# JOHN PENNEKAMP CORAL REEF STATE PARK

## **APPROVED MANAGEMENT PLAN**

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

**SEPTEMBER 1, 2004** 



# Department of Environmental Protection

Jeb Bush Governor Marjorie Stoneman Douglas Building 3900 Commonwealth Boulevard, MS 140 Tallahassee, Florida 32399-3000 Colleen M. Castille Secretary

September 1, 2004

Ms. BryAnne White Office of Park Planning Division of Recreation and Parks 3900 Commonwealth Blvd.; M.S. 525 Tallahassee, Florida 32399

#### Re: John Pennekamp Coral Reef State Park Lease #3627

Ms. White:

On August 20, 2004, the Acquisition and Restoration Council recommended approval of the John Pennekamp Coral Reef State Park management plan.

On September 1, 2004, the Office of Environmental Services, acting as agent for the Board of Trustees of the Internal Improvement Trust Fund, <u>approved the management plan</u> for John Pennekamp Coral Reef State Park. Pursuant to Section 253.034, Florida Statutes, and Chapter 18-2, Florida Administrative Code this plan's ten-year update will be due on September 1, 2014.

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. Please forward copies of all permits to this office upon issuance.

Sincerely,

Paula L Allen

Paula L. Allen Office of Environmental Services Division of State Lands Department of Environmental Protection

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## **TABLE OF CONTENTS**

INTRODUCTION	1
PURPOSE AND SCOPE OF PLAN	1
MANAGEMENT PROGRAM OVERVIEW	3
Management Authority And Responsibility	3
Park Goals and Objectives	4
Management Coordination	6
Public Participation	7
Other Designations	7

## **RESOURCE MANAGEMENT COMPONENT**

INTRODUCTION	9	
RESOURCE DESCRIPTION AND ASSESSMENT		
Natural Resources	9	
Cultural Resources		
RESOURCE MANAGEMENT PROGRAM	23	
Special Management Considerations	23	
Management Needs And Problems		
Management Objectives		
Management Measures For Natural Resources		
Management Measures For Cultural Resources		
Research Needs		
Resource Management Schedule		
Land Management Review		

## LAND USE COMPONENT

INTRODUCTION	35			
EXTERNAL CONDITIONS				
Existing Use Of Adjacent Lands	35			
Planned Use Of Adjacent Lands	36			
PROPERTY ANALYSIS	36			
Recreation Resource Elements	36			
Assessment Of Use	37			
CONCEPTUAL LAND USE PLAN	39			
Potential Uses And Proposed Facilities	41			
Facilities Development	43			
Existing Use And Optimum Carrying Capacity	44			
Optimum Boundary	44			

## TABLE

TABLE 1 -	- Existing Use A	And Optimum C	Carrying Capac	ity	45
				·	

## LIST OF ADDENDA

## **ADDENDUM 1**

Acquisition History and Advisory Group Information	. A	1	-	1
ADDENDUM 2				
References Cited	. A	2	-	1
ADDENDUM 3				
Soil Descriptions	. A	3	-	1

## ADDENDUM 4

	Plant And Animal List	A	4	-	1
A	ADDENDUM 5				
	Designated Species List	A	5	-	1
A	ADDENDUM 6				
	Priority Schedule and Cost Estimates	A	6	-	1

## MAPS

Vicinity Map	2
Soils Map	11
Natural Communities Map	13
Base Map	
Conceptual Land Use Plan Map	40
Optimum Boundary Map	46

#### **INTRODUCTION**

John Pennekamp Coral Reef State Park (Coral Reef State Park) is located in Monroe County on Key Largo (see Vicinity Map) about 20 miles south of Homestead. Access to the park is from U.S. Highway 1 at mile marker 102.5. Key Largo is the most northeasterly key in the chain of islands known as the Florida Keys. The vicinity map also reflects significant land and water resources existing near the park.

The land base of the park is located on the southwest shoreline of Largo Sound. There are also several non-contiguous tracts of land in Key Largo north and south of the land base that border the marine portions of Coral Reef State Park. The submerged portion of the park extends three miles out into the Atlantic Ocean and is approximately 23 statute miles in length. When first dedicated as a park, it also included the submerged areas east of the three-mile state jurisdictional line to the 60-foot depth contour. The federal portions of the original park are now managed as the Key Largo Existing Management Area, a zone within the Florida Keys National Marine Sanctuary (FKNMS).

The park is named for the late John D. Pennekamp, a Miami newspaper editor whose efforts led to the establishment of this state park. The park was originally established due to growing concern that the coral reefs in the Florida Keys were being destroyed by excessive collection of coral, conch and tropical fish. As development increased in the Keys, it became increasingly important to acquire additional upland habitat to protect the entire ecosystem. 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 63,561 acres. Park acreage has been calculated on the composition of natural communities, in addition to ruderal and developed areas.

The park was acquired in 1959 as a dedication. At John Pennekamp Coral Reef State Park, public outdoor recreation and conservation is the designated single use of the property (see Addendum 1). There are no legislative or executive directives that constrain the use of this property.

#### PURPOSE AND SCOPE OF THE PLAN

This plan serves as the basic statement of policy and direction for the management of John Pennekamp Coral Reef 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 replace the March 20, 1998 approved plan. 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 one corresponds to a particular aspect of the administration of the park. The resource management component provides a detailed inventory and assessment of the natural and cultural resources of the park. Resource management problems and needs are identified, and specific management objectives are established for each resource



type. This component provides guidance on the application of such measures as prescribed burning, exotic species removal and restoration of natural conditions.

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

In the development of this plan, the potential of the park to accommodate secondary management purposes ("multiple uses") was analyzed. These secondary purposes were considered within the context of the Division's statutory responsibilities and an analysis of the resource needs and values of the park. This analysis considered the park natural and cultural resources, management needs, aesthetic values, visitation and visitor experiences. For this park, it was determined that no secondary purposes could be accommodated in a manner that would not interfere with the primary purpose of resource-based outdoor recreation and conservation. Uses such as, water resource development projects, water supply projects, stormwater management projects, linear facilities and sustainable agriculture and forestry 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 affect public recreational uses.

Many operating procedures are standard system wide and are set by policy. These procedures are outlined in the Division's Operations Manual (OM) that covers 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 John Pennekamp Coral Reef State Park, a balance is sought between the goals of preserving natural conditions and providing various recreational opportunities. Natural resource management activities are aimed at management of natural systems. Development in the park involves providing public access and recreational facilities in a way that safely accommodates recreational needs while providing the necessary level of protection for important natural resources. Program emphasis is designed to maintain and restore the park's natural communities, interpret natural and cultural resources, and provide educational benefits.

The large fish and shellfish assemblage in the park is a significant natural resource that supports several sport and commercial fisheries. The principal gamefish are bonefish (Albula vulpes) and tarpon (Megalops atlantica). Permit (Trachinotus falcatus), an excellent foodfish, is also much sought after by sport anglers. Many species taken by recreational anglers are sold commercially, and fall into the category of foodfish. These include many species of snapper, grouper and grunt, snook, and several species of mackerel. Ballyhoo (Hemiramphus brasiliensis) are caught with small "hair" hooks, or castnetted, for live or dead bait, by recreational fishermen, usually after having been chummed close to the boat. Several species of "whitebait," including pilchards and sardines (Harengula spp.), and mullet (Mugil spp.) are castnetted along the shore for bait. Several invertebrates are caught, including pink shrimp (Penaeus duorarum), which are dipnetted from channels during the winter, spiny lobster which are caught by hand while snorkelling or diving during the day or, bullynetting at night in the creeks, and stone crabs (Menippe *mercenaria*), which are trapped. However, in 1993 the Marine Fisheries Commission established regulations that abolished the 2-day sport lobster season within the park and prohibited lobstering in coral formations within the park throughout the regular lobster season (Florida Administrative Code 46-24.0065). Marine species harvested commercially in the park at present include spiny lobster and stone crab, which are trapped, ballyhoo, a baitfish which is purse seined and cast-netted, and bottom fish such as grouper, snapper, and various reef fish, which are caught by hook and line. A commercial license is required for all these activities. Special regulations have been established which prohibit the taking of reef fish with any method from the park (Florida Administrative Code 46-5.002). Commercial fishing is an existing historical use in the park. Commercial fishing is subject to regulation by the Florida Fish and Wildlife Conservation and the National Marine Fisheries Service. As such, prohibition of this existing use would likely require a coordinated effort with these agencies.

#### **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 and monitor the condition of and impacts to the marine communities and water quality of the park.
  - **A.** Protect the park's marine resources from all dredging, filling, and other construction activity by outside sources.
  - **B.** Protect the coral reef community in the park by keeping lobster exclusion zones marked and pulling abandoned traps.
  - **C.** Install and maintain mooring buoys at selected patch reefs to reduce anchor and boating impacts to coral, as necessary.
  - **D.** Increase area closed to internal combustion engine operation for protection of submerged bottom by continuing to install and maintain buoys in selected areas where water depth is 4' or less, as approved after public workshops and Department review.
  - **E.** Protect the marine fauna and flora of the park by working cooperatively with law enforcement agencies to increase patrol presence on the water and enforce existing rules and regulations.
  - **F.** Protect the shallow submerged marine communities from boating damage by continuing to improve and maintain channel markers and regulatory buoys and signs and distribute educational materials regarding safe boating.
- 2. Protect and monitor the condition of and impacts to the upland communities of the park.
  - A. Remove exotic flora and fauna to eliminate or minimize its presence and replant with native species, as necessary.
  - **B.** Approve draft of exotic removal plan and continue to implement and update it.
  - **C.** Restore topographically altered communities to appropriate elevations and similar plant species composition.
  - **D.** Enhance least tern nesting in the park by discouraging human and predator intrusion and removing vegetation from potential nesting sites.
  - **E.** Survey and monitor the status and condition of endangered species within the park.
- **3.** Protect and monitor the cultural resources of the park.
  - **A.** Conduct a Level II archaeological survey to determine the extent and locations of prehistoric and historic sites.
  - **B.** Protect existing archaeological sites and their associated artifact assemblage from vandalism, erosion, and other forms of encroachment.
  - **C.** Continue to restore and maintain the cultural site located at the Shaw Property known as the Key Lime Grove.
    - (1) Develop a plan for the grove to determine its maintenance and interpretation needs.
    - (2) Plant additional key limes, mangoes, and avocados to insure that this cultural resource continues to survive.

## **Recreational Goals**

4. Continue to provide quality resource based outdoor recreational and interpretive programs

and facilities at the state park.

- A. Maintain overnight accommodations, including RV and tent camping.
- **B.** Maintain opportunities for picnicking, boating, swimming and hiking.
- **C.** Continue to provide access to the coral reef for snorkeling, scuba diving, glass bottom boat tours and fishing.
- 5. 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.
  - A. Pursue funding to expand and improve the Visitor Center.
    - (1) Expand the auditorium to accommodate groups of 250-300.
    - (2) Upgrade the aquariums in the Visitor Center to meet ADA requirements, providing viewing access for the disabled.
- **6.** Expand the paddling trail.
  - A. Provide additional locations for day use rest areas and primitive camping.
- 7. Provide a park wide interpretive strategy.
  - **A.** Conduct interpretive programs to educate visitors about the Florida Keys ecology, its value and impacts to it.
  - **B.** Conduct interpretive programs to educate visitors about Florida's earlier inhabitants.
  - **C.** Continue the frequent and diverse interpretive programs, expand and update where needed with new information and static displays.

#### Park Administration/Operations

- 8. Continue working closely with the concessionaire.
  - **A.** Assist in implementing special package deals that would promote park activities, thereby increasing visitor services and revenue.
  - B. Coordinate with concessionaire in construction of maintenance facility.
- 9. Increase the current volunteer program to help meet the needs of the growing facilities.
- 10. Increase programs offered to the community, working more with the local schools.
- **11.** Facilitate research in the park that will provide information beneficial to preservation of the natural resources.
  - **A.** Pursue funding to develop research and housing facilities for a field research support station on the Shaw Tract.
  - **B.** Pursue funding to determine methods of minimizing stormwater runoff impacts.
- **12.** Prevent development impacts to the park by evaluating and responding to environmental permit applications or other environmental issues that may affect submerged, wetland, or upland communities.
- **13.** Pursue funding for a survey of the park boundaries.
  - A. Survey the mean high water line.
  - **B.** Survey the upland boundaries focusing on areas of encroachment.
- 14. Work with FDOT to ease the traffic congestion at the main entrance.
- **15.** Obtain a Park Service Specialist and one Ranger position to address the natural resource and interpretation needs.
- 16. Pursue funding to acquire additional upland and wetland properties included in the park's optimum boundaries, including parcels identified in the Tropical Flyways and North Key Largo CARL projects.

#### **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 December 3, 2003 and a DEP Advisory Group meeting was held on December 4, 2003. The purpose of these meetings was to present the management plan to the public and to provide the Advisory Group members the opportunity to discuss the draft management plan.

#### **Other Designations**

John Pennekamp Coral Reef 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.

All waters within the unit have been designated as Outstanding Florida Waters, pursuant to Chapter 62-302 Florida Administrative Code. Administered by the Department of Environmental Protection, this program was created by Section 403.061, Florida Statutes, and protects lakes, rivers and streams against degradation of existing ambient water quality. Surface waters in this unit are also classified as Class III waters by DEP.

This park is not designated as an aquatic preserve; however, it is included within the Florida Keys National Marine Sanctuary (FKNMS), which was established in 1990. The portion of the Sanctuary where the park is located is designated as the Key Largo Existing Management Area, a zone within the FKNMS. The sanctuary encompasses all of the waters surrounding the Keys. It was created after three large ship groundings on the reef tract in 1989 and several serious outbreaks of coral disease triggered growing concern regarding the long-term environmental condition of the coral reef and associated communities. On June 19, 2002 the state waters within the FKNMS, including the waters of the park, were declared a "no discharge" zone where discharge of sewage, whether treated or not, is prohibited for all vessels.

#### **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**

This park is part of the High Coral Keys physiographic region, the southernmost continuation of the Atlantic Barrier Chain. The edge of the continental shelf parallels the Keys approximately seven miles offshore. Maximum elevations in the mainland portions of Coral Reef State Park reach 10 to 12 feet above mean sea level. On the offshore islands, elevations are less than 10 feet above mean sea level. Average depths in Hawk Channel, which parallels the shore in State waters, are 13 to 15 feet.

Coral Reef State Park is primarily a marine park. Only a small fraction of the total area is located above mean high water. Most of the park is submerged or intertidal land. The uplands of the park consist of several tracts on Key Largo and some areas above mean high water on the islands north and east of Key Largo, of which El Radabob Key is the largest.

Some of the park topography has been altered by human activities. Dredging and filling of wetlands has occurred mainly where mangrove swamp was filled to provide a land base for the park's facilities and dredged to create a marina basin. In past years, several private developments elsewhere on Key Largo have dredged boat channels on submerged park land.

These alterations affect a considerable portion of the total area, which has otherwise remained in a natural state. There are at least 15 sites that would benefit from topographic restoration, most of which are listed in the 1990 DEP dock and fill evaluation.

#### **Geology**

The geological formation of the upper Florida Keys is Key Largo limestone. It is derived from a Pleistocene coral reef that consisted of the same coral species as the present living reefs of the Keys. Several thousand years ago, a drop in sea level exposed portions of this ancient reef, forming numerous islands. Key Largo is the largest of these islands. Key Largo limestone is white to grey, porous, pitted with solution holes, and imbedded with crystalline calcite. In some areas, the surface has weathered into smooth caprock. Limestone on the uplands is covered with a thin layer of organic soil and leaf litter. It is often exposed along the intertidal portions of the shoreline and in submerged areas between the shore and Hawk Channel. Other submerged areas such as shallow banks are covered by a layer of calcareous sediment. A thick layer of organic muck covers the limestone in the mangrove swamps.

