important part of many visitors' experiences, public access may need to be restricted in certain areas for protection of the plant and wildlife species involved. Special attention in planning will be given to minimizing human disturbances in this primary wildlife area. The actual location of interpretive trails and boardwalk structures within the tropical hammock and adjacent to mangrove communities are the product of careful evaluation to avoid impacts on the listed species and the natural communities themselves. Well-planned access to these communities is an important component of the environmental education programs at the park.

Natural Features

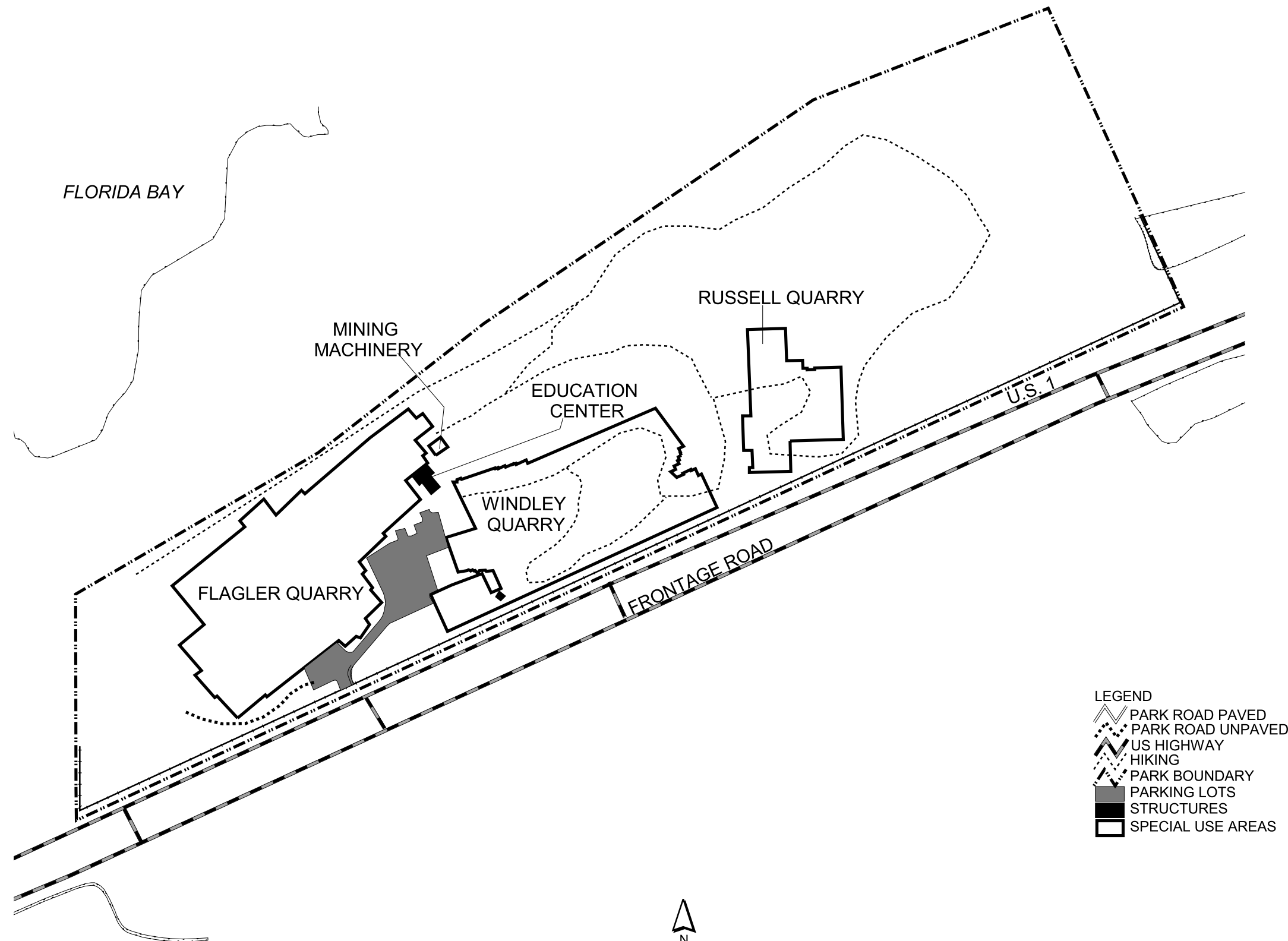
The outstanding natural feature of the park is the fossil coral reef exposed by the keystone quarry operations. This is the main attraction for most of the park's visitors and the focal point for many of the unit's educational activities. The nearly pristine tropical hammock is the second important feature, followed closely by intact transition vegetation and the solid mangrove/buttonwood shoreline on Florida Bay. Together, these features provide an opportunity to interpret the entire natural history of the Florida Keys because they reveal a complete cross section of a typical island.

Archaeological and Historical Features

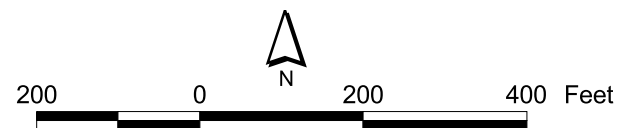
The cultural features as described in the resource management component include the quarries, the quarry station siding and remnants, and the abandoned quarrying machinery, an Indian midden area, conch house remnants and a well enclosure. Each of these resources is included in park interpretive materials or programs. Again, the revealed history of keystone quarrying and the connection of this site to the Flagler railroad are the leading cultural features of the state park.

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



- LEGEND**
- PARK ROAD UNPAVED
 - PARK ROAD PAVED
 - US HIGHWAY
 - HIKING
 - PARK BOUNDARY
 - PARKING LOTS
 - STRUCTURES
 - SPECIAL USE AREAS



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

**WINDLEY KEY FOSSIL REEF
 GEOLOGICAL STATE PARK**

BASE MAP

uses made of the unit are briefly described in the following sections.

Past Uses

The most obvious past use of the property is quarrying of fossil coral rock, which began around 1908 and ended in the 1960s. Since the quarrying operation first began, geologists and geology students have studied the fossil reef revealed in the walls and floors of the quarries.