#### <u>Soils</u>

According to the Natural Resources Conservation Service (USDA 1995) there are seven soil types in this park (see Soils Map). There are two soil types for the upland communities. Pennekamp gravelly muck and Matecumbe muck are both found in tropical hammocks, although the former is generally found on slightly higher elevations and has a greater amount of loose rocks lying on the surface. Rock outcrop - Tavernier complex occurs in tidal swamps where there is an extensive amount of exposed bedrock. Islamorada muck and Key Largo muck are both found in tidal swamps. Udorthents - Urban land complex is the disturbed soil type where layers of crushed limestone and coral have been placed, usually over wetlands, for urban development. Elevation generally ranges from three to ten feet. A detailed description of the soil types is included in Addendum 3.

Soil erosion is currently not a large problem at this park unit since most of the upland is solid limerock with only a thin covering of soil and the Keys are not exposed to high wave energy. The extensive undeveloped portions of the shoreline are densely vegetated with mangroves, which help bind and stabilize sediment and filter surface runoff. Filled areas immediately adjacent to the water that lack native vegetative covers are vulnerable to erosion during heavy rainstorms. This can result in increased turbidity in the nearshore waters. There has also been some soil erosion of the submerged bank edges along the entrance channel of South Sound Creek. This bank erosion is caused by boat wakes and propeller scarring, which tears seagrass from the edge of the flats, leaving the sediment exposed and easily resuspended into the water column.

## **Minerals**

Other than Key Largo limestone, there are no known minerals of commercial value occurring at this unit.

## **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 small fresh water lenses that formed in the surface limestone during the rainy season and were replenished by rainfall. Some nearshore fresh water upwelling, an extension of the Biscayne Aquifer occurred in at least one location on North Key Largo. However, canalization of southeast Florida and subsequent saltwater intrusion into the Biscayne Aquifer has changed the regional hydrology considerably. At this time, fresh water on Key Largo is found on the uplands in solution holes only, following



rainfall, and as small, variable fresh water lens. Drainage in the upland areas of the Keys, including Key Largo, consists of immediate runoff into the adjacent marine environment, and seepage through the porous limestone. Because of the high permeability of the substrate, retention time of rainwater in Key Largo limestone is short.

#### **Natural Communities**

The system of classifying natural communities employed in this plan was developed by the Florida Natural Areas Inventory (FNAI) <u>FNAI Descriptions</u>. The premise of this system is that physical factors, such as climate, geology, soil, hydrology and fire frequency generally

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

The park contains ten 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.

**Coastal berm.** Several small narrow berms can be found on El Radabob and Rattlesnake Keys. These slightly elevated berms are found immediately landward and parallel to the mangrove shoreline. Coastal berms develop along low-energy shorelines where sand, shell material and debris are deposited over time from storms. Species composition is highly variable but generally consists of dense thickets of large shrubs, small trees, and xerophytic plants. Some of the more common species observed on Rattlesnake and El Radabob Keys include nickerbean (*Caesalpinia bonduc*), Spanish stopper (*Eugenia foetida*), blolly (*Guapira discolor*), blackbead, and spider lily (*Hymenocallis latifolia*). The coastal berms are in fair condition. They have been degraded by invasive exotic vegetation, particularly cork tree (*Thespesia populnea*), Brazilian pepper (*Schinus terebinthifolia*), and latherleaf (*Colubrina asiatica*). To protect this habitat, exotic removal is needed.

**Coastal rock barren.** This ecotonal community occurs in an intertidal continuum between marine tidal swamp and rockland hammock. It is characterized as a flat rockland with much exposed and eroded limestone and a sparse cover of stunted xeric vegetation, including mangroves and herbaceous plants. Soils generally consist of calcareous marls and organic debris within solution depressions and crevices in the coralline limestone.

The coastal rock barren in the park occurs on El Radabob Key and on Key Largo between MM 104 and 106.5, in an elongated band north of Largo Sound and south of Garden Cove, landward of the mangroves. In these areas, exposed limestone is weathered to caprock and pitted with countless solution holes. Salinity in the standing water of the solution holes may reach 80 parts per thousand or more at times of low rainfall. Because temperature and salinity may be extremely high in this habitat, vegetation is frequently limited and stunted. There is generally little or no canopy coverage. Vegetation consists primarily of stunted black and white mangroves, buttonwood (*Conocarpus erectus*), saltwort, sea ox-eye daisy (*Borrichia* spp.), and glasswort (*Salicornia* spp.). Tree branches are often colonized by numerous airplants (*Tillandsia* spp.) and orchids (*Encyclia* spp.). On slightly higher elevations, plants



such as saffron plum (*Sideroxylon reclinata*), joewood (*Jacquinia keyensis*), prickly pear (*Opuntia stricta*), randia (*Randia aculeata*), and hog plum (*Ximenia americana*) can be found. Coastal rock barren is heavily utilized by wading birds for foraging and roosting.

Because of its proximity to the water and the low density of vegetation, this habitat has historically been highly impacted by land development. The habitat in the park is in excellent condition. It requires protection from development and plant poaching.

**Rockland hammock.** In the majority of the uplands are covered by rockland hammock. Most of the hardwood trees are of West Indian origin. Their seeds were transported to the Keys by storms, ocean currents, and birds. The hammock typically has a dense canopy and open understory. The soil consists of a thin organic layer over a rocky limestone substrate. Some of the predominant trees in the undisturbed portions of the hammock are gumbo-limbo (*Bursera simaruba*), wild tamarind (*Lysiloma latisiliquum*), poisonwood (*Metopium toxiferum*), mahogany (*Swietenia mahagoni*), pigeon plum (*Coccoloba diversifolia*), strangler fig (*Ficus aurea*), and Jamaica dogwood (*Piscidia piscipula*).

The hammock provides food and shelter for a number of insects, amphibians, reptiles, birds, and mammals. The latter are mainly raccoon (*Procyon lotor*), the eastern grey squirrel (*Sciurus carolinensis*), opossum (*Didelphis marsupialis*) and two non-native rats, the black rat (*Rattus rattus*) and the Norwegian rat (*Rattus norvegicus*). The range of two endangered mammals, the Key Largo woodrat (*Neotoma floridana smalli*) and the Key Largo cotton mouse (*Peromyscus gossypinus allapaticola*) once extended through much of Key Largo. Although the park still provides habitat, no recent sightings have been documented on park land. The state-listed white-crowned pigeon (*Columba leucocephala*) relies upon undeveloped hammock areas such as those in John Pennekamp Coral Reef State Park and Dagny Johnson Key Largo Hammock Botanical State Park. Several color varieties of the Florida tree snail (*Liguus fasciatus*) inhabit the hardwood hammock.

The hammock also contains an increasing number of non-native species including, the brown anole (*Anole sangrei ornatus*), the tokay gecko (*Gecko gecko*), and Cuban tree frogs (*Hyla septentrionalis*).

A transitional area of low hammock separates the high interior hammock from wetland communities. Because of its low elevation, species composition is limited to those that are fairly salt tolerant. Within the park, a distinct narrow transition zone is located on Key Largo west of North Sound Creek above the rocky intertidal area lining the hardwood hammock. It is also found on a number of the higher offshore islands. Some of the filled wetlands at the park's landbase have been revegetating with species similar to those found in this transition zone. Typical species include buttonwood, Spanish stopper (*Eugenia foetida*), poisonwood (*Metopium toxiferum*), blackbead (*Pithecellobium guadalupense*), and Florida thatch palm (*Thrinax radiata*). The land crab (*Cardisoma guanhumi*) and the hermit crab (*Coenobita clypeatus*) are two of the more visible invertebrate species that inhabit this area.

The rockland hammock in the park is in good condition. Much of the current hammock represents second growth that has regrown since it was cleared for agricultural purposes in the early 1900s. Potential threats to this community include canopy disruption and fragmentation, exotic plant infestation, and ground water reduction. It requires protection from these forces, as well as development and poaching of rare plants and animals. The edge of the hammock is the most vulnerable to invasion by exotic plants, but even interior sections have been invaded

by Sapodilla (*Manilkara zapota*) and spotted ground orchids (*Oeceoclades maculata*) in recent years.

**Marine composite substrate.** Marine composite substrate in this park represents an ecotonal community between seagrass, consolidated substrate, and unconsolidated substrate where some plant and animal species of each may be found together. Because of this, marine composite community is highly variable in composition and size and offers a great amount of diversity. This habitat in the park is in excellent condition. In addition to being interspersed between communities in the Atlantic Ocean, marine composite substrate also occurs in the northeast and southeast corners of Largo Sound and throughout South Sound Creek. This creek is subjected to strong currents. Subsequently, the tides have swept away the bottom sediment in certain areas creating a matrix of consolidated substrate, unconsolidated substrate, and grass beds.

A well-developed shoal fringe community occurs on the southern boundary of the park adjacent to Rodriguez Key. The majority of this unusual habitat is actually located outside of park boundaries. This community is frequently found on the east side of shallow sediment banks. It consists of an unusually dense concentration of finger coral and coralline algae interspersed among seagrass and some unconsolidated substrate. There are generally two bands of zonation. A band of red coralline algae (Goniolithon strictum) occurs on the shallowest portion of the bank, while finger coral (Porites furcata) occurs in a narrow band adjacent to this at slightly greater depth (Ginsburg, 1972). In some areas, both zones may occur in less than one foot of water. Other organisms found in this community include echinoderms, crustaceans, mollusks, and sponges. The branching finger coral and corraline algae are very fragile and easily broken by physical impact. Damaging activities to this habitat would include anchoring, prop dredging, and even foot traffic. Because of its unique and fragile nature, this area may require additional protective measures in the future as boat use in the area increases. Although not currently part of the park, this community may soon be acquired as part of the package of property included with the acquisition of Rodriguez and Dove Keys.

Marine consolidated substrate. Marine consolidated substrate, also referred to as hardbottom, occur along the shoreline of Key Largo and El Radabob Key, from the intertidal zone to a maximum depth of approximately 12 feet. It is also found in the shallow waters on the east side of Largo Sound. This community intergrades considerably with seagrass, unconsolidated substrate as sediment accumulates, and vegetation recruits onto unconsolidated. Because of this complex intergrading, delineation between seagrass and hardbottom is difficult. For example, both the Marszalek maps (Marszalek 1981), and more recently, a USGS map (Lidz et al. 1997) delineate consolidated substrate, unconsolidated substrate, seagrass, and coral reefs, but the results are somewhat different. Where marine consolidated substrate is found in the upper keys, the seafloor consists of Key Largo limestone, with minimal sediment accumulation. The fauna and flora of this habitat is highly variable but is usually dominated by calcareous algae, octocorals, and sponges. Typical algae include Acetabularia spp., Caulerpa spp., Halimeda spp., Penicillus spp., Sargassum spp. and Udotea spp. Octocorals such as sea whips (Pterogorgia sp.) and sea rods (Plexaura sp.) can frequently be seen swaying near the surface of the shallow clear waters. Small hardy stony coral species are also found, but are not as abundant. These include finger coral (Porites porites), starlet coral (Siderastrea radians), rose coral (Manicina areolata), and lobed star coral (Solenastrea hyades). Voss (1976) provides an identification guide for many of the invertebrates typically found on consolidated substrate. Although there is an abundance of

coral in this habitat, consolidated substrate differs from patch reefs in species composition and in the fact that the species present in this community do not actively accrete or build massive structures.

Consolidated substrate is important since it provides a foundation for the development of other marine communities, when conditions are suitable. It provides important nursery habitat for fish and invertebrates, including the commercially important spiny lobster (*Panulirus argus*) and stone crab (*Menippe mercenaria*) (Voss, 1976). Fish and crustaceans typically found in seagrass and mangrove habitat also utilize this community.

This habitat is currently in good condition in the park. It can be easily destroyed through siltation, turbidity, eutrophication, dredge and fill activities, or boating impacts. Because of its proximity to developed areas of Key Largo, it is vulnerable to pollution from stormwater runoff. The hardbottom located near the Port Largo flats and the east side of Largo Sound was restricted from combustible motor use in 1993 to protect the shallow hardbottom and seagrass flats from boating damage.

**Marine coral reef.** The coral reefs within the park are classified as patch reefs. These reefs, along with the outer bank reefs, back reef, and reef flat comprise the Florida Keys reef tract, which runs parallel to the Keys in an arcuate band. Patch reefs occur scattered in the area landward of the outer reef and generally seaward of Hawk's Channel. Some less developed patch reefs also occur inshore of Hawk's Channel. Two large areas within the park have a high aggregation of patch reefs. Basin Hill Shoals lies in the northern half of the park offshore of Dagny Johnson Key Largo Hammocks Botanical State Park. Mosquito Banks lies in the southern half of the park offshore of the park land base and the developed portion of Key Largo. Smaller areas of patch reefs are found in other areas of the park as well.

Patch reefs characteristically are somewhat circular in shape, have a dome-shaped topography with at least three meters of relief, vary in size from 30 to 700 meters (m) in diameter, and occur in water two to nine meters deep (Jaap, 1984). Depending on water depth at the site and topography of the reef, the upper surface of the patch reef may lie immediately beneath the surface of the water and may be partially exposed at low tides. The patch reefs at Basin Hill Shoals exemplify this.

Coral reef environments are among the most diverse and productive environments in the world. Approximately 60 species of stony corals and 40 species of octocorals have been reported in the Keys. Within the park, 30 species of stony corals and 24 species of octocorals have been identified. Large branching corals such as elkhorn coral (Acropora palmata) which are a conspicuous element of the outer reef, are generally not found in this inshore habitat. Massive boulder corals and octocorals are the dominant coral species found at patch reefs. Common stony corals which are important in formation of the limestone framework of the reef include mountain star coral (Montastrea annularis), cavernous star coral (Montastrea cavernosa), grooved brain coral (Diploria labyrinthiformis), boulder brain coral (Colpophyllia natans), symmetrical brain coral (Diploria strigosa) and massive starlet coral (Siderastrea siderea) (Jaap 1984). Other major groups of organisms contributing to reef formation and composition include octocorals, sponges, calcareous algae, and hydrozoans. Because of the structural complexity of the reef and its proximity to other habitats, patch reefs support a diverse assemblage of invertebrates and fish. There are reported to be over 500 fish species in the Keys. Voss (1982) provided an extensive list of fish species occurring in the park. More recently, a study conducted by the National Marine Fisheries Service at patch reefs in the park observed 109 fish species over a three-year period (Bohnsack and Harper, 1992; McClellan and Bolden, 1995).

Corals grow best in warm, clear waters that have low nutrient levels and are subjected to low fluctuation in temperature and salinity. In addition to natural adverse conditions, patch reefs are subjected to a multitude of direct and indirect anthropogenic impacts. High levels of nutrients, toxic chemicals, and suspended particulate matter in the water column will adversely affect coral. This type of habitat degradation is often associated with upland development. Direct structural damage to corals may be caused by boat groundings, anchor damage, diver contact and storms.

The reefs in the northern portion of the park are generally in good condition. Because of the greater distance from development, the area is visited less by boaters. In addition, the presence of Dagny Johnson Key Largo Hammocks Botanical State Park on the adjacent uplands provides an important buffer from development impacts. The reefs in the southern portion of the park are more degraded primarily due to damage caused by boat groundings and more intense visitor use. While conducting a reef damage survey at selected patch reefs in the north and south end of the park, district biologists documented chronic occurrence of boat groundings over a two-year period from 1991–1993 (unpubl. data). Approximately 75 percent of all reported groundings occurred at Mosquito Bank. *Montastrea annularis* was the most frequently impacted coral species.