In the more recent past, the Windley Quarry was used as a staging area during the construction of the new bridges on U.S. Highway 1. Illegal dumped debris, which was a problem on the site when first acquired, has now been cleaned up to the extent feasible.

Recreational and Educational Uses

Since the completion of the Environmental Education Center at Windley Key, interpretation and education programs have been the primary activity of this state park. Nearly 3 miles of nature trails exploring both the Windley and Flagler Quarries and portions of the hammock has been created utilizing volunteer labor. Park visitation has increased since the construction of park facilities, with over 10,200 visitors enjoying the park in fiscal year 2000-01.

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 Windley Key Geological State Park the entire property been designated as a protected zone, with the exception of the areas currently developed for the visitor center, parking and storage (see Conceptual Land Use Plan).

Existing Facilities

Recreation and Interpretive Facilities

Environmental Education Center
Quarry Wall Walk (1.25 mi.)
Flagler Trail (.25 mi.)
Hammock and Sunset Trail (.85 mi.)

Support Facilities

Entrance and parking (25 cars)
Storage shed

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



LEGEND

- ✱ PROPOSED FACILITIES
- NATURE TRAILS
- OVERSEAS HERITAGE TRAIL STATE PARK
- PROTECTED ZONE
- PARK BOUNDARY

PROPOSED OVERLOOK

POTENTIAL SITE FOR SUPPORT FACILITIES

WINDLEY QUARRY

VISITOR CENTER, MACHINERY EXHIBIT AND PARKING

FLAGLER QUARRY

SUNSET TRAIL

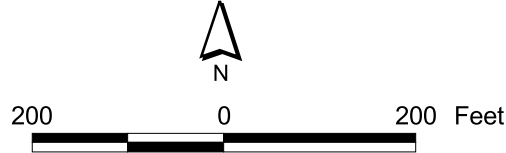
FLAGLER TRAIL

RUSSELL QUARRY

HAMMOCK TRAIL

OVERSEAS HERITAGE TRAIL

**CONCEPTUAL LAND USE PLAN
WINDLEY KEY FOSSIL REEF
GEOLOGICAL STATE PARK**



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

Windley Key Geological State Park is a small but significant unit of the state park system. Nowhere else in the Florida Keys is the geological history of the chain of coral islands interpreted as it is here. The success of programs at the state park should be enhanced in the future by expanding programs that provide guided tours, periodic renewal and updating of interpretive displays and materials offered by the Environmental Education Center, and expansion of programs offering lectures, directed studies and university-level research. These improvements will require either the expansion of park staff, or the continued support and development of the parks Citizen Support Organization, volunteer interpreter programs, and funding to support outside researchers.

Recreation Facilities

An elevated platform at the terminus of the Sunset Trail is recommended to allow views over the mangrove shoreline toward Florida Bay. Staff will investigate pervious, natural-appearing paving materials for the universally-accessible pathway to the overlook.

Support Facilities

A larger maintenance shop/storage facility is needed for park operations. Due to the extremely limited area of disturbed landscape between the edge of Windley Quarry and U.S. Highway 1, the floor of the quarry may be the only viable location for this structure. Careful analysis of the developed area and its immediate surroundings is needed to determine if a structure can be added outside the quarry itself. If construction in the quarry is necessary, the structure will be carefully sited at the base of the ramp located near the southwest corner. If this option is implemented, the structure will be sited and screened so as not to be visible from the Environmental Education Center or from other publicly accessible areas within Windley Quarry, to the extent possible.

Staff will investigate ways to make the park entrance more visible to automobiles approaching on U.S. Highway 1. The Florida Department of Transportation will be consulted regarding the construction of turn lanes at the park entrance, possibly as a part of the future construction of the Florida Keys Overseas Heritage Trail State Park along this section of U.S. Highway 1.

Facilities Development

Preliminary cost estimates for the following list of proposed facilities are provided in Addendum 8. 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 planning and design processes.

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

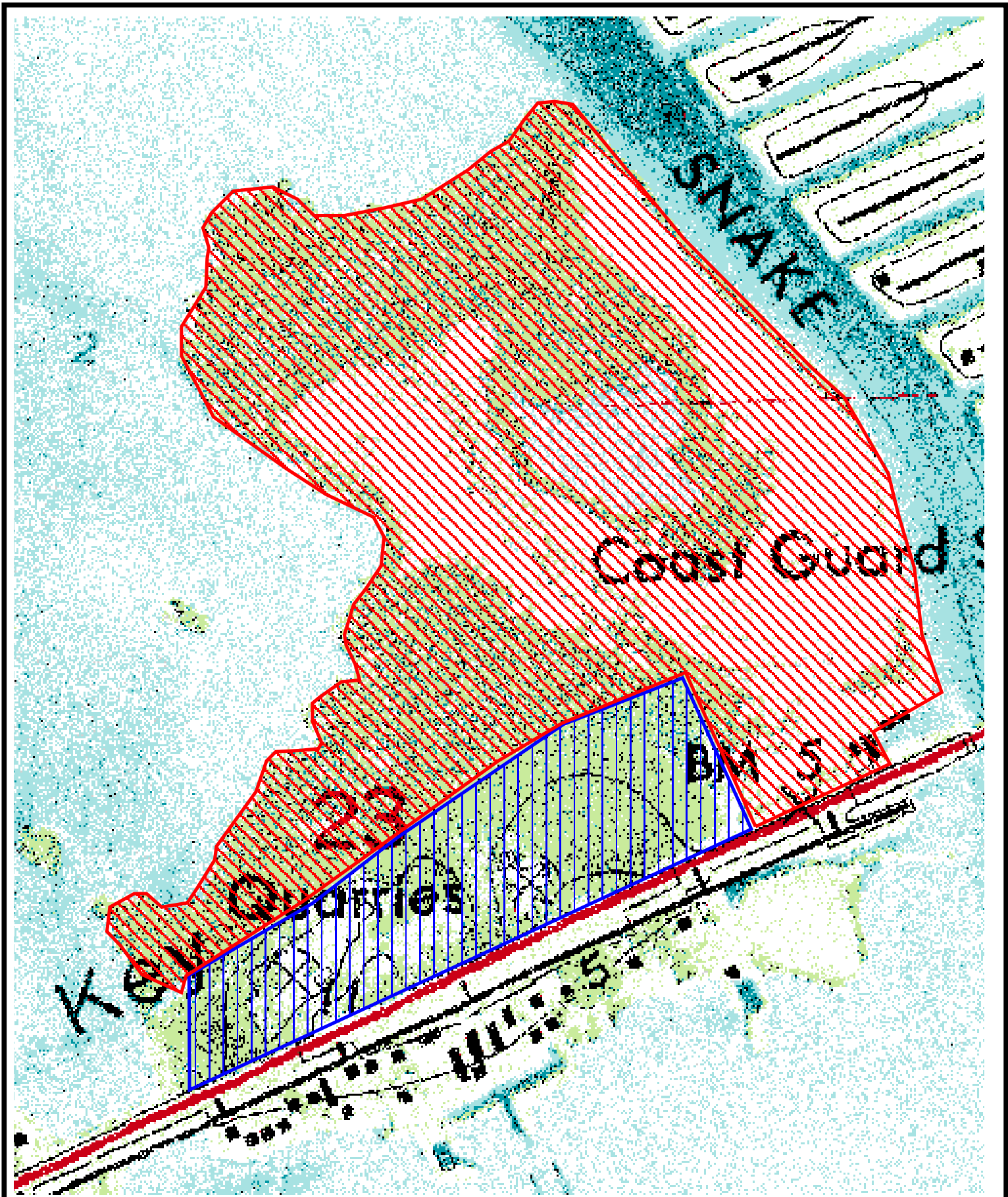
Activity/Facility	Existing Capacity		Proposed Additional Capacity		Estimated Optimum Capacity	
	One Time	Daily	One Time	Daily	One Time	Daily
Environmental Center	60	120			60	120
Special Events	200	200			200	200
Trails						
Nature Trails	20	80			20	80
TOTALS	280	400			280	400