In an effort to reduce the frequency of groundings on this sensitive environment, 12 buoys marked "Danger Reef" were placed around the Cannon Patch during 2001. Full time staffing is needed, however, to maintain the growing number of markers necessary to reduce groundings on coral reef, hardbottom and seagrass habitat.

**Marine grass beds.** The majority of the submerged portions of the park are comprised of marine grass beds. This community can be found in the mangrove creeks, the nearshore flats, and in the deeper offshore waters in and beyond Hawk Channel. Seagrass beds are one of the most biologically productive communities in the world. They are ecologically significant because they stabilize sediment, cycle nutrients, and provide habitat for a diversity of plants and animals. The dense blades of seagrass also promote deposition of suspended particulate matter, which improves water clarity, an important criterion for healthy coral growth and survival.

Turtle grass (*Thalassia testudinum*), shoal grass (*Halodule wrightii*), and manatee grass (*Syringodium filiforme*) are the three species of seagrass found at Coral Reef State Park. Turtle grass is considered a climax species and is the dominant vegetation in well-established beds. Shoal grass is typically a pioneer species that colonizes disturbed sites. Because it has a greater tolerance for temperature and salinity extremes, shoal grass can generally be found in greater concentration nearshore and on high banks. Seagrasses, unlike algae, are true flowering plants, and have roots, flowers, and seeds. However, the main method of propagation is often by lateral extension of rhizomes. Seagrass colonization requires a minimum amount of sediment, low current velocity, and sufficient light availability.

Other organisms found in the grass beds include macroalgae, mollusks, echinoderms, crustaceans, sponges, and coral. Epiphytes, tiny organisms that grow or live on seagrass, are also very abundant. Common epiphytic species occurring on the grass blades include coralline red algae, bryozoans, hydrozoans, worms, amphipods, and gastropods. The grass beds serve

as nursery and foraging grounds for many species of fish and invertebrates that reside in the seagrass or migrate between the reefs, seagrass beds, and mangroves on a diurnal or seasonal pattern. Among these are several commercially important species such as grey snapper (*Lutjanus griseus*), black mullet (*Mugil cephalus*), spiny lobster, and pink shrimp (*Penaeus dourarum*). The endangered green turtle (*Chelonia mydas*) feeds on seagrasses as part of its diet.

Although the grass beds in deeper water and the mangrove creeks are in excellent condition, the majority of the shallow grass flats adjacent to navigational channels are in poor condition (Sargent et al. 1995). This includes the flats adjacent to South Sound Creek, Port Largo, and North Sound Creek. Boats motoring over seagrass beds with insufficient water depth run aground or create propeller scars and turbidity plumes through the flats. This degrades and destroys habitat, destabilizes the seafloor, reduces water clarity, and causes erosion of additional sediment. Prop scars revegetate very slowly and may actually increase in size with time if they erode. In 1993, the seagrass and hardbottom flats adjacent to the South Sound Creek channel (Port Largo flat), the North Sound Creek channel (Garden Cove flat), and the east side of Largo Sound were restricted from internal combustion motor use in an attempt to prevent additional damage in these areas and allow for recovery of the grassbeds. At the same time additional channel markers and signage were installed to reduce navigational errors. At the time of the closure, 136 acres were found to be damaged (Deaton 1995). This resource management action has been evaluated by district biological staff and it was determined that additional markers were necessary to dissuade boaters from cutting across Garden Cove flats when exiting North Sound Creek. In 2001, seven no combustion zone buoys were placed along the radius of the bend in the North Sound Creek channel as it approaches Garden Cove, to lead boaters lacking local knowledge on the correct course.

Largo Sound overall supports a healthy seagrass community. However, there are two large areas where seagrass died off in the early 1990s. One area is located near the boat-mooring field. The cause of the seagrass dieoff may somehow be associated with the mooring field, or due to eutrophication or disease. The other bare area is located at the north end of the sound between Taylor Creek and North Sound Creek. In this area, dense mats of turtle grass have been lifting up from the seafloor. According to several seagrass researchers, this manner of seagrass loss is considered very unusual (J. Kenworthy, M. Durako, pers. comm.).

Sediment plumes occur regularly and persist for long periods in Hawk channel, at the entrance to North and South Sound Creek and in Largo Sound. These sediment plumes are caused by turbulence from the propellers of vessels that draw nearly as much water as the channels in which they are running. Large amounts of sedimentation are harmful to both seagrasses and corals, which require clear water for best growth.

**Marine tidal swamp.** This community is in excellent condition. The three forms of mangrove community found in the park are fringe, overwash, and scrub mangrove forests. Fringe forests border shorelines and tidal creeks and are inundated daily by tides. Overwash forests are characterized as broad low-lying areas that are frequently overwashed by tides and consequently have high rates of organic export and nutrient import (Odum et al. 1982). Scrub forests are found at supratidal elevations and are only inundated by high tides seasonally.

The majority of marine tidal swamp is located between Port Largo and Garden Cove. The recent (2003) additions of Rodriguez and Dove Keys, added to the offshore islands of Rattlesnake and El Radabob Keys, support large mangrove communities. While Rattlesnake

Key is an example of overwash forest, El Radabob Key contains overwash, fringe, and scrub forest. The east and west shorelines are bordered with fringe mangrove forest. In the interior, there is a wide band of scrub mangrove forest, which is dominated by large black mangroves (Avicennia germinans) with an understory predominantly composed of saltwort (Batis *maritima*). Although there is a narrow band of hammock and rock barren in the center of the island, the north and south ends contain overwash forest. Rattlesnake and El Radabob Keys are separated from the mainland of Key Largo by a maze of smaller mangrove islands and tidal creeks. The two largest creeks that separate the islands, provide water flow through the mangrove system, and provide boater access to offshore areas are North Sound Creek and South Sound Creek. Rodriguez and Dove Keys are located offshore of the mainland at about MM95, near the south end of the park. The three species of mangroves which are found in marine tidal swamp include red mangrove (*Rhizophora mangle*), black mangrove (*Avicennia* germinans), and white mangrove (Laguncularia racemosa). Mangroves provide storm protection, stabilize the shoreline, and stabilize sediments by trapping and accumulating silt and organic debris in their root systems. They are also important to the reefs because they trap silt that is detrimental to corals. Mangrove leaf litter provides an important source of organics to the marine environment and is the basis for a complex food chain that includes the seagrass and coral reef communities. Many fish and crustacea, including shrimp, snapper, spiny lobster, snook, and tarpon, use the tidal swamp community as nursery grounds, and migrate between the mangroves, seagrass, and reefs through various portions of their life.

Due to intensive development of the mangrove shoreline, this biological community has been drastically reduced in south Florida. Along with it, habitat for species such as mangrove crabs (*Aratus pisonii* and *Goniopsis cruentata*) and wading birds has declined. Within the park, however, the majority of the tidal swamp has not been destroyed. This is particularly true for the northern section of the park adjacent to Dagny Johnson Key Largo Hammocks Botanical State Park. Through acquisition of the adjacent uplands, development of this area was prevented, consequently preventing destruction of the mangrove shoreline. The more intensely developed areas where mangrove loss has occurred are located at Ocean Reef Club, on the western shoreline of Largo Sound, and along the shoreline south of the park land base from the Port Largo area to Rock Harbor.

Although the tidal swamp community is generally in excellent condition, accumulation of flotsam in the mangroves is a continual problem. This is especially severe on the offshore islands where it is difficult for park staff or volunteers to access and conduct periodic cleanups. Oil and fuel spills and destruction for private development remain potential threats to this community. Additional land acquisition and continued protection of this habitat is required.

**Marine unconsolidated substrate.** This habitat consists of primarily unvegetated loose sand and marl depositions in intertidal and subtidal marine waters of the park. The distribution of the sediments is highly dependent on the wind and currents. Although the habitat appears barren it supports a diverse infaunal community, including polychaete worms, mollusks, shrimp, and crabs. Small fish congregate and feed on plankton over the loose substrate. Wading birds come to the open flats to feed as well.

Within Coral Reef State Park, this habitat occurs inshore as shallow sediment banks along the edge and interspersed within seagrass beds. Sediment banks along high use navigational channels, such as South Sound Creek, remain unvegetated and unstable due to the erosive action of boat wakes, currents, and waves. Unconsolidated substrate is also found along

portions of the mangrove shoreline, particularly in the northern section of the park.

In Largo Sound, two large areas of bare sediment were formerly seagrass beds. The seagrass in these areas has died. The seafloor is now predominantly bare silty mud with minor cover of macroalgae and sparse seagrass. These areas may eventually recolonize to a seagrass community. Monitoring currently underway by district biological staff is discussed further in the marine grass bed section.

Offshore, unconsolidated substrate is found as long elliptical bars seaward of Hawk's Channel, interspersed between patch reefs and seagrass and as a halo surrounding the perimeter of individual patch reefs. These halos are created by herbivorous fish and invertebrates that venture from the safe cover of the reef at night to graze on nearby seagrass and algae. The sands of sediment banks near reefs consist of calcareous particles derived from reef tract organisms such as mollusks, coral, foraminifera, and calcareous algae. These same organisms are the primary components of nearshore sediment banks.

The marine unconsolidated substrate in this park is in good condition. It is a dynamic community that can succeed into a seagrass community or become destabilized and changed in configuration by natural and human forces. However, it is resilient to such forces and recovers rapidly. Because of its proximity to developed areas of Key Largo, it is vulnerable to accumulation of toxic levels of heavy metals, oils, and pesticides that are detrimental to marine life, particularly larvae and fry of invertebrates and fish.

**Ruderal and developed.** Ruderal areas are areas that were cleared of native vegetation or topographically altered by dredging or filling of wetlands or submerged lands. For example, in some areas, wetlands and shallow seagrass beds were filled to create uplands. These disturbed lands have become colonized with invasive exotic vegetation, primarily Australian pine (Casuarina equisetifolia) and Brazilian pepper (Schinus terebinthifolius). Egret Island, which is located adjacent to the Winston Waterways subdivision, and the Shaw tract, which is located immediately north of the park's visitor center, were until recently colonized with such exotics. Restoration efforts in 2001-2003 have largely eliminated exotics from the Shaw tract and Egret Island. There are also several areas where the seafloor and wetlands were dredged to create deep-water access in association with dredged canals. Another ruderal area in the park is a fruit grove. A portion of hammock on the Shaw tract was cleared by a previous owner to create a horse pasture and tropical fruit orchard. Although the Key lime, mango, and avocado trees that are cultivated at the site are not native, the grove is maintained as a representation of the fruit historically cultivated throughout the Keys in the past. Care must be taken when restoring the grove, to avoid impacts to Schaus' Swallowtail butterflies (Papilio aristodemus ponceanus), which utilize citrus as a larval food source.

#### **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.

There are currently 26 designated plant species and 24 designated animals known to occur in the park. Among these is the highly endangered American crocodile (*Crocodylus acutus*), which has been observed in Dispatch Creek and the adjacent slough east of Ocean Reef Club.

The West Indian manatee (*Trichechus manatus latirostris*) is a regular winter and spring visitor that is frequently observed in the park boat basin. Hawksbill (*Eretmochelys imbricata*), loggerhead (*Caretta caretta*), and green (*Chelonia mydas*) sea turtles are commonly seen in park waters throughout the year, particularly around the patch reefs. The eastern indigo snake (*Drymarchon corais couperi*) was once observed in hammock areas, but has not been seen recently. Schaus' swallowtail butterflies may be present in the park. The historic Key Lime Grove should be managed in accordance with protection of this listed species. Use of any fertilizer or pesticides will be permitted only with approval by District biology staff since citrus serves as a larval food source. A number of bird species of designated status are feeding, roosting, or nesting in the park. Among these are the white-crowned pigeon (*Columba leucocephala*) and the least tern (*Sterna antillarum*).

In the past, least terns have nested on the spoil banks adjacent to the entrance channel of South Sound Creek and on an artificial island remnant of a former fill spit, known as Dynamite Island, in the northern section of the park. Nesting has not been observed near South Sound Creek for several years. This may be due to increased vegetative cover, or excessive disturbance from nearby boaters. Low numbers of least terns continued attempts at nesting at the Dynamite Island site with little success. Efforts made to improve nesting in this location met with little success, partly because the remote location makes monitoring the site very difficult.

The park uplands hold several of the most "collectable" threatened and endangered (FWC) species: Schaus swallowtail butterfly, three species of rare tree snails, two orchids, a number of bromeliads, and one extremely rare cactus (*Pilocereus*) so rare it is not even listed yet. The entire US population is apparently in one location in this park. A rare scarab beetle (*Ataenius brevicollis*) is known only from specimens collected in nests of the Key Largo woodrat, whose range once included lands now managed by this park.

The Division is working with researchers from the University of Florida to study the potential for reintroduction of Miami Blue butterflies to Coral Reef State Park. Reintroduction will be considered, based on the outcome of that research, and on the outcome of a lawsuit that has been brought by the Monroe County Mosquito Control District against reintroduction of the species to Everglades and Biscayne National Parks.

#### **Special Natural Features**

The extensive patch reef community is a unique natural feature of this unit. This habitat comprises a portion of the only living coral reef tract in the continental United States. Eighty percent of the estimated 6,000 patch reefs in the Florida Keys reef tract occur off Key Largo in John Pennekamp Coral Reef State Park and the Florida Keys National Marine Sanctuary (NOAA, 1995). As many as 34 species of corals have been reported to live on a single reef.

When established in 1960, the park boundaries were much larger and included more and larger reefs than it does today, and those located further offshore usually featured better visibility. Since the park boundaries were reduced in the mid 1970s and protection of the popular diving reefs was transferred to the Key Largo National Marine Sanctuary, the park's remaining patch reefs attracted snorkelers. The shallow depths allow easy access to breath-holding swimmers, and feature nearly the same spectacular marine-life diversity and color seen on the deeper outer bank reefs found three miles further offshore.

After Dagny Johnson Key Largo Hammock Botanical State Park, JPCRSP has the largest contiguous parcels of rockland hammock left in the United States. A botanical treasure, the

park's day-use nature trails hold a disproportionately high diversity of tree species. Also of special interest, the park holds a high number of tree species that are either rare or have very restricted ranges in the US. The park's forests include a number of US champion trees. Not only its species, but also the park's plant communities, are considered rare, particularly the coastal rock barren and rockland hammock.

#### **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.

John Pennekamp Coral Reef State Park was included on the National Register of Historic Places in 1972. It is listed in the Florida Site File as 8MO 208 NR. The park's establishment made history by being the first underwater park in the continental United States. Because the seafloor is in constant change, eroding in some areas and being covered with sand in others, an unknown number of underwater archaeological sites may occur in the park, both prehistoric and historic.

A number of shipwrecks of archaeological importance have been documented to occur in the area. The larger of these, such as the Benwood and HMS Winchester, actually lie in submerged areas that were once a part of the park but are now managed as the Florida Keys National Marine Sanctuary. Historic wreckage has been recorded at Basin Hill Shoals, Garden Cove, and Garrett's Reef. There are several historic wrecks at or near Basin Hill Shoals. Only one of these, however, is located within park boundaries and it is questionable whether this site should be considered historic. Historical artifacts at Garrett's Reef, also referred to as Cannon Patch, consist of two cannons lying in a patch reef, now greatly camouflaged by encrusting corals and sponges. The cannon previously located at the Garden Cove site have been re-located to the underwater site at Cannon Beach. More recently, a comprehensive underwater archeological survey was conducted for the Florida Keys National Marine Sanctuary (Hayes 1997). This survey documented additional historical wreckage at Mosquito Banks and on the flats off El Radabob Key. Underwater archeologists estimate that at least 20 times the number of known shipwrecks lies undisturbed along the reefs and on the flats under the turtle grass and sand. The entire site is often covered with sand that has been deposited on top of the wreckage over time.