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 for direct management by the Division as part of the 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.



The optimum boundary for this unit includes a 291-acre parcel that lies on the upper end of Windley Key. It is located on the bay side of U.S. Highway 1, with about 2,660 feet of shoreline on Snake Creek. The property consists of approximately 136 acres of uplands and wetlands and 155 acres of submerged land. There are nearly four acres of relatively



400 0 400 800 Feet

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

LEGEND

-  Optimum boundary
-  Park boundary

**WINDLEY KEY FOSSIL REEF
 GEOLOGICAL STATE PARK**

**OPTIMUM BOUNDARY
 MAP**

undisturbed rockland hammock community on the property. A band of transitional vegetation separates the hammock from the wetlands. If acquired the site could be managed for natural resource preservation and interpretive purposes.

Addendum 1—Acquisition History

Windley Key Fossil Reef Geological State Park Acquisition History

Purpose and Sequence of Acquisition

The Board of Trustees of the Internal Improvement Trust Fund (Trustees) acquired Windley Key Fossil Reef Geological State Park to develop, operate and maintain the property for outdoor recreation, park, conservation, historic and related purposes.

The initial acquisition of the park took place on January 17, 1986, when the Trustees purchased the property. On September 29, 1986, the Trustees leased Windley Key Fossil Reef Geological State Park to the Division of Recreation and Parks (Division) under Lease No. 3453. This lease is for a period of fifty (50) years and will expire on September 28, 2036.

According to the Trustees lease, the Division manages Windley Key Fossil Reef Geological State Park only for the development, conservation and protection of natural and cultural resources of the park and for resource-based public outdoor recreation that is compatible with the conservation and protection of the property.

Title Interest

The Trustees hold fee simple title to Windley Key Fossil Reef Geological State Park.

Special Conditions on Use

Windley Key Fossil Reef Geological 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 the park's unit management plan) are not consistent with this management plan or the management purposes of the park and will be discouraged.

Outstanding Reservations

There are no outstanding rights, reservations and encumbrances that apply to Windley Key Fossil Reef Geological State Park.

**Windley Key Fossil Reef Geological State Park
Advisory Group List**

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Long Key, Florida 33001

Windley Key Fossil Reef Geological State Park Advisory Group Staff Report

The Advisory Group appointed to review the draft management plan update for Windley Key Fossil Reef Geological State Park met at the park on Friday, March 21, 2003. Mr. Dennis Henize represented Tina Henize, and Mr. Herb Bryan represented Noble Hendrix. Mayor Spehar, Ms. Jetton, Mr. Wheeler, and Mr. Simmons did not attend. All other appointed Advisory Group members were present. Attending staff included Danny Jones, David Boyd and Lew Scruggs.

Mr. Scruggs began the meeting by explaining the purpose of the management plan and the advisory group, and explaining the procedure for the Advisory Group's review of the draft plan. He also provided a brief overview of the Division's planning process. Mr. Boyd described the natural and cultural resources of the park, and outlined resource management goals, objectives and management activities. Mr. Scruggs gave a brief explanation of the land use component of the plan. Mr. Scruggs then asked each member of the advisory group to provide individual comments on the plan.

Summary Of Advisory Group Comments

Mr. Wilkinson said that he is glad that no major construction projects are proposed for the park. He suggested that additional photographic interpretation should be considered for better explanation of the history of the keystone quarries and the early residents of the site. He noted that turn lanes are needed on US 1 to improve public safety at the park entrance. He recommended additional treatment of the mining equipment on display in the quarry to stop ongoing corrosion problems. Mr. Wilkinson noted that the park is well managed, and the draft management plan is very good.

Mr. Grau asked if there are mosquito control activities in the park, whether tree snails are found in the hammock areas, and whether there are fire ant control problems. Mr. Wells answered no to each of these questions.

Mr. Berg stated that the draft plan is good. He agreed that the existing and proposed facilities are appropriate, and future major development does not appear necessary for this park. He asked if the land proposed to be acquired under the park's optimum boundary was included in a CARL project, or would be purchased under the Division's Additions and Inholdings program. Staff responded that the area is most likely included in the Division's Additions and Inholdings list.

Mr. Henize agreed that the draft is a good plan. He supported the recommendation that turn lanes be provided at the park entrance.

Ms. Sprunt supported the plan recommendation to construct an overlook on Sunset Trail. She noted that there may be federal funding for construction of overlooks on Florida Bay. She suggested the Division evaluate an alternative paving surface in use elsewhere in the Keys to provide universally accessible trails in the state park.

Mr. Bryan agreed that the plan is good. He asked if there had been homesteads on the property, and staff described the historic cultural sites of the park.

Mr. Harring stated that he is proud of the state park, and believes that the draft plan is excellent. He recommended that providing a performance space at the park, which was included in the original planning for the Windley Key visitor center, is no longer necessary since the Islamorada Village of Islands is planning a civic amphitheater at Founder's Park. He suggested that the performance space element of the plan should be removed. Mr. Harring agreed that turn lane improvements are needed on US 1. He recommended that the park entrance and sign should be made more visible to approaching motorists.

Staff Recommendations

Staff recommends approval of the proposed management plan for Windley Key Fossil Reef Geological State Park as presented with the following changes.

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The proposal to adapt the visitor center building to include a stage overlooking the Windley Quarry will be removed. Discussion will be added to the plan to recommend improvements in the visibility of the park entrance for approaching vehicles on US 1, and identifying the need for turn lanes on the highway at the park entrance.

Addendum 2—References Cited

Windley Key Fossil Reef Geological State Park

References Cited

- Lane, E., (1986). Geology of the State Parks in the Florida Keys. Florida Geological Survey Leaflet No. 14, Tallahassee, Florida.
- Bond, P., (1986). Carbonate Rock Environments of South Florida. Geological Society of America Centennial Field Guide - Southeastern Section.
- Stanley, S., (1966). Paleoecology and Diagenesis of Key Largo Limestone, Florida. American Association of Petroleum Geologists Bulletin, Vol. 50, New Haven, Connecticut.

Addendum 3—Soil Descriptions

Windley Key Fossil Reef Geological State Park
Soil Descriptions

(2) Pennekamp gravelly muck, 0 to 2 percent slopes, extremely stony – This soil is on tropical hammocks in the uplands of the upper keys. About 10 percent of the surface of this soil is covered with stones that are dominantly 10 to 20 inches in diameter. Individual areas are subject to rare flooding from hurricanes and other tropical storms. Elevations are dominantly 5 to 15 feet above sea level, according to National Geodetic Vertical Datum of 1929. The mean annual temperature is about 78 degrees F, and the mean annual precipitation is about 50 inches.

(7) Udorthents–Urban land complex – This map unit is in constructed upland areas adjacent to areas of water throughout the keys. Individual areas are subject to rare flooding from hurricanes and other tropical storms. Elevations vary, depending on the thickness of the fill material, but they are dominantly 3 to 10 feet above sea level, according to National Geodetic Vertical Datum of 1929.

(9) Lignumvitae marl, tidal – This soil is dominantly on the middle and lower keys in mangrove swamps. Individual areas are frequently flooded by tides. Elevations are dominantly at sea level, according to National Geodetic Vertical Datum of 1929. The mean annual temperature ranges from 75 to 78 degrees F, and the mean annual precipitation ranges from 40 to 50 inches.

Addendum 4—Plant and Animal List

Windley Key Fossil Reef Geological State Park

Plants

Common Name	Scientific Name	Primary Habitat Codes (for designated species)
barb-wire cactus	<i>Acanthocereus tetragonus</i>	12
golden leather fern	<i>Acrostichum aureum</i>	12
giant leather fern	<i>Acrostichum danaeifolium</i>	
false foxglove	<i>Agalinis maritima</i>	
false sisal	<i>Agave decipiens</i>	
sisal hemp	<i>Agave sisalana</i> *	
chaff flower	<i>Alternanthera flavescens</i>	
torchwood	<i>Amyris elemifera</i>	
marlberry	<i>Ardisia escallonioides</i>	
Mexican poppy	<i>Argemone mexicana</i> *	
Blodgett's silverbush	<i>Argythamnia blodgettii</i>	4
asparagus fern	<i>Asparagus densiflorus</i> *	
black mangrove	<i>Avicennia germinans</i>	
salt bush	<i>Baccharis halimifolia</i>	
saltwort	<i>Batis maritima</i>	
Spanish needle	<i>Bidens alba</i> var. <i>radiata</i>	
samphire	<i>Blutaparon vermiculare</i>	
sea ox-eye daisy	<i>Borrichia aborescens</i>	
sea oxeye	<i>Borrichia frutescens</i>	
pitted bluestem	<i>Bothriochloa pertusa</i> *	
Bahama strong bark	<i>Bourreria succulenta</i>	
gumbo limbo	<i>Bursera simaruba</i>	
Jamaica caper	<i>Capparis cynophallophora</i>	
limber caper	<i>Capparis flexuosa</i>	
goatweed	<i>Capraria biflora</i>	
balloon vine	<i>Cardiospermum corindum</i>	
balloon vine	<i>Cardiospermum halicacabum</i> *	
Australian pine	<i>Casuarina equisetifolia</i> *	
Madagascar periwinkle	<i>Catharanthus roseus</i> *	
partridge pea	<i>Chamaecrista fasciculata</i>	
graceful sandmat	<i>Chamaesyce hypericifolia</i>	
snowberry	<i>Chiococca alba</i>	
yellow hibiscus	<i>Cienfuegosia yucatanensis</i>	4
saw grass	<i>Cladium jamaicensis</i>	
pigeon plum	<i>Coccoloba diversifolia</i>	
seagrape	<i>Coccoloba uvifera</i>	
buttonwood	<i>Conocarpus erecta</i>	
blue mist flower	<i>Conoclinium coelestinum</i>	
cordia	<i>Cordia globosa</i>	12
geiger tree	<i>Cordia sebestena</i> *	
Rhacoma	<i>Crossopetalum ilicifolium</i>	12
rattlebox	<i>Crotalaria pumila</i>	
fragrant milkweed	<i>Cynanchum northropiae</i>	
Bermuda grass	<i>Cynodon dactylon</i> *	
umbrella sedge	<i>Cyperus involucratus</i> *	
nutgrass	<i>Cyperus rotundus</i> *	
Egyptian grass	<i>Dactyloctenium aegyptium</i> *	
Florida begger weed	<i>Desmodium tortuosum</i> *	
false-mint	<i>Dicliptera sexangularis</i>	
saltgrass	<i>Distichlis spicata</i>	
milkbark	<i>Drypetes diversifolia</i>	12