Two cannons from a 1695 shipwreck are on display at the park land base at the day use beach near the concession (Cannon Beach). They were taken from the HMS Winchester, a 60-gun ship that wrecked on Carysfort Reef. An underwater display of cannons is located in the adjacent swimming area. Fourteen cannons salvaged from the 1715 Spanish Plate Fleet that wrecked near Fort Pierce were placed in Largo Sound 50 yards from shore in a protected swimming area. They are arranged in a pattern resembling a wrecked ship. The display is easily accessible to snorkelers.

In the early 1900s, tropical fruit orchards and plantations were established throughout the Keys. A portion of the hammock on the Shaw tract was once cleared for a horse pasture and fruit grove. Key lime, mango, and avocado trees were grown on the site. The grove is still maintained as a representation of the Keys early agricultural history.

There are no recorded prehistoric sites present at John Pennekamp Coral Reef State Park. However, this part of Monroe County is physiographically well suited for the presence of early Glades and later Seminole cultures, and the prehistory of the region would suggest that sites are probable. In addition, due to the extensive area of grass flats bordering land, archeologists have speculated that the shallow submerged flats may have once supported aboriginal habitations when sea level was lower.

#### **RESOURCE MANAGEMENT PROGRAM**

#### **Special Management Considerations**

#### **Timber Management Analysis**

Chapters 253 and 259, Florida Statutes, require an assessment of the feasibility of managing timber in land management plans for parcels greater than 1,000 acres if the lead agency determines that timber management is not in conflict with the primary management objectives of the land. The feasibility of harvesting timber at this park during the period covered by this plan was considered in context of the Division's statutory responsibilities, and an analysis of the park's resource needs and values. The long-term management goal for forest communities in the state park system is to maintain or re-establish old-growth characteristics to the degree practicable, with the exception of early successional communities such as sand pine scrub and coastal strand. During the development of this plan, an analysis was made regarding the feasibility of timber management activities for this park. It was then determined that the primary management objectives of the unit could be met without conducting timber management activities.

#### **Additional Considerations**

Coral reefs and the surrounding marine environment require special management considerations. These communities are especially sensitive to water quality degradation and anthropogenic impacts. Aside from natural catastrophes, water quality degradation and overuse of the reefs are two of the greatest potential problems to the marine resources of the park. To minimize such damage, numerous resource management objectives and monitoring projects have been established by park staff. However, management actions on a regional scale are also needed for such problems. To address these concerns, Coral Reef State Park, Biscayne National Park, and Key Largo National Marine Sanctuary have exchanged water quality data in a cooperative effort in the past. As part of the Florida Keys National Marine Sanctuary, a Water Quality Protection Program was developed by the Environmental Protection Agency, DEP, and National Oceanic and Atmospheric Administration. It included compiling existing information and data regarding the status of the Sanctuary's natural environment and developing and implementing a water quality-monitoring program and associated research program. The second phase of the program will develop options for corrective actions. This large and comprehensive effort to evaluate and improve water quality in the Keys should be a great benefit to the park.

#### **Management Needs and Problems**

The natural communities at Coral Reef State Park are subject to natural and human related threats. Natural adverse conditions include severe storms and hurricanes, temperature

extremes, oxygen depletion, and air exposure of marine organisms during exceptionally low tides. Because these events are natural, there is no need to manage against them. Human related threats include damage from excessive or inappropriate visitor use, impacts from development of adjacent habitat, pollution of the marine environment, and collection of terrestrial and marine fauna and flora. Management can address these anthropogenic impacts through restoration, implementation of protective measures, commenting on local development projects, documentation of after-the-fact damage, monitoring programs and sometimes legislation. The park has been working with Monroe County to develop a mosquito control plan that adequately addresses protection of the park's natural resources.

The shallow patch reefs and nearshore seagrass flats are extremely vulnerable to damage from boaters and excessive visitor use. Boat groundings occur frequently at both natural communities in areas where boat traffic is heavy. Mangroves can also be damaged by excessive boat wakes and boat groundings. A seagrass protection program was established in 1993 in an attempt to reduce or eliminate boat groundings and prop scarring in seagrass beds. Certain areas were restricted from motorized vessels and navigational channels were better delineated through installation of additional regulatory signage. Speed regulations were implemented in portions of the mangrove creeks. Educational brochures and kiosks were also produced and distributed throughout the area. Two interagency task forces, the Seagrass Outreach Partnership and the Seagrass Environmental Problem Solving Team, have used a combination of educational publications, radio shows, public service news broadcasts, better marking of grass beds, and scientific research to reduce groundings in these areas since 1998.

Although these efforts have been helpful in reducing damage to park resources, groundings continue to occur. The large percentage of boaters operating in these waters with insufficient knowledge of local waters or the importance of these habitats, combined with poor marking of many shallow areas and the bilingual nature of the population, makes this problem very difficult to solve.

Increased marking of shallow areas is likely the only long-term solution to the habitat destruction caused by these groundings. Currently, however, the park has approximately 200 markers of various types to maintain and no full time staff dedicated to this duty. Buoy maintenance requires a crew of 2-3 people for field work, but the demands imposed by the large number of visitors in this park makes it difficult to dedicate such a crew to protecting marine resources.

Research has been conducted by district biological staff to monitor and evaluate the impact of visitor use at patch reefs. Several sites were selected at Basin Hill Shoals and Mosquito Banks. In each area, one patch reef was marked as a closed area. The closed areas served as a control to compare damage at sites that receive visitation, including some that had mooring buoys available, and others which were unmarked. Study results may quantify the type and severity of reef damage with varying levels of usage and the impacts or benefits of mooring buoys. This information can assist park management in making recommendations on optimum carrying capacity at the patch reefs.

The threat of rapid development adjacent to park boundaries is a major problem for Coral Reef State Park. Development results in destruction of mangrove and hammock communities. Habitat fragmentation, increased spread of invasive exotic plants and animals, pollution of nearshore waters from stormwater runoff and sewage effluent, and dredging of shallow submerged areas for boat use are some of the impacts associated with urban development. Until the North Key Largo CARL acquisition is complete, this area is vulnerable to the same clearing, dredging, and filling activities that have occurred on Key Largo.

A continuing problem for all of south Florida is pollution of the marine environment. A longterm study of water quality has been completed in the park by District staff, providing baseline data from the 1980s and 1990s. Turbidity caused by dredging can result in siltation of grass beds and nearby reefs, in addition to the actual destruction of the areas being dredged. Developments such as marinas, canals, boat docks, and boat basins cause chemical water pollution. High nutrient loads, sewage, bilge water, fuel, oil, grease, anti-fouling paints, pesticides, trace metals, PCBs, plasticizers, and other toxic pollutants spill, leach, or are discharged into the marine environment. Since 1999, a number of beach health advisories have been posted throughout the Keys, including in Key Largo and JPCRSP, because of county initiating testing for pathogens often associated with poor wastewater treatment practices. Until the present time, these advisories have been removed on the first subsequent testing date. Some chemicals can be toxic to marine life, and some are lethal at extremely low concentrations. Pollution originating at sea from shipping lanes compounds the problem. Good water quality is critical to the survival of coral communities and the maintenance of a healthy marine environment. Therefore, management has to be alert for opportunities to prevent degradation of the waters in and around the park. A new sewage treatment plant has been built in the park, alleviating problems associated with poor siting and mechanical breakdowns of the old treatment plant.

The numerous dredged canals adjacent to the park are a serious water quality concern. The canals range from 10 to 30 feet in depth while the adjacent nearshore waters are only one to three feet deep for quite a distance from shore. The canals trap pollutants, creating chronic water quality problems. Due to the poor circulation, the lower layers of the canal water become stagnant and low in oxygen content. During storm events, an overturn of the water column can result in oxygen-poor water coming to the surface and causing massive fish kills. Such incidents have occurred in the past, affecting park waters. To improve water quality conditions, the canals need to be partially filled to reduce their excessive depth. In addition, stormwater runoff inputs need to be minimized.

To restore the natural communities of the park and offset regional losses of wetland and submerged habitat, dredged seagrass beds and filled tidal swamps need to be restored to the greatest extent possible. Egret Island, a partially filled mangrove island near Newport Bay, was restored to historic contours and revegetated with native species during 2002-2003. The bridge, which formerly provided access to the island, was then removed by the county.

Unauthorized fill spits and docks in the park were identified by the department in 1989-1991. This document, called the 1990 Dock and Fill Evaluation, is on file at the district office in Key Largo and is used by district and park staff to help document the history of illegality associated with these structures and to pursue their removal. The document is also used as a basis for requesting denial of new permit applications at these sites. These fillspits and docks continue to be used by trespassers and additional illegal filling and dock construction is discovered virtually each year. Assessments have been conducted for damage to natural resources, but no resolution for many of these cases has been finalized. On July 26, 2000, the Division of State Lands review of JPCRSP recommended these violations should be permanently resolved.

These areas should be priority shoreline restoration projects when funding is available. The

park has already completed several topographic restoration projects. Monitoring of damage and restored sites, by the restoration contractor, at the expense of the violator should be incorporated in restoration efforts.

Protection of marine life has been a problem since there are commercial markets for numerous species of fish and invertebrates, both for food and ornamental purposes. Responding to a need to protect ornamental reef fish such as angelfish, surgeonfish, and sergeant majors, which have little or no food value but were allowed to be taken by hook and line, the Division of Recreation and Parks obtained a rule amendment in 1989 to provide additional protection for reef species (Florida Administrative Code 46-5.002). This regulation prohibits the harvest in any manner of numerous species of tropical reef fish. Similarly, in 1993 the Marine Fisheries Commission passed a regulation that prohibited lobstering during the two-day sport season within the park, prohibited recreational lobstering in all coral formations, and prohibited commercial lobstering in some areas. (Florida Administrative Code 46-24.0065). This was done primarily due to secondary impacts to coral that occurred during lobstering activities. Commercial trapping of lobsters is still allowed outside the lobster exclusion zones. In response to law enforcement needs, the park placed 60 buoys delineating the lobster exclusion zones in 2000. The 60 buoys currently delineating the lobster exclusion zones has been deemed inadequate. Additional buoys, along with staff to maintain them, are badly needed for these zones to be effective. The park would like to limit the number of lobster traps placed in the park, as well, but this may require coordination with Florida Fish and Wildlife Conservation Commission officials. Enforcement of these and other regulations is a major need in the park. The current level of law enforcement presence on the water is insufficient to protect the extensive park resources and the situation has gotten substantially worse in recent years.

Research areas have been set aside to monitor species composition and numbers of fish, and the level of coral damage, in these areas versus those that have not been closed to the public.

Removal of derelict lobster and stone crab traps is a continual problem in the park. These traps will continue to catch and kill marine organisms until they are removed or deteriorate. Each year a permit is obtained from the FFWCC to remove derelict traps. The traps are removed and a report is sent to FFWCC.

On upland park property, occurrence of exotic plants, particularly on disturbed land such as the Shaw tract and park campground has lessened in recent years, but high visitation year round, has left park staff with minimal time to work on exotic removal. Sites that are difficult to access, such as El Radabob Key, receive even less attention. An increase in park staff or funding for contract removal of exotics is needed to address this problem.

#### **Management Objectives**

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

Natural resource management objectives for submerged areas of Coral Reef State Park are to protect and preserve park waters with emphasis on the reefs and shallow flats. This can be accomplished through enforcement of rules and regulations pertaining to the park and the

Florida Keys National Marine Sanctuary. The management plan for the Sanctuary, which encompasses all marine waters in the Keys, including John Pennekamp Coral Reef State Park, was approved in 1997. Its establishment should provide additional protection for the park.

- 1. Acquisition of undeveloped uplands bordering park to protect rock barren and rockland hammock from destruction and preserve water quality.
- 2. Acquire submerged lands around Rodriguez and Dove Keys to protect rare habitats in these areas.
- **3.** Place additional regulatory signage around seagrass flats and patch reef areas to reduce boating impacts.
- **4.** Install additional mooring buoys to reduce anchor damage to coral reefs and seagrass beds.
- 5. Hire full-time buoy maintenance personnel to maintain regulatory buoys and remove abandoned lobster traps.
- 6. Hire trained marine biologist to protect park's marine resources.
- 7. Continue to monitor county water quality testing program and augument with an annual water clarity study to track the condition of water resources in the park.
- **8.** Comment on environmental permit applications to reduce detrimental impacts to park natural resources.
- **9.** Pursue restoration of coral and seagrass habitats damaged by boat groundings and other events.
- **10.** Removal of non-native vegetation and re-planting with native plants.
- **11.** Re-establishment of original topography to disturbed areas as an aid in restoration of disturbed plant communities.
- **12.** Continue and expand interpretive tours and events.
- **13.** Initiate a program of routinely surveying unmarked areas of the park, taking GPS coordinates of survey markers and marking park boundaries or erecting fences.

#### **Management Measures for Natural Resources**

#### **Hvdrology**

Hydrology of the area has been altered by canalization of the Everglades and dredging of residential canal systems in Key Largo. Regional restoration of the Everglades system and topographic restoration in Key Largo would help reduce the effects of these hydrological alterations. The Division should work with Monroe County and other government agencies to establish appropriate standards for canal and marina restoration on Key Largo. Park staff will comply with best management practices to maintain or improve the existing water quality on site and will take measures to prevent soil erosion or other impacts to water resources. Preservation of the mangrove shoreline is one of the best ways to prevent or minimize soil erosion.

#### **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-dependent communities within this park unit.

#### **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.

All of the designated species in Coral Reef State Park are protected by park regulations that do not allow the destruction or removal of any plant or animal. However, a majority of the park is not located behind a defined entrance or associated with visitor facilities. The park has highly irregular borders, lacks fences, and has few recent surveys with obvious corner markers. These, and vegetative growth and or removal make boundaries almost impossible to discern. Enforcement of encroachment and building code violations are nearly impossible in many areas. The public can access park waters and offshore islands from private marinas, docks, or residential canals. There are also several tracts of uplands on Key Largo which are separate from the landbase and which, although posted, have no staffing. Because of this, poaching of rare marine and terrestrial fauna and flora remains a concern. Adequate patrol by law enforcement officers is necessary to deter poaching. Monitoring is also important to assess the status and condition of listed species. Florida Natural Areas Inventory maintains tracking records of listed species in the park (Addendum 6). These should be updated periodically. Additional monitoring of endangered species should be conducted as necessary.

Special protective measures for the West Indian manatee need to be provided in the park, particularly during the winter and fall months when they are more abundant in the mangrove creeks and nearshore waters of Key Largo. In addition to habitat loss, injuries caused by boat propellers are one of the main causes for the decline of the species. The park has implemented speed limits in a portion of North and South Sound Creek and in the park's boat basin in an attempt to avoid collisions with boats. Though these speed zones were not established for manatees, they may have a minor beneficial effect for them. Establishment of non-combustion zones over shallow seagrass beds will also deter collisions with boats and provide habitat protection. The park needs to continue to provide updated educational information and interpretive programs on manatee protection to the public as supplied by the Bureau of Protected Species Management. Sightings of manatees in the park should continue to be documented and reported to the Bureau of Protected Species Management.

Although the American crocodile is more abundant on the bay side of Key Largo, this species has historically used park coastal waters near Dispatch Creek and Dispatch Canal. Recent sightings require resident education and additional patrol presence to prevent disturbance or poaching of these shy and highly endangered reptiles.

The Schaus' Swallowtail butterfly is occasionally observed in the park. Torchwood, the host plant for this species, occurs in the park, as does Key Lime, another larval plant food. Efforts should be made to monitor for Schaus' swallowtails in the Key Lime Grove, to plant additional food sources and to protect the species during restoration of the grove.

In the past, least terns have been observed nesting in the park on the spoil islands adjacent to South Sound Creek and on Dynamite Island, off North Key Largo. A more effective means of eliminating boat traffic near Dynamite Island during nesting season needs to be found if nesting is to be successful, but the island's remote location makes this task extremely difficult. No successful nesting has been recorded on the spoil islands since the early 1980s despite park efforts to post the island, trap for black rats, and remove some of the herbaceous vegetation. At Dynamite Docks, nesting occurred at the end of the artificial fill spit with limited success over the years. In 1992, the spit was removed to restore the altered submerged and wetland communities. The terminus was retained as an island, now called Dynamite Island, so that tern nesting could continue. By doing this, it was more difficult to disturb the nesting area. District biological staff is monitoring nesting activity and success. Decoys were intermittently put on the island to attract terns and the island was well posted to discourage human intrusion. However, there have still been problems with boaters coming onto the island and disturbing the birds. This ground nesting species is very vulnerable to mammalian predators and human disturbance. Since Dynamite Island supports one of the few groundnesting colonies of least terns in south Florida, it is very important for park staff to continue to keep the area posted and free of disturbance. More law enforcement presence is needed in that area during the nesting season (April 1 - August 30). Park staff may want to resume efforts to enhance nesting habitat on the South Sound Creek spoil islands as well. This will require extensive clearing of vegetation, removal of any mammalian predators, and improved posting around the islands.

Sea turtles do not nest within the park. However, sea turtles are frequently sighted in the park's waters. Sightings and stranding information are recorded and reported to the appropriate state and federal agency. The park should initiate an educational program regarding the impacts of trash and monofilament on sea turtles, as well as birds.

#### **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 affect non-resistant native species. Therefore, the policy of the Division is to remove exotic species from native natural communities.

John Pennekamp Coral Reef State Park has several major concentrations of invasive exotic plants, which occur on and adjacent to disturbed land. The largest remaining infestations include seaside mahoe/portia (*Thespesia populnea*) behind the campground and boat trailer areas and near the dive shop, which has only partially been treated and beach naupaka (*Scaevola taccada*) near the highway at MM 104.5.

The offshore islands have been infested with Brazilian pepper (*Schinus terebinthifolius*), seaside mahoe/Portia tree, and lather leaf (*Colubrina asiatic*) along the coastal berms and hammock edges. Threats for new invasions come from several sources; exotics already established in the park, spread by natural means (birds, wind, water etc.), neighboring developments, and dumping found throughout the site. These areas are a high priority for exotic plant treatment, as they threaten unique habitats and are a seed source for an otherwise pristine area, as well as the mainland of Key Largo.

There are also a number of exotic fauna that are becoming an ever-greater threat to native species. Some of the most abundant include brown anoles (*Anolis sagrei*), Eurasian collared doves (*Streptopelia decaocto*), Tokay geckos (*Gecko gecko*), Cuban tree frogs (*Hyla septentrionalis*) and black and Norwegian rats (*Rattus rattus* and *Rattus norvegicus*). All of these species have usurped habitats and largely displaced their native counterparts. Fire ants (*Solenopsis* spp.) have deterred successful nesting of ground nesting birds such as least terns and nighthawks. Green iguanas (*Iguana iguana*) have cropped and killed campground buffer

plants.

Feral and free-roaming cats constitute a predation problem for many species of birds in the park and are likely a contributing factor to the extirpation of Key Largo wood rat and Key Largo cotton mouse populations. They should be controlled to reduce their impacts on these and other species.

Exotics and dumping of trash are a problem at Key Largo Narrows. Latherleaf (Columbrina asiatica), Brazilian pepper (*Schinus terebinthifolius*) and Leadtree (*Leucaena leucocephala*) are the primary problem species here. A fence needs to be erected to keep out undesirables.

A comprehensive exotic treatment plan is in the process of being written for the park. When completed, it will be on file at the park office and both District 5 offices.

#### **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.

The most visible problem species at Coral Reef State Park is the raccoon. Feeding by park visitors has caused raccoons to lose their fear of humans. As a result, many enter the campground and steal food that has not been properly secured from visitors. When an individual becomes especially aggressive or the population increases to an excessive level, park staff live-traps some animals. The raccoons are taken to Monroe County Animal Shelter. Public education by park staff regarding the impacts of feeding wildlife needs to be continued.

There are also a number of marine species in the park that may be conceived as problem species by the public. These include stinging invertebrates such as fire coral, Portuguese manof-war, or sea urchins. Some fish that on rare occasions may be dangerous to humans include sharks, stingrays, and barracudas. Interpretation has prevented any of these species from becoming a serious problem so far. Signs and literature alert visitors to potentially dangerous species and teach them how to avoid injury from them.

#### **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 <u>DHR Cultural Management Statement</u>).

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.

The park was placed on the National Register of Historic Places because of its significance as the first underwater marine park in the United States and the abundance of shipwrecks in the area. The biological integrity of the submerged marine communities must be preserved to protect this historic site. Management measures for this were addressed in previous sections.
The only known historic artifacts in the park consist of submerged and exposed cannons. These artifacts need to be protected from theft. The heavy weight and camouflaged appearance of the submerged cannons strongly discourages poaching. There is currently no need for additional management measures. Comprehensive archaeological surveys are needed for park lands recently acquired through the CARL program.

#### **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.

All corals are protected by state law, and these laws are enforced by park personnel, the Florida Park Patrol and the Florida Fish and Wildlife Conservation Commission, and Sanctuary staff. However, in order to identify and prevent indirect impacts, such as declines due to water quality degradation, water quality research and monitoring should be conducted periodically. District biological staff conducted such monitoring from 1982 to 1998.

Monitoring of direct physical impacts to the coral reef community was initiated in the spring of 1992 and continued until 1998. Visual and photographic monitoring was conducted at regular intervals at several selected patch reefs receiving varying levels of visitor use. Data from this study can provide information on the effect of visitor use to the reefs. Management practices should be implemented accordingly.

An ocean current study in the Key Largo area that includes nearshore park waters has been conducted. Information regarding direction, strength, and seasonality of any existing nearshore currents, beyond tidal and wind-caused movement was gathered. This information is vital for analysis of water quality conditions, protection of sensitive marine communities, and assessment of upland development impacts.

Resource-based carrying capacities of the park's patch reefs have been determined, to some degree, but it is difficult to assess the results of this work since the amount of recreational use in park waters has not been adequately quantified. For example, it has not been determined how many boats in the area actually recreate in the park, recreate in the sanctuary, or are traveling through the area without stopping. In addition, the amount of use generated by park visitors, versus commercial dive outfitters, has not been determined. The current plan to regulate through the installation and monitoring of mooring buoys can help provide a means of assessing the effects of recreational use on the reefs. Based on that research, the number of buoys can be adjusted until an optimum carrying capacity is established.

There is little or no information at present on commercial and recreational catches of fish and invertebrates. Data are needed on species composition, size, and location, as well as fishing effort. This can be done through on-board interviews and inspections. In addition, a weekend creel census at frequently used local boat ramps needs to be conducted. The results will provide park management with information regarding total catch volume, fishing effort, and the stability of fish populations in the park.

Finally, the submerged lands in the park need to be mapped on a periodic basis to monitor

changes in the size and distribution of reefs, grass beds, and mangroves. This is currently being done in part by district biological staff. In addition, recent aerial photography taken for the Florida Keys National Marine Sanctuary and Monroe County's Wetland Delineation Program may be available for this purpose. In 1994 and again in 1997, a series of aerial photographs were taken of the park's seagrass resources and the level of prop scarring was quantified by the Florida Marine Research Institute. This effort needs to continue periodically in the future to monitor the need for additional measures to protect this resource.

An extensive amount of additional research and monitoring in the park is conducted by other state and federal agencies and university researchers. Two hundred twenty nine (229) research permits have been issued for work in the park since records were kept. Research has focused on a wide range of terrestrial and marine subjects. Research permit applications in the park are evaluated according to several criteria. These include assessing if the proposed research would damage or alter the environment, directly benefit the park, or indirectly benefit the park. Another consideration is whether an alternative location is available outside of the park that would equally suffice. These criteria are employed so that the original intent of the park's establishment, to protect it for public enjoyment, will not be compromised.

JPCRSP was the first marine park in the United States and is the only state park containing extensive coral reef resources. In addition to the corals, there are large areas of seagrass and mangrove marine habitat. The park is home to large, diverse communities of fish and shellfish that are exploited both recreationally and commercially. Two of the primary industries in Monroe County – tourism and commercial/recreational /fishing - are dependent on these resources. JPCRSP has the highest level of visitation of any park in the state park system. The park does not currently have a biologist with advanced training in marine biology. JPCRSP is in need of a marine biologist to concentrate on the needs of managing the highly stressed marine resources of the park.

- 1. Conduct coral and seagrass restoration projects and monitor the results, using money from grounding fines, to test various methodologies of restoration in these habitats.
- 2. Coordinate with USFWS to design a protocol for re-introduction of the Key Largo wood rat and Key Largo cotton mouse in hammock areas of the park.
- 3. Conduct a creel survey of recreational fish harvests from park waters.
- 4. Conduct further resource-based carrying capacity studies to determine limits on the level of reef use allowed.
- 5. Resume water quality studies and monitor county testing for fecal bacteria levels to track trends in water quality within the park.

#### **Cultural Resources**

A study of underwater historical resources was recently completely for the Florida Keys National Marine Sanctuary. The unpublished report is on file at the district office. However, a more extensive survey could be useful in identifying shipwrecks and archeological sites that may now be buried or extensively colonized. A comprehensive survey on the uplands of all newly acquired property is needed to determine if any prehistoric or historic sites exist within park boundaries.

#### **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 Improvement Trust Fund (board) are being managed for the purposes for which they were acquired and in accordance with a land management plan adopted pursuant to s. 259.032, the board of trustees, acting through the Department of Environmental Protection (department). The managing agency shall consider the findings and recommendations of the land management review team in finalizing the required 10-year update of its management plan.

John Pennekamp Coral Reef State Park was subject to a land management review on <u>July 26.</u> <u>2000</u>. The review team made the following determinations:

- 1. The land is being managed for the purpose for which it was acquired.
- 2. The actual management practices, including public access, were in compliance with the management plan for this site.

# LAND USE COMPONENT

# **INTRODUCTION**

Land use planning and park development decisions for the state park system are based on the dual responsibilities of the 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, regional demographics, adjacent land uses and the park's interaction with other facilities.

John Pennekamp Coral Reef State Park is located in Monroe County about 50 miles south of Miami in the southern part of the state. The populations of Monroe County and the adjacent Dade and Broward have grown 21 percent since 1990, and are projected to grow an additional 17 percent by 2010 (BEBR, University of Florida, 2000). As of 2000, 20.2 percent of residents in these counties were in the 0-14 age group, 43.4 percent in the 15-44 age group, 21.9 percent in the 45-64 age group, and 14.5 percent were aged 65 and over, which is more than the state average for the younger two groupings and lower for the 45 and older (BEBR, University of Florida, 2000). Nearly 2,782,716 reside within 50 miles of the park, which includes the cities of Homestead, Florida City, Coral Gables, Miami, Hialeah, Miramar, Pembroke Pines, Hollywood, and Hallandale (Census, 2000).

John Pennekamp Coral Reef State Park recorded 966,976 visitors in 2001-2002 FY. This represents a net 5 percent decrease over the last five years. By Division estimates, these visitors contributed \$37,571,015 in direct economic impact and the equivalent of 571.4 jobs to the local economy (Florida Department of Environmental Protection, 2002).

# **Existing Use of Adjacent Lands**

John Pennekamp Coral Reef State Park is located on North Key Largo, which is the

northernmost key of the Florida Keys. The park has almost 3,000 acres of upland located mostly in the southern portion of the park. The majority of the park is submerged lands in the Atlantic Ocean. The Keys, being a major tourist destination, have large commercial developments supporting the tourist trade. These as well as residential communities surround the upland and border the submerged areas of the park. Dagny Johnson Key Largo Hammock Botanical State Park borders the park in the northern part of Key Largo. This protects the sensitive surrounding water bodies, wetlands, and reefs.

In addition to Dagny Johnson Key Largo Hammock Botanical State Park, other recreation opportunities in the vicinity are offered at Everglades National Park and Biscayne National Park.

# **Planned Use of Adjacent Lands**

The Future Land Use designations surrounding the park are mainly commercial, residential, and conservation (Urban and Sub Urban Residential, Resort, Sub Urban Commercial, Improved Subdivision, Sparsely Settled and Native Area) (Monroe County 2000). Given the demand for residential development in the Florida Keys and the popularity of the area among out-of-state visitors, development of lands to the north and south of the park should be anticipated, despite highly restrictive local and state development regulation. Residential and commercial development supporting tourism will predominate. Anticipated problems resulting from this development include increased congestion on U.S. Highway 1, higher demand for the parks resources, and water quality impacts.

# **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

Most of John Pennekamp Coral Reef State Park's land area is submerged or intertidal. The upland property consists of tracts of land on Key Largo, one of which is the operations land base, and a few acres on the islands north and east of Key Largo. Elevations range from sea level to10 - 12 feet. Tropical hammocks on the small upland limestone areas in the park provide excellent opportunities for nature study.

# Water Area

The submerged land at John Pennekamp Coral Reef State Park covers over 98 percent of the park property. It contains numerous shoals, shallows, and coral outcroppings excellent for diving and snorkeling. Inexperienced boaters are encouraged to utilize the charter boats for trips out to the reefs. Canoeing is excellent along the quiet, remote mangrove coastline.

# **Shoreline**

The park contains 81,344 linear feet of shoreline. There are 36,320 feet along the Atlantic Ocean, 33,024 feet along Largo Sound, and 12,000 feet along Newport Bay. Swimming is popular at the Largo Sound beach areas at the park land base.

# Natural Scenery

At Coral Reef State Park, visitors can see wild areas of tropical hardwood hammocks, mangrove swamps, and a long undeveloped mangrove shoreline. The most outstanding natural scenery in this park, however, is underwater. The coral reefs provide numerous opportunities for scuba diving, snorkeling, and glass bottom boat tours, which leave from the park land base.

# Significant Wildlife Habitat

The coral reef and seagrass communities at John Pennekamp Coral Reef State Park are among the most diverse and productive environments in the world. They provide food and shelter for a wide variety of fish and other marine vertebrates and invertebrates. The mangrove communities are also extremely important as wildlife habitat areas since they are nursery grounds for fish and shellfish, and provide breeding grounds for numerous birds and other animals.

# **Natural Features**

The coral reefs are the most outstanding natural features in the state park. The reef tract, found in this section of Florida, is the only living coral reef ecosystem in the continental United States. The reefs are only accessible by boat.

# Archaeological and Historical Features

There are no recorded prehistoric sites at the park but significant archaeological and historical features exist. A number of shipwrecks or archaeological importance is documented. Underwater archaeologists estimate the existence of 20 times the known number. To interpret the wrecks to visitors, artifacts from three ships have been relocated to the swimming area and placed in positions to resemble an actual wreck.

An historical grove containing key lime, mango, and avocado trees is maintained on the Shaw tract.

# Assessment of Use

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

# Past Uses

While in private ownership, the land base portion of John Pennekamp Coral Reef State Park remained relatively undeveloped. The exception is a small residential dwelling that was part of the Shaw life estate and is now in park ownership. The public use facilities area and the boat basin were filled in preparation for private development immediately prior to acquisition by the state. The submerged portions of the unit were under state jurisdiction even before they were leased to the Department of Natural Resources for management.