* Non-native Species

Windley Key Fossil Reef Geological State Park

Plants

Common Name	Scientific Name	Primary Habitat Codes (for designated species)
Guiana plum	<i>Drypetes lateriflora</i>	
goose grass	<i>Eleusine indica</i> *	
butterfly orchid	<i>Encyclia tampensis</i>	
gophertail lovegrass	<i>Eragrostis ciliaris</i> *	
black torch	<i>Erithalis fruticosa</i>	12
beach creeper	<i>Ernodea littoralis</i>	
white stopper	<i>Eugenia axillaris</i>	
Spanish stopper	<i>Eugenia foetida</i>	
red stopper	<i>Eugenia rhombea</i> – cultivated	12
grassleaf spurge	<i>Euphorbia graminea</i> *	
pencil tree	<i>Euphorbia tirucalli</i> *	
seaside gentian	<i>Eustoma exaltatum</i>	
creeping morning glory	<i>Evolvulus convolvuloides</i>	12
princewood	<i>Exostema caribaeum</i>	12
inkwood	<i>Exothea paniculata</i>	
strangler fig	<i>Ficus aurea</i>	
shortleaf fig	<i>Ficus citrifolia</i>	
hurricane grass	<i>Fimbristylis cymosa</i>	
yellowtop	<i>Flaveria linearis</i>	
seven-year apple	<i>Genipa clusiifolia</i>	
lignum vitae	<i>Guaiacum sanctum</i>	12
blolly	<i>Guapira discolor</i>	
Everglades velvetseed	<i>Guettarda elliptica</i>	
rough velvetseed	<i>Guettarda scabra</i>	
crabwood	<i>Gymnanthes lucida</i>	
prickly apple cactus	<i>Harrisia simpsonii</i>	12
scorpion tail	<i>Heliotropium angiospermum</i>	
seaside heliotrope	<i>Heliotropium curassavicum</i>	
bladder mallow	<i>Herissantia crispa</i>	
hibiscus	<i>Hibiscus poeppigii</i>	12
night-blooming cereus	<i>Hylocereus undatus</i> *	
spider lily	<i>Hymenocallis latifolia</i>	
white ironwood	<i>Hypelate trifoliata</i>	12
Florida Keys indigo	<i>Indigofera mucronata</i> var. <i>keyensis</i>	4
morning glory	<i>Ipomoea indica</i> var. <i>acuminata</i>	
morning glory	<i>Ipomoea triloba</i> *	
beach elder	<i>Iva imbricata</i>	
sky blue morning glory	<i>Jacquemontia pentanthos</i>	
joewood	<i>Jacquinia keyensis</i>	4
devil's backbone	<i>Kalanchoe daigremontiana</i> *	
caltrop	<i>Kallstroemia maxima</i> *	
thoroughwort	<i>Koanophyllon villosum</i>	
black ironwood	<i>Krugiodendron ferreum</i>	
wild lettuce	<i>Lactuca graminifolia</i>	
white mangrove	<i>Languncularia racemosa</i>	
lantana	<i>Lantana camara</i> *	
wild lantana	<i>Lantana involucrata</i>	
wild lettuce	<i>Launaea intybacea</i> *	
lead tree	<i>Leucaena leucocephala</i> *	
sea lavender	<i>Limonium carolinianum</i>	
Christmas berry	<i>Lycium carolinianum</i>	

* Non-native Species

Windley Key Fossil Reef Geological State Park

Plants

Common Name	Scientific Name	Primary Habitat Codes (for designated species)
wild dilly	<i>Manilkara bahamensis</i>	12,4
mayten	<i>Maytenus phyllanthoides</i>	12
marsh elder	<i>Melanthera nivea</i>	
poisonwood	<i>Metopium toxiferum</i>	
key grass	<i>Monanthes littoralis</i>	
cheeseweed	<i>Morinda royoc</i>	
lancewood	<i>Ocotea coriacea</i>	
ground orchid	<i>Oeceoclades maculata</i> *	
prickly-pear cactus	<i>Opuntia stricta</i>	12
Guinea grass	<i>Panicum maximum</i> *	
winged paspalum	<i>Paspalum fimbriatum</i> *	
wild allamanda	<i>Pentalinon luteum</i>	
Jamaica dogwood	<i>Piscidia piscipula</i>	
cockspur	<i>Pisonia aculeata</i>	
blackbead	<i>Pithecellobium keyense</i>	
cat's claw	<i>Pithecellobium unguis-cati</i>	
wild plumbago	<i>Plumbago scandens</i>	
wild poinsettia	<i>Poinsettia cyathophora</i>	
rustweed	<i>Polypremum procumbens</i>	
purslane	<i>Portulaca oleracea</i>	
wild coffee	<i>Psychotria nervosa</i>	
white indigo-berry	<i>Randia aculeata</i>	
darling plum	<i>Reynosa septentrionalis</i>	12
red mangrove	<i>Rhizophora mangle</i>	
natal grass	<i>Rhynchelytrum repens</i> *	
rougeberry	<i>Rivina humilis</i>	
annual glasswort	<i>Salicornia bigelovii</i>	
bowstring hemp	<i>Sansevieria hyacinthoides</i> *	
soapberry	<i>Sapindus saponaria</i>	
beach naupaka	<i>Scaevola sericea</i> *	
Florida boxwood	<i>Schaefferia frutescens</i>	12
Brazilian pepper	<i>Schinus terebinthifolius</i> *	
gulf graytwig	<i>Schoepfia chrysophylloides</i>	
sea purslane	<i>Sesuvium portulacastrum</i>	
saffron plum	<i>Sideroxylon celastrina</i>	
mastic	<i>Sideroxylon foetidissimum</i>	
willow bustic	<i>Sideroxylon salicifolium</i>	
paradise tree	<i>Simarouba glauca</i>	
greenbrier	<i>Smilax havanensis</i>	
Bahama nightshade	<i>Solanum bahamense</i>	
potato tree	<i>Solanum erianthum</i>	
prickly cordgrass	<i>Spartina spartinae</i>	
buttonweed	<i>Spermacoce verticillata</i> *	
dropseed	<i>Sporobolus indicus var. indicus</i> *	
West Indian dropseed	<i>Sporobolus indicus var. pyramidalis</i> *	
porterweed	<i>Stachytarpheta urticifolia</i> *	
pencil flower	<i>Stylosanthes hamata</i>	
sea blite	<i>Suaeda linearis</i>	
West Indian mahogany	<i>Swietenia mahagoni</i>	12
yellow elder	<i>Tecoma stans</i> *	
portia	<i>Thespesia populnea</i> *	