# **Recreational Uses**

The majority of recreational activities available at John Pennekamp Coral Reef State Park



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center on the aquatic resource. Snorkeling and scuba diving are the most popular activities in the park, followed by fishing. Other activities enjoyed include hiking, fishing, bird and butterfly watching, swimming, camping, canoeing, kayaking, sailing, and glass bottom boat tours. The visitor center includes an extensive nature museum, with a 30,000-gallon indoor aquarium displaying a replica of the reef.

# **Other Uses**

Commercial fishermen harvest spiny lobster, stone crab, ballyhoo, grouper, snapper, grunt and various reef fish in the park waters.

# **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 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 John Pennekamp Coral Reef State Park, tidal swamp, coastal berm, coastal rock barren, rockland hammock, estuarine and all the marine communities have been designated as protected zones as delineated on the Conceptual Land Use Plan.

#### **Existing Facilities**

#### **Recreation Facilities**

Small Picnic Pavilions (11) Large Picnic Pavilion (1) Dive Shop Boat Docks and Loading Areas Visitor Center Observation Tower

# **Support Facilities**

Residences (5) Restrooms (1) Bathhouses (3) Marine Boat House Ranger Station Office Building

- Concession Building Swimming Areas Camping Area (47 sites) Youth Camp Nature Trails (.5 mi.) Canoe Trail (2.5 mi.)
- Storage Buildings (5) Shop Sewage Treatment Plant Parking (385 spaces) Greenhouse

# 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



# JOHN PENNEKAMP **CORAL REEF STATE PARK**

**INSET - LAND BASE** 

**CONCEPTUAL LAND USE PLAN** 

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

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

#### **Potential Uses and Proposed Facilities**

In 1991, the Department of Natural Resources, Office of Land Use Planning and Biological Services published the Key Largo Land Use Feasibility Study. The purpose of the study was to provide land use recommendations to the Governor and Cabinet for the upland and

submerged land areas of John Pennekamp Coral Reef State Park, Dagny Johnson Key Largo Hammocks Botanical State Park, and proposed additional land acquisitions on north Key Largo. This plan will continue to address the recommendations of the study.

The existing forms of recreation should be continued at John Pennekamp Coral Reef State Park. The coral reef ecosystem provides unique opportunities for recreational and environmental education activities available nowhere else in the continental United States. The Coral Reef State Park land base has functioned as a successful recreational use and reef access facility for over 30 years. The Division continues to work in partnership with a park concessionaire to periodically renovate and improve the land base facilities, within the footprint of that existing development. The public facilities at the waterfront have been upgraded and are now in compliance with ADA guidelines.

The Visitor Center needs to be expanded to accommodate the one million yearly visitors and large groups that attend the Key Largo Hammock Botanical State Park lecture series. The auditorium presently holds 88 but the 13 part lecture series draws 200-300 people for each talk. The expanded space should accommodate 250-300 and convert to several smaller rooms when needed. An additional viewing tank and coral farm added to the visitor center expansion would aid in interpretation. As recommended in the Key Largo Land Use Feasibility Study, any renovations to the Visitor Center should be in keeping with the Keys vernacular.

The campground bathhouses have been replaced as recommended in the Key Largo Land Use Feasibility Study. The abandoned structure, one of the old bathhouses, should be converted to a screened pavilion for the use of the campers.

This conceptual land use plan recommends a revision to the Key Largo Land Use Feasibility Study in the Shaw Tract area. The management of this site has, since the study, been turned over to the state and progress made in removal of exotic species. In the area designated for cottages, a more appropriate and valuable addition to the park is a field research support facility. The coral reef ecosystem found at this park provides unique opportunities for the scientific community to conduct research into its natural processes. A field research support facility would enhance the parks research needs. Ten cabins holding four people each, a meeting room, and a wet lab are recommended. This facility could house Americorps volunteers during certain months of the year as well. Current restrictions placed on development of lodging in the Florida Keys by the Monroe County Comprehensive Plan and Land Development Regulations have been extended to state parkland by the current interpretation of the regulations. This management plan recommends the retention of the lodging element of the approved Land Use Feasibility Study for John Pennekamp Coral Reef State Park revised, however, as the proposed field research support facility. It is not feasible to proceed with implementation of the concept without additional discussion and agreement with Monroe County and the Department of Community Affairs.

An emphasis on sustainable design and development principles is recommended for the field research support facility. For example, the use of recycled construction materials, solar orientation for passive heating and cooling, ceiling fans for ventilation (rather than air conditioning), photovoltaic generation of electricity, composting toilet systems, and recycling of solid wastes could all be incorporated in the design. Careful site design, native landscape and sensitive construction planning should be applied to minimize disturbance, control run-off, and improve the vegetation on the site. These principles would emphasize environmental sensitivity to the site and be illustrative of the scientific progress to be realized here.

Also in the Shaw tract is the remnants of a fruit grove that still has a few of the original key lime, avocado, and mango trees. This provides an opportunity to interpret the historical use of the site. The extent of restoration should be determined after considering the pesticides, fertilizers and irrigation requirements. A trail connecting the main parking area to the grove with an interpretive kiosk and picnic pavilion in the grove is recommended.

The concessionaire at Coral Reef State Park rents canoes and kayaks. The park's marked canoe trail allows visitors to explore a mangrove creek, over-wash forest, and sea grass beds. In order to provide resting areas and primitive camping opportunities for these boaters, Division staff, with input from representatives of the canoeing and kayaking public, will consider the following sites (listed from north to south). Several day use rest areas, and two or three primitive campsites, the latter accommodating up to 12 visitors, could be provided. Analysis of recreational needs and natural resources at the identified sites will precede final decisions regarding public access and use.

- **1.** Palo Alto: this site has a small clearing that could be utilized for a rest area.
- 2. Ocean Forest Estates: the northern tip of the southern most of two islands off Ocean Forest Estates has an area that could be used for primitive camping. A small and unusually high upland area surrounded by mangrove wetlands and open water. The dredge spoil in this area could be used for camping.
- **3.** Ocean Reef Shores: the scarified shoreline at the end of a plugged canal, flanked by state owned lots, should be considered as a rest area.
- 4. Rattlesnake Key: this parcel is currently on the CARL list, and is within the optimum boundary of the state park. It would need to be surveyed for significant cultural and natural resources before use.
- 5. Largo Sound, El Radabob Key: located on the eastern edge of Largo Sound, this site has been used in the past for ranger-led overnight stays.
- 6. Shaw tract: located in Largo Sound, the Shaw tract is adjacent to the state parkland

base. This site, however, may need to be discontinued if the field research support station is developed in the future.

- 7. Egret Island: this island is near the end of the state park canoe trail in Newport Bay and would be an ideal spot as a resting site and primitive camping area.
- **8.** Lower Sound Point, El Radabob Key: this area is difficult to access and the mosquito population is intense so only a resting site is recommended. It has a commanding view of the South Sound Creek entrance.
- **9.** Cleared area near Kawama Club condominium: there is a cleared spit approximately 1/4 mile offshore from the Kawama Club Condos that would be appropriate for a resting site and a primitive camping area.
- **10.** Dove Key: this key, newly under Division management, will need to be investigated but its upland areas may provide resting or primitive camping.

All of these locations would require a backcountry permit in order to camp, and must be limited in the number of people allowed overnight visitation. The provision of composting toilet facilities and designated campsites would be the limit of physical development at each site.

A need exists for a concession boat maintenance building and it is recommended that the structure be built in the same area as the existing oil storage tank. The building and storage area would be surrounded by a wooden fence and kept in an orderly manner so the visual impact would be minimal.

Support facilities are periodically reviewed and upgraded. A new sewage treatment plant was constructed in the last five years. Funding should be allocated for an engineering study to determine the most efficient retrofit methods of minimizing stormwater runoff impacts.

A complete survey of the mean high water line is needed to delineate the park boundary to control activities that damage resources within park. Any construction within the park boundary has to be in accordance with 62D-2.013(8), Florida Administrative Code. A survey of the upland boundary is also needed and fencing installed where there are encroachment issues. Such fencing should be penetrable by wildlife.

Seasonally high visitation at the State Park, coinciding with the busy tourist season of the surrounding area, continues to create traffic congestion on U.S. Highway 1 at the park gate. Park staff is presently using a mobile check-in station to speed admittance but a more permanent solution must be found. The Division will work with Monroe County and the Florida Department of Transportation to determine if improvements to the state highway at the park road intersection are needed to address these problems.

# **Facilities Development**

Preliminary cost estimates for the following list of proposed facilities are provided in Addendum 6. 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 creating budgets for future park improvements, and may be revised as more information is collected through the planning and design processes.

#### **Recreation Facilities**

**Campground** Pavilion

#### **Expansion to Visitor Center**

# **Primitive Campsites**

Stabilized tent sites Composting Restroom (3)

#### Shaw tract fruit grove

Interpretive Kiosk Picnic Pavilion Trail

#### **Field Research Support Facility**

Classroom/Dining Shelter Camp restroom Primitive Cabins Small Laboratory Stabilized parking (10 cars)

# **Support Facilities**

Shop building (concessionaire) Engineering Study

# **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. The carrying capacity of the water-based activities is based on the capacity of the service provided through the land base concession, as there is no adequate method of determining the carrying capacity of the offshore areas of the park.

# **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 for use 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 to be used as the basis for permit denial or the imposition of permit conditions.

	Existing Capacity		Proposed Additional		Estimated Optimum <u>Capacity</u>	
	One		One		One	
Activity/Facility	Time	Daily	Time	Daily	Time	Daily
Camping						
Standard	188	188	0	0	188	188
Primitive*			12	12	12	12
Picnicking	216	432	16	32	232	464
Swimming	80	160			80	160
Field Research Station			40	40	40	40
Trails						
Nature	10	40	5	20	15	60
Boating						
Glass Bottom	149	447			149	447
Sailing	24	48			24	48
Scuba/ snorkling boats	195	550			195	550
Canoe/kayak	60	120			60	120
Power boat rental	240	240			240	240
TOTAL	1,162	2,225	73	104	1,235	2,329

#### Table 1--Existing Use and Optimum Carrying Capacity

Note: The fishing facilities are assumed to serve the same recreational user base as the picnicking and boating, therefore, no separate carrying capacity is determined for them.

\* Preliminary estimate, additional site analysis and planning may result in fewer than 12 visitors using primitive campsites.

• Note: An official carrying capacity for the offshore areas of the state park has not been established. Numbers reflect park concessionaire maximums.

Numerous other parcels have been identified for addition to John Pennekamp Coral Reef management areas. Acquisition of these lands will significantly enhance ownership cohesiveness, management goals relating to resource protection and recreation opportunities, and enhance the state's ability to protect environmentally unique and irreplaceable lands and the offshore coral reef system. Acquisition of developed parcels is not intended, unless for administrative or staff residence purposes.

Rodriquez and Dove Keys are recent additions to John Pennekamp State Park. The submerged lands surrounding Rodriquez and Dove Keys and eastward have highly vulnerable reefs and a large diversity of marine flora and fauna, including threatened and endangered species. It is recommended that the boundary of John Pennekamp State Park be amended as illustrated on the Optimum Boundary Map. In general, the suggested boundary will extend from Key Largo three miles to meet an extension of the existing three-mile boundary. The southwest boundary line will begin 400 feet from the mean high water mark of Dove Key. The northwest boundary will extend directly out from the existing park land. At this time, no lands are considered surplus to the needs of the park.



Addendum 1—Acquisition History and Advisory Group Information

# Sequence of Acquisition

The State of Florida acquired John Pennekamp Coral Reef State Park to develop, operate and maintain the property for outdoor recreation, park, conservation, historic and related purposes.

On December 3, 1959, the Trustees of the Internal Improvement Fund of the State of Florida (Trustees) put aside and dedicated a portion of the outer continental shelf situated seaward of a line three geographic miles from Key Largo, Florida. The Trustees dedicated the property to the Division of Recreation and Parks (Division), for park, recreation and conservation purposes. The dedication constituted establishment of John Pennekamp Coral Reef State Park.

Since 1959, the State has acquired additional parcels, through purchases using LATF and P2000/Acquisitions and Inholdings funds, and through donations, and incorporated them into John Pennekamp Coral Reef State Park.

On January 23, 1968, the Trustees leased the property to the Division under Lease No. 2324 for a period of ninety-nine (99) years. In 1988, a new lease number, Lease No. 3627, was assigned to John Pennekamp Coral Reef State Park without making any changes to the terms and conditions of lease No. 2324. The new ease expires on January 23, 2067.

According to the Trustees lease, Division manages John Pennekamp Coral Reef State Park only for the development, conservation and protection of natural and cultural resources and to provide public outdoor recreation that is compatible with the conservation and protection of the property.

#### **Title Interest**

The Trustees hold fee simple title to the John Pennekamp Coral Reef State Park.

# **Specials Conditions on Use**

John Pennekamp Coral Reef 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, stormwater management projects, linear facilities and sustainable agriculture and forestry (other than those forest management activities specifically identified in this plan) are not consistent with this plan or the management purposes of the park.

# **Outstanding Reservations**

Following is a listing of outstanding rights, reservations, and encumbrances that apply to John Pennekamp Coral Reef State Park

Instrument: Instrument Holder: Start Date: End Date: Outstanding Rights, Uses Etc.:	Deed Ocean Reef Club, Inc. December 6, 1985 No ending date is given Title to subject property will revert to the instrument holder if the property is used for any purposes other than fishing, boating, nature study and observation, and research and wildlife refuges.
Instrument: Instrument Holder: Start Date: End Date: Outstanding Rights, Uses Etc.:	Dedication Ocean Reef Club, Inc. November 4, 1983 No ending date is given Title to subject property will revert to the instrument holder if the property is used for any purposes other than fishing, boating, nature study and observation, and research and wildlife refuges.
Instrument: Instrument Holder: Start Date: End Date: Outstanding Rights, Uses Etc.:	Special Warranty Deed Ocean Reef Club, Inc. March 17, 1982 No ending date is given Title to subject land will revert to the instrument holder if the property is used for any purposes other than fishing, boating, nature study and observation, and research and wildlife refuges.
Instrument: Instrument Holder: Start Date: End Date: Outstanding Rights, Uses Etc.:	Limited Warranty Deeds (3) El Radabob Liquidation Trust May 22, 1963 No ending date is given Title to Subject property will revert to the instrument holder if the property is not used for public park purposes.
Instrument: Instrument Holder: Start Date: End Date: Outstanding Rights, Uses Etc.:	Deed Herbert J. Shaw May 6, 1961 No ending date is given Title to subject property will revert to the instrument holder if the property is not used for park and recreational purposes for five consecutive years.
Instrument: Instrument Holder: Start Date: End Date: Outstanding Rights, Uses Etc.:	Warranty Deed J. G. McKay Mach 21, 1961 No ending date is given Title to subject property will revert to the instrument holder if the property is not used for public park purposes.