* Non-native Species

Windley Key Fossil Reef Geological State Park

Plants

Common Name	<i>Scientific Name</i>	Primary Habitat Codes (for designated species)
Key thatch	<i>Thrinax morrisii</i>	12
Florida thatch palm	<i>Thrinax radiata</i>	12
twisted air plant	<i>Tillandsia flexouosa</i>	12
silvery wild pine	<i>Tillandsia paucifolia</i>	
ball moss	<i>Tillandsia recurvata</i>	
Spanish moss	<i>Tillandsia usneoides</i>	
puncture weed	<i>Tribulus cistoides</i> *	
Mexican daisy	<i>Tridax procumbens</i> *	
yellow alder	<i>Turnera ulmifolia</i> *	
Christmas palm	<i>Veitchia merillii</i> *	
hog-plum	<i>Ximenia americana</i>	
wild lime	<i>Zanthoxylum fagara</i>	
turf grass	<i>Zoysia matrella</i> var. <i>tenuifolia</i> *	

* Non-native Species

Windley Key Fossil Reef Geological State Park

Animals

Common Name	<i>Scientific Name</i>	Primary Habitat Codes (for all species)
MAMMALS		
raccoon	<i>Procyon lotor</i>	MTC
marsh rabbit	<i>Sylvilagus palustris</i>	MTC
BIRDS		
Loons		
Common loon	<i>Gavia immer</i>	OF
Pelican		
brown pelican	<i>Pelecanus occidentalis</i>	OF
Cormorant		
double-crested cormorant	<i>Phalacrocorax auritus</i>	OF
Frigatebird		
magnificent frigatebird	<i>Fregata magnificens</i>	OF
Hérons		
great blue heron	<i>Ardea herodias</i>	75
great egret	<i>Casmerodius albus</i>	75
snowy egret	<i>Egretta thula</i>	75
reddish egret	<i>Egretta rufescens</i>	75
cattle egret	<i>Bubulcus ibis</i>	75
Louisiana heron	<i>Egretta tricolor</i>	75
little blue heron	<i>Egretta caerulea</i>	75
green heron	<i>Butorides striatus</i>	75
yellow-crowned night heron	<i>Nycticorax nycticorax</i>	75
Ibis And Spoonbill		
white ibis	<i>Eudocimus albus</i>	75
roseate spoonbill	<i>Ajaia ajaja</i>	75
Ducks		
lesser scaup	<i>Aythya affinis</i>	OF
red-breasted merganser	<i>Mergus serrator</i>	OF
Vultures		
turkey vulture	<i>Cathartes aura</i>	OF
Eagles And Hawks		
swallow-tailed kite	<i>Elanoides forficatus</i>	OF
bald eagle	<i>Haliaeetus leucocephalus</i>	OF
sharp-shinned hawk	<i>Accipiter striatus</i>	12, OF
red-shouldered hawk	<i>Buteo lineatus</i>	12, OF
broad-winged hawk	<i>Buteo platypterus</i>	12, OF
Swainson's hawk	<i>Buteo swainsoni</i>	12, OF
northern harrier	<i>Circus cyaneus</i>	12, OF
osprey	<i>Pandion haliaetus</i>	75, OF
Falcon		
peregrine falcon	<i>Falco peregrinus</i>	12, OF
American kestrel	<i>Falco sparverius</i>	12, OF
Limpkin		
limpkin	<i>Aramus guarauna pictus</i>	75

* Non-native Species

Windley Key Fossil Reef Geological State Park

Animals

Common Name	Scientific Name	Primary Habitat Codes (for all species)
Rail		
sora rail	<i>Porzana carolina</i>	75
Plovers		
killdeer	<i>Charadrius vociferus</i>	75
black-bellied plover	<i>Pluvialis squatarola</i>	75
Stilt		
black-necked stilt	<i>Himantopus mexicanus</i>	75
Sandpipers		
spotted sandpiper	<i>Actitis macularia</i>	75
willet	<i>Catoptrophorus semipalmatus</i>	75
greater yellowlegs	<i>Tringa melanoleuca</i>	75
lesser yellowlegs	<i>Tringa flavipes</i>	75
ruddy turnstone	<i>Arernaria interpres</i>	75
sanderling	<i>Calidris alba</i>	75
least sandpiper	<i>Calidris minutilla</i>	75
dowitcher	<i>Limnodromus scolopaceus</i>	75
Gulls And Terns		
laughing gull	<i>Larus atricilla</i>	75, OF
ring-billed gull	<i>Larus delawarensis</i>	75, OF
herring gull	<i>Larus argentatus</i>	75, OF
common tern	<i>Sterna hirundo</i>	75, 81, OF
least tern	<i>Sterna antillarum</i>	75, 81, OF
royal tern	<i>Sterna maxima</i>	75, 81, OF
Skimmers		
black skimmer	<i>Rynchops niger</i>	75, OF
Pigeon And Doves		
white-crowned pigeon	<i>Columba leucocephala</i>	12
mourning dove	<i>Zenaida macroura</i>	12
ground dove	<i>Columbina passerina</i>	12, 81
Cuckoos And Ani		
black-billed cuckoo	<i>Coccyzus erythrophthalmus</i>	12
yellow-billed cuckoo	<i>Coccyzus americanus</i>	12
mangrove cuckoo	<i>Coccyzus minor</i>	12
smooth-billed ani	<i>Crotophaga ani</i>	12
Goatsuckers		
chuck-will's widow	<i>Caprimulgus carolinensis</i>	12
whip-poor-will	<i>Caprimulgus vociferus</i>	12
common nighthawk	<i>Chordeiles minor</i>	12
Kingfisher		
belted kingfisher	<i>Ceryle alcyon</i>	75
Woodpeckers		
red-bellied woodpecker	<i>Melanerpes carolinus</i>	12
yellow-shafted flicker	<i>Colaptes auratus</i>	12
Flycatcher		
eastern kingbird	<i>Tyrannus tyrannus</i>	12
gray kingbird	<i>Tyrannus dominicensis</i>	12