# John Pennekamp Coral Reef State Park Outstanding Rights, Uses, Encumbrances, Etc.

#### And

#### Dagny Johnson Key Largo Hammock Botanical State Park

#### **Advisory Group List**

The Honorable Murray Nelson Monroe County Board of County Commissioners 500 Whitehead Street, Suite 102 Key West, FL 33040

Eric Kiefer, Park Manager John Pennekamp Coral Reef State Park P. O. Box 487 Key Largo, FL 33043

Noble Hendrix, Chair South Dade Soil and Water Conservation District 25399 Southwest 157th Avenue Homestead, FL 33031

Mr. Randal Grau Florida Fish and Wildlife Conservation Commission P. O. Box 430541 Big Pine Key, FL 33043

Ms. Rebecca Jetton Department of Community Affairs 2796 Overseas Highway, Suite 212 Marathon, FL 33050

Steve Klett, Manager Crocodile Lakes National Wildlife Refuge P. O. Box 370 Key Largo, FL 33050

David Score, Manager Florida Keys National Marine Sanctuary 95230 Overseas Highway Key Largo, FL 33037

Peter Henry, General Manager Cheeca Lodge Mile Marker 82 Islamorada, FL 33036 Ms. Susan Sprunt 228 Apache Street Tavernier, FL 33070

Ms. Joan Barrow Upper Keys Citizens Association 205 North Ocean Drive, Route 7 Key Largo, FL 33037

Jeanette Hobbs, Manager Florida Keys Environmental Restoration Trust Fund 11400 Overseas Highway Marathon, FL 33050

Don Bottomley, Chapter Chair Florida Trail Association, Big Cypress Chapter 35250 SW 177 Court Homestead, FL 33034

Captain George Clark, President Key Largo Fishing Guides Association P. O. Box 168 Key Largo, FL 33037

Mr. Frank Woll Florida Bay Outfitters 104050 Overseas Highway Key Largo, FL 33037

David Ritz, Manager Ocean Reef Club Citizens Association 24 Dockside Lane, # 505 Key Largo, FL 33037

Mr. Joe Clark 38 Exuma Road Key Largo, FL 33037

Earl Daley, President The Harborage Condominium Corporation 70 Ocean Drive Key Largo, FL 33037

# And

# Dagny Johnson Key Largo Hammock Botanical State Park

#### **Advisory Group List**

Mr. John Halas Florida Keys National Marine Sanctuary 95230 Overseas Highway Key Largo, FL 33037 Ms. Monica Woll Florida Bay Outfitters P. O. Box 2513 Key Largo, FL 33037

#### And

#### Dagny Johnson Key Largo Hammock Botanical State Park

#### **Advisory Group Staff Report**

The Advisory Group appointed to review the proposed unit management plan for **John Pennekamp Coral Reef State Park (JPCR)** and Dagny Johnson Key Largo Hammock Botanical State Park (KLH) met at the John Pennekamp State Park Visitor Center on December 4<sup>th</sup>, 2003. Mr. John Halas represented Mr. David Score and Ms. Monica Woll represented Mr. Frank Woll. Mr. Noble Hendrix, Mr. Randal Grau, Ms Rebecca Jetton, Mr. Steve Klett, Mr. Peter Henry, Ms Susan Sprunt, Captain George Clark, Mr. Joe Clark, and Mr. Earl Daley did not attend. All other appointed Advisory Group members were present. Attending staff were Mr. George Jones, Mr. Danny Jones, Mr. Eric Kiefer, Mr. Bob Bodner, Ms. Renate Skinner, Mr. David Boyd, Ms. Janice Duquesnel, Mr. Jim Duquesnel, Mr. Steve Eibl, and Ms. Carol Perfit. Also attending as public observers were Ms. Lenora Albury and Mr. Steve Gibbs.

Ms. Perfit began the meeting by explaining the purpose of the advisory group, reviewing the meeting procedures and providing a brief overview of the Division's planning process. She then asked the Advisory Group members to comment on the plan.

#### **Summary Of Advisory Group Comments**

Ms. Jeanette Hobbs, an environmental representative from the Florida Keys Environmental Restoration Trust Fund, questioned the designation of Egret Island in the JPCR plan as a primitive camping site along the canoe trail. Restoration of this island is in process and terns are using the disturbed site for nesting. She wanted to know if the primitive campsite would be closed during nesting season. Both Eric Kiefer and George Jones assured her the site would be closed if terns were nesting. Jim Duquesnel noted that raccoons are swimming out to the island and may interfere with nests and eventually vegetation growth will make it unsuitable for nesting. Ms. Hobbs said the rest of the plan looks compatible with resource management.

Mr. John Halas, representing Florida Keys National Marine Sanctuary, noted some language corrections in the JPCR plan and requested that the Florida Keys National Marine Sanctuary be added to the maps of both plans. He also wanted the coral disease concerns in the JPCR plan expanded to include water quality and threat of oil drilling. The Florida Keys National Marine Sanctuary has been cooperating with the State Park in buoy placement and maintenance. John expressed desire to continue this work. He noted the lack of information on the management of the three-mile boundary beyond Rodriguez Key. Problems exist when there are groundings and there is no clear indication on which agency should respond. George Jones explained that this is one of the issues being presented in the JPCR plan. The new boundary has been drawn to the three-mile point beyond Rodriguez and Dove Keys.

Ms. Joan Mowery Barrow, an environmental representative from the Upper Keys Citizens Association, questioned the beach health advisories posted on the JPCR swimming areas. If the new water treatment plant is working properly, what is the cause of the contamination? Eric Kiefer explained that the waters at Cannon and Far Beaches are tested every week. He has noticed the beach health advisories occur after a heavy rainstorm and usually only on Cannon Beach. This beach has less natural water circulation. When the water is tested two days later the advisory is lifted. The plan addresses water quality, storm water run-off and plans to study and mitigate the problem. There was also discussion about other pathogen

#### And

#### Dagny Johnson Key Largo Hammock Botanical State Park

#### **Advisory Group Staff Report**

sources. Jim Duquesnel mentioned local bird rookeries in Largo Sound as a possible cause of higher E. coli levels at Cannon Beach.

Joan Barrow questioned the present status of the comprehensive exotic treatment plan. It was called for in the draft plan and the 1998 approved plan. George Jones explained that as District Bureau Chief he requested this plan for all 25 District Five parks. Philip Myers is writing them but is also responsible for exotic control throughout the district so has not had time to complete all the plans. Eric Kiefer said an exotic control plan is followed in park maintenance and the written one will be similar.

Joan Barrow noted that feral cats are listed as a problem species in the JPCR plan and as an exotic species in the KLH plan. Janice explained that problem species are native species that become a nuisance. The reference to feral cats will be moved to the exotic species section in the JPCR plan.

Aerial spraying is still occurring and Joan Barrow is concerned about its effect on native species. She would like the park to encourage ground rather than aerial spraying. Jim Duquesnel said the park has an agreement with the county and no aerial spraying takes place over the park but agreed that wind carries the spray and the problem needs addressing. Renate Skinner noted that she is reviewing the mosquito control plans now.

In reference to the biking and hiking trail expansion in the KLH plan, Joan Barrow suggested some changes. The Port Bougainville area is a disturbed area and she agrees with the trail expansion there. She agrees that people need paths away from the main roads. The north end trail along old C905, however, she would like delayed for five years until the wood rat population has recovered. She questioned if the trail along 905 is in the utility easement. The county is re-paving this road and wider pavement for a bike lane would encourage faster driving speeds. Carol Perfit said the plan calls for a path in the utility easement. Eric Kiefer and David Boyd said that the park reviews permits and can make comments but does not have a final vote. Joan Barrow mentioned that the re-paving of Card Sound Road should consider an adjacent bike path, separate from the road. This road has no homes and fewer animal crossings because of the existing canal on one side.

Joan Barrow questioned the potential of installing cameras to monitor illegal immigrant activity along the park boundaries. Eric Kiefer said they could be effective but the cost is prohibitive.

Mr. Don Bottomley, representing the recreational user group Florida Trail Association, would like to investigate the potential of connecting the Overseas Heritage Trail with the Florida National Scenic Trail using the trails at KLH. The trail presently uses US 1 but a better route would be through the park connecting over Card Sound Road. He said that old C905 is good for bikes but would like to see a more scenic and enclosed trail for hikers. Primitive camping within the park accessed by trail would also be a welcome addition for hikers. Also concerning trail development, Don Bottomley would like to see more emphasis on developing trails for not-motorized boats. Jim Duquesnel reported that one camping site accessible by water is being developed now.

Don Bottomley suggested using local students for facility development and planting. Jim

#### And

#### Dagny Johnson Key Largo Hammock Botanical State Park

#### **Advisory Group Staff Report**

Duquesnel mentioned that the park does use student groups as well as homeowner associations, The Nature Conservancy volunteers, and Americorp. Students are presently involved in re-vegetation. Plant identification classes are also held at the park. The limiting factor with volunteer labor is the need for park personnel to be involved and their time is limited.

Don Bottomley inquired about off road biking opportunities. There are no facilities south of Miami. Port Bougainville was discussed as the only potential area with enough disturbed ground but George Jones said it would be a challenge in management with the existing program of exotic removal and restoration. Jim Duquesnel brought up the conflicting atmosphere between off road biking and nature hiking. The park is getting more requests for expanded hiking opportunities than off-road biking. Don Bottomley said Florida Trails Association supports separate trail designations. Janice Duquesnel clarified that the purchase of the property was primarily for the preservation of habitat so we need to limit the development of high impact uses.

Don Bottomley said the rest of the plan meets with his approval.

Ms. Monica Woll, representing the recreational user group, Florida Bay Outfitters, requested some wording change to the JPCR plan to distinguish between primitive and car camping and power boating and paddling. She would like Goal A.1. under Recreational Goals to read primitive camping instead of tent camping. Goal A.2. to add paddling in addition to boating. She questioned how soon the canoe trail camping sites would be developed. Eric Kiefer explained the plan's ten-year time frame. The park develops facilities, as the money becomes available. As previously mentioned, one of the primitive campsites is being developed now.

Monica Woll echoed Joan Barrow's concern for the beach health advisories. She inquired if the marina may cause some of the contamination. Eric Kiefer said they may but we cannot control offsite issues.

Mr. David Ritz, representing the adjacent landowners and the Ocean Reef Community Association, expressed approval for the bike path in the northern section of KLH along CR 905. Their preference is for the trail to be located under the power lines separate from the road and to end at the intersection of 905 and 905A. However, they would not be opposed to it following the road up to the front gate of Ocean Reef. A concern was expressed for the proposed bike path running contiguous to the southern boundary of the Ocean Reef community. He stated that this route was discussed in the past and altered to a more southerly cut through. David Ritz reported that Ocean Reef Community Association raised the money for the road removal from Dispatch Slough with the understanding that this would discourage a bike path through here. He inquired about the location of the proposed 905 section of the path. Carol Perfit clarified that the plans were to use the utility ROW. Renate Skinner said the bike trail as proposed is part of the Key Largo Land Use Feasibility Study and the previously approved plan.

David Ritz agrees that the overlook at Dispatch Slough is a good idea and would like to see the roadway radius changed and curbing installed at this point.

He understands the need to protect the natural resource but feels that the park may be going

#### And

#### Dagny Johnson Key Largo Hammock Botanical State Park

#### **Advisory Group Staff Report**

too far with installation of fences and signs. The wilderness atmosphere should not be destroyed with protective measures. He also takes issue with the regulation on pruning mangroves and dock regulation in the bays and not in the canals. Have any studies been done to prove injury to mangroves through trimming? George Jones explained that mangrove pruning is a statewide issue and not one that a park can change. The bay waters are state park property and the canals are not. Renate Skinner said that dock regulations are for habitat preservation. JPCR owns up to the mean high water line and is responsible for the protection of that habitat.

David Ritz complimented the park on the work that has been done, especially in the Port Bougainville area and the work with children and re-vegetation with native plants. He reported that neighbors are pleased with the removal of the road to Egret Island. He does not believe it a good idea to put a primitive camping site on the island as called for in the JPCR plan. Previous island users were noisy and left a lot of trash. Monica Woll replied that primitive campers are quiet, bring little power with them, and clean up after themselves. David Ritz said that a meeting with the neighbors would allay some of these fears. George Jones reinforced the positive aspect of primitive campers and said the park will restrict the number of users.

The Honorable Murray Nelson, Mayor, Monroe County Board of County Commissioners, who arrived later, stated his support for the plan and would like the county to cooperate with the park wherever possible.

Ms. Perfit thanked everyone for participating and adjourned the meeting.

#### **Staff Recommendation**

# Staff recommends approval of the proposed John Pennekamp Coral Reef State Park management plan as presented with the following changes:

The addition of primitive campsites along the canoe trail:

- Ocean Forest Estates mid-point between Garden Cove and Ocean Reef Club
- Dove Key and Lower Sound Point on El Radabob Key potential primitive campsite Rattlesnake Island potential primitive campsite if property is acquired.

Feral cats discussion moved to the Exotic Species section of the Resource Management Component.

#### Staff recommends approval of the proposed Dagny Johnson Key Largo Hammock Botanical State Park management plan as presented.

Ms. Barrow suggested that the plan should mandate delaying development of bicycle facilities on Old C905 until Wood Rat populations recover from current declines. The park management plan does not determine the schedule for funding improvements. That schedule evolves from an annual process determined by recreational demands and Division and Departmental priorities through development of the legislative budget request. If funding is provided, then the Division's site planning and design process will insure that unacceptable impact to any of the park's natural or cultural resources will not result from the proposed facilities or activities.

#### And

#### Dagny Johnson Key Largo Hammock Botanical State Park

#### **Advisory Group Staff Report**

Furthermore, the Division of Recreation and Parks works in cooperation with the Florida Fish and Wildlife Conservation Commission and the US Fish and Wildlife Service in managing for the protection of all listed plant and animal species in the state parks. The resource management component of this management plan addresses the issues surrounding the woodrat, cotton mouse, tree snails, Schaus swallowtail butterfly and listed plants of the park, identifying the special management considerations and research needs necessary for their protection. These safeguards on the design of facilities and proactive management programs will provide the best possible protection of the listed species of the park.

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Addendum 3—Soil Descriptions

(2) Pennekamp gravelly muck - This soil is on tropical hammocks in the uplands of the Upper Keys. About 10 percent of the surface of the soil is covered with stones that are dominantly 10 to 20 inches in diameter. Soil, where it occurs, is 4 to 16 inches. Individual areas are subject to rare flooding from hurricanes and other tropical storms. Elevations are dominantly 5 to 15 feet above sea level. The Pennekamp soil is well drained. It has a seasonal high water table at a depth of 3.5 to 5.0 feet during the wet periods of most years. Permeability is moderately rapid. Most areas of this soil support native vegetation and are used as habitat for woodland wildlife.

(3) Matecumbe muck - This soil occurs on tropical hammocks in the uplands throughout the keys. Individual areas are subject to occasional flooding from hurricanes and other tropical storms. Elevations are less than 15 feet above sea level. The soil is moderately well drained. It has a seasonal high water table at a depth of 1.5 to 3.0 feet during the wet periods of most years. Permeability is rapid. Most areas of this soil type support native vegetation and are used as habitat for woodland wildlife.

(4) Rock outcrop - Tavernier complex, tidal - This map unit is in mangrove swamps and coastal rock barrens throughout the keys. Individual areas are subject to daily flooding by tides. Elevations are less than two feet above sea level. Approximately 60 percent of this map unit consists of areas of exposed bedrock. These areas are dominantly one to four inches above the surface of the surrounding soil and range from approximately two feet to more than 200 feet in diameter. The Tavernier soil is very poorly drained. The seasonal high water table is at or near the surface during much of the year. Permeability is rapid. Most areas of this map unit support native vegetation and are used as habitat for wetland wildlife.

(5) Islamorada muck, tidal - This soil is dominantly on the Upper Keys in mangrove swamps. Individual areas are subject to daily flooding by tides. The depth to bedrock is 20 t 50 inches. Elevations are dominantly at or below sea level. The Islamorada soil is very poorly drained. The seasonal high water table is at or near the surface much of the year. Permeability is rapid. Most areas of this soil support native vegetation and are used as habitat for wetland wildlife.

(6) Key Largo muck, tidal - This soil is dominantly on the Upper Keys but can occur throughout the Keys. It is in mangrove swamps. The soil is very poorly drained. The depth to bedrock is 50 to 90 inches. The seasonal high water table is at or near the surface during much of the year. Permeability is rapid. Most areas support native vegetation and are used as habitat for wetland wildlife.