* Non-native Species

Windley Key Fossil Reef Geological State Park

Animals

Common Name	Scientific Name	Primary Habitat Codes (for all species)
great crested flycatcher	<i>Myiarchus crinitus</i>	12
Swallows		
barn swallow	<i>Hirundo rustica</i>	81
Crow		
fish crow	<i>Corvus ossifragus</i>	75
Mimic Thrushes		
mockingbird	<i>Mimus polyglottus</i>	12
gray catbird	<i>Dumetella carolinensis</i>	12
brown thrasher	<i>Toxotoma rufum</i>	12
Thrushes		
blue-gray gnatcatcher	<i>Poliophtila caerulea</i>	12
ruby-crowned kinglet	<i>Regulus calendula</i>	12
Waxwing		
cedar waxwing	<i>Bombycilla cedrorum</i>	12
Shrike		
loggerhead shrike	<i>Lanius ludovicianus</i>	12, 81
Vireos		
white-eyed vireo	<i>Vireo griseus</i>	12
black-whiskered vireo	<i>Vireo altiloquus</i>	12
Wood Warblers		
black-and-white warbler	<i>Mniotilta varia</i>	12
worm-eating warbler	<i>Helminthos vermivorus</i>	12
northern parula	<i>Parula americana</i>	12
yellow warbler	<i>Dendroica petechia</i>	12
Cape May warbler	<i>Dendroica tigrina</i>	12
black-throated blue warbler	<i>Dendroica caerulescens</i>	12
yellow-throated warbler	<i>Dendroica dominica</i>	12
blackpoll warbler	<i>Dendroica striata</i>	12
prairie warbler	<i>Dendroica discolor</i>	12, 81
palm warbler	<i>Dendroica palmaris</i>	12
northern waterthrush	<i>Seiurus noveboracensis</i>	12
Louisiana waterthrush	<i>Seiurus motacilla</i>	12
common yellowthroat	<i>Geothlypis trichas</i>	12
American redstart	<i>Setophaga ruticilla</i>	12
Grosbeaks, Sparrows, And Buntings		
cardinal	<i>Cardinalis</i>	12
rose-breasted grosbeak	<i>Pheucticus ludovicianus</i>	12
indigo bunting	<i>Passerina cyanea</i>	12
painted bunting	<i>Passerina ciris</i>	12
Blackbirds And Orioles		
red-winged blackbird	<i>Agelaius phoeniceus</i>	75, 12
common grackle	<i>Quiscalus guiscula</i>	75, 12
northern oriole	<i>Icterus galbula</i>	12
summer tanager	<i>Piranga rubra</i>	12
Weavers		
house sparrow	<i>Passer domesticus</i>	12

* Non-native Species

Windley Key Fossil Reef Geological State Park

Animals

Common Name	<i>Scientific Name</i>	Primary Habitat Codes (for all species)
INVERTEBRATES		
Phylum Mollusca		
banded forest snail	<i>Drymaeus multilineatus</i>	12, 81
Florida tree snail	<i>Liguus fasciatus</i>	12, 81
Phylum Arthropods		
ARACHNIDA		
silver argiope	<i>Argiope argentata</i>	12
crab spider	<i>Gasteracantha cancriformis</i>	12
golden orb spider	<i>Nephila clavipes</i>	12
INSECTA		
preying mantis	<i>Stagmomantis carolina</i>	12, 81
zebra butterfly	<i>Heliconius charitonius</i>	12, 81
giant swallowtail	<i>Papilio cresphontes</i>	12, 81
buckeye butterfly	<i>Precis coenia</i>	12, 81
ANTHROPODS		
Phylum Arthropoda		
mangrove crab	<i>Aratus pisonii</i>	76, 75
mangrove crab	<i>Goniopsis cruentata</i>	76, 75
fiddler crab	<i>Uca pugilator</i>	76, 75
land crab	<i>Cardisoma guanhumii</i>	76, 75
land hermit crab	<i>Coenobita clypeatus</i>	75, 12, 81
AMPHIBIANS		
Cuban tree frog	<i>Hyla septentrionales</i>	12, 81
REPTILES		
ashy gecko	<i>Sphaerodactylus cinereus</i>	12, 81
green anole	<i>Anolis carolinensis</i>	12, 81
southeastern five-lined skink	<i>Eumeces inexpectatus</i>	12, 81
Florida Keys mole skink	<i>Eumeces egregius egregius</i>	12, 81
mangrove water snake	<i>Natrix fasciata compressicauda</i>	76

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
46. Flatwood/Prairie Lake
47. Marsh Lake

Lacustrine—Continued

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 5—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).
- S? = not yet ranked (temporary)

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

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 that is in danger of extinction throughout all or a significant portion of its range.
- PE = Proposed for addition to the List of Endangered and Threatened Wildlife and Plants as Endangered Species.
- LT = Listed as Threatened Species. Defined as any species that is likely to become an endangered species within the near future throughout all or a significant portion of its range.
- PT = Proposed for listing as Threatened Species.
- C = Candidate Species for addition to the list of Endangered and Threatened Wildlife and Plants. Defined as those species for which the USFWS currently has on file sufficient information on biological vulnerability and threats to support proposing to list the species as endangered or threatened.
- E(S/A) = Endangered due to similarity of appearance.
T(S/A) = Threatened due to similarity of appearance.

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.

Windley Key Fossil Reef Geological State Park

Designated Species

Plants

Common Name/ Scientific Name	FDA	Designated Species Status	
		USFWS	FNAI
Barb-wire cactus <i>Acanthocereus tetragonus</i>	LT		
Golden leather fern <i>Acrostichum aureum</i>	LT		G5/S3
Blodgett's wild-mercury (silverbush) <i>Argythamnia blodgettii</i>	LE		G2/S2
Mexican (Yellow) hibiscus <i>Cienfuegosia yucatanensis</i>	LE		G2G4/S1
Cordia <i>Cordia globosa</i>	LE		
Rhacoma <i>Crossopetalum ilicifolium</i>	LT		G2/S2
Milkbark <i>Drypetes diversifolia</i>	LE		G3G4/S2
Black torch <i>Erithalis fruticosa</i>	LT		
Red Stopper – cultivated <i>Eugenia rhombea</i>	LE		G3G5/S1
Creeping morning glory <i>Evolvulus convolvuloides</i>	LE		
Princewood <i>Exostema caribaeum</i>	LE		
Lignum-vitae <i>Guaiacum sanctum</i>	LE		G4G5/S2
Simpson's prickly apple (prickly apple cactus) <i>Harrisia simpsonii</i>	LE		G2Q/S2
Hibiscus <i>Hibiscus poeppigii</i>	LE		
White ironwood <i>Hypelate trifoliata</i>	LE		G3G5/S1
Decumbent (Florida Keys) indigo <i>Indigofera mucronata</i> var <i>keyensis</i>	LE		G5?T1/S1
Skyblue clustervine (morning glory) <i>Jacquemontia pentanthos</i>	LE		G5/S2
Joewood <i>Jacquinia keyensis</i>	LT		G4/S3
Wild dilly <i>Manilkara bahamensis</i> (<i>jaimiqui</i>)	LT		G4Q/S3
Mayten <i>Maytenus phyllanthoides</i>	LT		
Prickly-pear cactus <i>Opuntia stricta</i>	LT		
Darling plum <i>Reynosia septentrionalis</i>	LT		
Yellowwood (Florida boxwood) <i>Schaefferia frutescens</i>	LE		G5/S2

Windley Key Fossil Reef Geological State Park

Designated Species

Plants

Common Name/ <i>Scientific Name</i>	FDA	<u>Designated Species Status</u>	
		USFWS	FNAI
West Indies mahogany <i>Swietenia mahogoni</i>	LE		G3G4/S2
Brittle (Key) thatch palm <i>Thirnax morrisii</i>	LE		G4G5/S3
Florida thatch palm <i>Thirnax radiata</i>	LE		G4G5/S2
Banded wild-pine (twisted air plant) <i>Tillandsia flexuosa</i>	LE		G4/S3

Windley Key Fossil Reef Geological State Park

Designated Species

Animals

Common Name/ <i>Scientific Name</i>	Designated Species Status		
	FFWCC	USFWS	FNAI
BIRDS			
Roseate spoonbill <i>Ajaia ajaja</i>	LS		G5/S2S3
White crowned pigeon <i>Columba leucocephala</i>	LT		G3/S3
Little blue heron <i>Egretta caerulea</i>	LS		G5/S4
Reddish egret <i>Egretta rufescens</i>	LS		G4/S2
Snowy egret <i>Egretta thula</i>	LS		G5/S4
Tricolored heron <i>Egretta tricolor</i>	LS		G5/S4
Peregrine falcon <i>Falco peregrinus</i>	LE	LE	G4/S2
Southeastern American kestrel <i>Falco sparverius</i>	LT		G5T3T4/S3
Bald eagle <i>Haliaeetus leucocephalus</i>	LT	LT	G4/S3
Osprey <i>Pandion haliaetus</i>	LS		G5/S3S4
Brown pelican <i>Pelecanus occidentalis</i>	LS		G4/S3
Least tern <i>Sterna antillarum</i>	LT		G4/S3
REPTILES AND AMPHIBIANS			
Florida Keys mole skink <i>Eumeces egregius egregius</i>	LS		G4T2/S2
INVERTEBRATE			
Florida tree snail <i>Liguus fasciatus</i>	LS		

Addendum 6—Priority Schedule And Cost Estimates

**Windley Key Fossil Reef Geological 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.

1. Inventory and develop a reference collection for fossilized corals and other marine resources.
Estimated Cost: \$25,000.
2. Seek funding for management restoration and preservation of the park's cultural resources
Estimated Cost: \$100,000-\$150,000.
3. Develop a cultural resource preservation plan **Estimated Cost: \$25,000**
4. Pursue funding for a comprehensive cultural resource survey of the park. **Estimated Cost: \$25,000.**
5. Draft a Scope of Collections Statement; catalog and inventory any permanent collections.
Estimated Cost: \$25,000.
6. Pursue funding to hire a conservation professional to evaluate quarry machinery and produce a conservation plan. **Estimated Cost: \$25,000.**
7. Seek funding for planned enhancement of facilities, including observation towers and a shop/storage facility. **Estimated Cost: \$200,000.**
8. Seek funding for staff (education and training specialist) for program implementation.
Estimated Cost: \$30,000.

TOTAL ESTIMATED COST: \$455,000-495,000.

**Windley Key Fossil Reef Geological State Park
Priority Schedule And Cost Estimates**

Item	Quantity	Unit	Unit Price	Multiplier	Amount
Recreation Facilities					
Scenic Overlook / Wildlife Blind	3.000	ea.	\$18,000.00	1.50	\$81,000.00
Support Facilities					
3 Bay Shop Building	1.000	ea.	\$135,000.00	1.50	\$202,500.00
Flammable / Small Storage Building	1.000	ea.	\$9,600.00	1.50	\$14,400.00
				Sub-Total	\$297,900.00
				20 percent Contingency Fee	\$59,580.00
				Total	\$357,480.00

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.