(7) Udorthents-Urban land complex - This soil occurs on uplands which were articifially created by the placement of crushed limestone over marl and other soil materials. This map unit is on coastal areas throughout the Keys and was made for urban development. These altered areas are rarely subjected to flooding from hurricanes and tropical storms. Elevations vary, depending on the thickness of the fill material, but are dominantly 3 to 10 feet above sea level. This soil type is moderately well drained and has a seasonal high water table at a depth of 2 to 4 feet during the wet periods of most years. This map unit generally supports no native vegetation, although invasive exotic species tend do quite well.

(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

#### Plants

Common Name	Scientific Name	Primary Habitat Codes (for designated species)
Indian mallow	Abutilon permolle	
Cinnecord	Acacia choriophylla +	
Sweet acacia	Acacia farnesiana +	
Barb-wire cactus	Acanthocereus tetragonus	
Golden leather fern	Acrostichum aureum	12
Giant leather fern	Acrostichum danaeifolium	
Red sandalwood	Adenanthera pavonina *	
False foxglove	Agalinis maritima	
False sisal	Agave decipiens	
Woman's tongue	Albizia lebbeck *	
Aloe	Aloe vera *	
Chaff flower	Alternanthera flavescens	
Alternanthera	Alternanthera paronvchioide	s *
Alice-clover	Alvsicarpus vaginalis *	
Notch-leaved amaranth	Amaranthus blitum *	
Common ragweed	Ambrosia artemisiifolia	
Torchwood	Amyris elemifera	
Bushy bluestem	Andropogon glomeratus var.	pumilus
Broom-sedge	Andropogon virginicus	1
Sugar apple	Annona squamosa *	
Coral vine	Antigonon leptopus *	
Marlberry	Ardisia escallonioides	
Asparagus fern	Asparagus densiflorus *	
Brace's aster	Aster bracei	
Sand atriplex	Atriplex pentandra	
Black mangrove	Avicennia germinans	
Eyebright ayenia	Ayenia euphrasiifolia	
Salt bush	Baccharis halimifolia	
Water hyssop	Bacopa monnieri	
Saltwort	Batis maritima	
Spanish needle	Bidens alba var. radiata	
Green shrimp plant	Blechum pyramidatum *	
Samphire	Blutaparon vermiculare	
Red spiderling	Boerhavia diffusa	
Spiderling	Boerhavia erecta	
Sea ox-eye daisy	Borrichia aborescens	
Sea oxeye	Borrichia frutescens	
Pitted bluestem	Bothriochloa pertusa *	
Bahama strong bark	Bourreria succulenta	
Blueheart	Buchnera americana	
Black olive	Bucida bucera *	
Gumbo limbo	Bursera simaruba	
Locustberry	Byrsonima lucida +	12
Gray nicker-bean * Non-native Species	Caesalpinia bonduc	

#### Plants

Common Name	Scientific Name	Primary Habitat Codes (for designated species)
Southern sea rocket	Cakile lanceolata	
Beautyberry	Callicarpa americana	
Basket plant	Callisia fragrans *	
Sea daisy	Calyptocarpus vialis *	
Spicewood	Calyptranthes pallens	
Bay-bean	Canavalia rosea	
Cinnamon bark	Canella winterana	12
Jamaica caper	Capparis cynophallophora	
Limber caper	Capparis flexuosa	
Goatweed	Capraria biflora	
Bird pepper	Capsicum annuum var. glabi	riusculum
Tabasco pepper	Capsicum frutescens *	
Balloon vine	Cardiospermum corindum	
Papaya	Carica papaya *	
Love vine	Cassytha filiformis	
Australian pine	Casuarina equisetifolia *	
Madagascar periwinkle	Catharanthus roseus *	
Southern sandbur	Cenchrus echinatus	
Sandspur	Cenchrus gracillimus	
Coinwort	Centella asiatica	
Blodgett's spurge	Chamaesyce blodgettii	
Hairy spurge	Chamaesyce hirta	
Graceful sandmat	Chamaesyce hypericifolia	
Mendez's sandmat	Chamaesyce mendezii	
Seaside spurge	Chamaesyce mesembryanthe	mifolia
Florida hammock sandmat	Chamaesyce ophthalmica	-
Blackweed	Chamaesyce prostrata	
Snowberry	Chiococca alba	
Pineland snowberry	Chiococca parvifolia	
Bitter bush	Chromolaena odorata	
Cocoplum	Chrysobalanus icaco +	
Satinleaf	Chrysophyllum oliviforme	
Sorrel vine	Cissus trifoliata	
Fiddlewood	Citharexylum spinosum +	
Key lime	Citrus aurantiifolia *	
Grapefruit	Citrus x paradisi *	
Pitch apple	Clusia rosea *	
Pigeon plum	Coccoloba diversifolia	
Seagrape	Coccoloba uvifera	
Coconut palm	Cocos nucifera *	
Croton	Codiaeum variegatum *	
Coffee colubrina	Colubrina arborescens+	
Latherleaf	Colubrina asiatica *	
Soldierwood * Non-native Species	Colubrina elliptica	

+ Cultivated

#### Plants

Common Name	Scientific Name	Primary Habitat Codes (for designated species)
Davflower	Commelina diffusa var. diffusa	*
Day flower	Commelina erecta	
Buttonwood	Conocarpus erecta	
Dwarf horseweed	Convza canadensis var. pusilla	
Jute	Corchorus siliquosus	
Geiger tree	Cordia sebestena *	
Rhacoma	Crossopetalum rhacoma	12
Rattlebox	Crotalaria numila	
King sago palm	Cvcas revoluta *	
Marsh parsley	Cyclospermum leptophyllum *	
Milkweed	Cynanchum angustifolium	
Leafless cynanchum	Cynanchum scoparium	
Bermuda grass	Cynodon dactylon *	
Umbrella sedge	Cyperus croceus	
Yellow nutgrass	Cyperus esculentus *	
False saw grass	Cyperus ligularis	
Umbrella sedge	Cyperus nlanifolius	
Egyntian grass	Dactyloctenium aegyntium *	
Royal poinciana	Delonix regia *	
Virgate mimosa	Desmanthus virgatus	
Beggarweed	Desmodium incanum	
Florida begger weed	Desmodium tortuosum *	
Threeflower ticktrefoil	Desmodium triflorum *	
Ponyfoot	Dichondra carolinensis	
False-mint	Diclintera sexangularis	
Southern crabgrass	Digitaria ciliaris	
Pangola grass	Digitaria pentzii *	
Varnish leaf	Dodonaea viscosa+	
Dracaena	Dracaena fragrans *	
Red-edged Dracaena	Dracaena marginata *	
Milkhark	Drunetes diversifolia	12
Guiana nlum	Drypetes arversijona Drypetes lateriflora	12
Cane nalm	Dyperes tutergrow	
Devil's potato	Echites umbellata	
Canada spike rush	Eleocharis geniculata	
Goose grass	Fleusine indica *	
Dollar orchid	Encuclia boothiana var ervthr	onioides 12
Butterfly orchid	Encyclia tampensis	
Gonhertail lovegrass	Encyclia lampensis Fragrostis ciliaris *	
Lovegrass	Fragrostis elliottii	
Centinede grass	Fremochlog ophiuroides *	
Black torch	Frithalis fruticosa	
Beach creener	Frnodea littoralis	
White stopper	Enouca monans Fuopnia avillaris	
* Non-native Species	Lugenia anniaris	

+ Cultivated

#### Plants

Common Name	Scientific Name	Primary Habitat Codes (for designated species)
Spanish stopper	Fugenia foetida	
Dog fennel	Eugenia joenaa Eunatorium canillifolium	
Grassleaf spurge	Euphorbia graminea *	
Crown of thorns	Euphorbia lactea *	
Sanddune spurge	Euphorbia trichotoma	
Finger grass	Euphoroid intenotoma Fustachys petraea	
Seaside gentian	Eustoma exaltatum	
Princewood	Exostema caribaeum	
Inkwood	Exostema caribacam Exothea paniculata	
False banyan	Ficus altissima *	
Strangler fig	Ficus aurea	
Weening fig	Ficus benjamina *	
Shortleaf fig	Ficus citrifolia	
India rubber tree	Ficus clastica *	
I surel fig	Ficus microcarpa *	
Hurricane grass	Ficus microcurpu Fimbristylis cymosa	
Governor's plum	Flacourtia indica *	
Vellowton	Flavoria linearis	
Stalkless vellowton	Flaveria trinervia	
Mauritius hemp	Fureraea foetida *	
Blanket flower	Gaillardia pulchella *	
Milk per	Galactia striata	
Milk pea	Galactia volubilis	
Southern gaura	Gaura angustifolia	
Southern gaura Seven year apple	Ganing clusiifolia	
Cronoshill	Geranium carolinianum	
Wild actton	Gossprium hirsettum	2 1 2
Chawstick	Gossyptum nirsutum Govania lumuloidas	5,12
Lignum vitao	Guaiacum sanctum	12
	Guatacum sancium Cuaning discolor	12
Everglades velvetseed	Guapira aiscolor Cuattanda alliptica	
Rough valvetseed	Guettarda soabra	
Crabwood	Guenarda scubra	
Firebush seerlethush	Gymnanines iuciaa	
Priekly apple agatus	Hawigia gimpoonii	1
Sunflower	Halignthus ground *	4
Sumiower Secretaria	Ileliatuonium angiogramuun	
Scolpion tan	Heliotropium anglospermun	
Pladder mallow	Helioiropium curassavicum Hoviggantia ovigna	
Wild hibigoug	Herissanila Crispa	
wild III0ISCUS	Hibigous poeppigli Hibigous poep airceastic com	aa ainonaia *
nioiscus Mahaa	niuiscus rosa-sinensis var. ro	su-sinensis
Nanoe Dester vira	Hippopulation and hills	
Doctor vine Spider lily	Hypocratea volubilis	
Spider IIIy * Non-native Species	Hymenocallis latijolla	

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## Plants

Common Name	Pri Scientific Name (for	mary Habitat Codes r designated species)
White ironwood	Hypelate trifoliata	12
Florida Keys indigo	Indigofera mucronata var. keyensis	s 12
Wild indigo	Indigofera spicata *	
Moon-flower	Ipomoea alba	
Morning glory	Ipomoea indica var. acuminata	
Railroad vine	Ipomoea pes-caprae ssp. brasiliens	sis
Morning glory	Ipomoea triloba *	
Moonvine	Ipomoea violaceae	
Sky blue morning glory	Jacquemontia pentanthos	
Bracelet-wood	Jacquinia arborea *	
Joewood	Jacquinia keyensis	4
Arabian jasmine	Jasminum sambac	
Devil's backbone	Kalanchoe daigremontiana *	
Life plant	Kalanchoe pinnata *	
Chandelier plant	Kalanchoe tubiflora *	
Black ironwood	Krugiodendron ferreum	
Wild lettuce	Lactuca graminifolia	
White mangrove	Languncularia racemosa	
Lantana	Lantana camara *	
Wild lantana	Lantana involucrata	
Wild bamboo	Lasiacis divaricata	
Peppergrass	Lepidium virginicum	
Green sprangle top	Leptochloa dubia	
Lead tree	Leucaena leucocephala *	
Sea lavender	Limonium carolinianum	
Chinese fan palm	Livistona chinensis *	
Christmas berry	Lycium carolinianum	
Tomato	<i>Lycopersicon esculentum *</i>	
Wild tamarind	Lysiloma latisiliquum	
False mallow	Malvastrum corchorifolium	
Mango	Mangifera indica *	
Wild dilly	Manilkara jaimiqui subsp. emargin	nata 4,12
Sapodilla	Manilkara zapota *	
Mayten	Maytenus phyllanthoides	
Marsh elder	Melanthera nivea	
Spanish lime	Melicoccus bijugatus *	
White sweet clover	Melilotus alba *	
Creeping cucumber	Melothria pendula	
Woodrose	Merremia dissecta *	
Poisonwood	Metopium toxiferum	
Climbing hempvine	Mikania scandens	
Four-o-clock	Mirabilis jalapa *	
Key grass	Monanthochloe littoralis	
Cheeseweed * Non-native Species	Morinda royoc	
. Cultivated		

+ Cultivated

## Plants

Common Name	Scientific Name	Primary Habitat Codes (for designated species)
Twinberry stopper	Myrcianthes fragrans+	
Lancewood	Ocotea coriacea	
Ground orchid	<i>Oeceoclades maculata *</i>	
Semaphore cactus	Opuntia corallicola+	
Prickly-pear cactus	Opuntia stricta	
Lady's sorrel	Oxalis corniculata	
Beach grass	Panicum amarum	
Guinea grass	Panicum maximum *	
Pellitory	Parietaria floridana	
Virginia creeper	Parthenocissus auinauefolia	
Tufted paspalum	Paspalum blodgettii	
Blue paspalum	Paspalum caespitosum	
Salt joint grass	Paspalum setaceum	
Salt joint grass	Paspalum vaginatum	
Passionflower	Passiflora multiflora	12
Corky-stemmed passionflower	Passiflora suberosa	
Tea-blinkums	Pectis glaucescens	
Chicken weed	Pectis prostrata	
Devil's backbone	Pedilanthus tithymaloides *	
Wild allamanda	Pentalinon luteum	
Pentas	Pentas lanceolata *	
Avocado	Persea americana *	
Creeping charlie	Phyla nodiflora	
Gale of wind	Phyllanthus amarus *	
Mascarene island leafflower	Phyllanthus tenellus *	
Serpent fern	Phymatosorus scolopendrium	*
Ground cherry	Physalis pubescens	
Ground cherries	Physalis walteri	
Artillery plant	Pilea microphylla	
Bahamian treecactus	Pilosocereus bahamensis	4,12
Jamaica dogwood	Piscidia piscipula	
Cockspur	Pisonia aculeata	
Blackbead	Pithecellobium keyense	
Cat's claw	Pithecellobium unguis-cati	
Plantain	Plantago major *	
Resurrection fern	Pleopeltis polypodioides var. n	nichauxiana
Bushy fleabane	Pluchea carolinensis	
Marsh fleabane	Pluchea odorata	
Blue plumbago	Plumbago auriculata *	
Wild poinsettia	Poinsettia cyathophora	
Wild poinsettia	Poinsettia heterophylla	
Milkwort	Polygala grandiflora	
Rustweed	Polypremum procumbens	
Purslane * Non-native Species	Portulaca oleracea	

+ Cultivated

#### Plants

Common Name	Scientific Name	Primary Habitat Codes (for designated species)
Eggfruit	Pouteria campechiana *	
Velvet burr	Priva lappulacea	
Guava	Psidium guaiava *	
Whisk fern	Psilotum nudum	
Wild coffee	Psychotria nervosa	
Brake fern	Pteris vittata *	
White indigo_berry	Randia aculeata	
Darling nlum	Ramana acuicana Ramasia sententrionalis	
Mangrove rubber vine	Rhahdadania hiflora	
Red mangrove	Rhubuuuenia bijiora Rhizophora mangla	
Notal grass	Dhynchabytmym papans *	
I aget grouthoon	Dhynchesia minima	
Least shoutbean	Rhynchosia minima Dhan chosia sausat-ii	12
Swartz's shoutbean	Rhynchosia swartzii	12
white-tops	Rnynchospora colorata	
Rougeberry	Rivina humilis	
Itch grass	Rottboellia cochinchinensis *	
Cabbage palm	Sabal palmetto	
Annual glasswort	Salicornia bigelovii	
Woody glasswort	Salicornia perennis	
Water pimpernel	Samolus ebracteatus	
Bowstring hemp	Sansevieria hyacinthoides *	
Soapberry	Sapindus saponaria	
Milkweed vine	Sarcostemma clausum	
Maidenbush	Savia bahamensis +	
Beach naupaka	Scaevola sericea *	
Florida boxwood	Schaefferia frutescens	12
Umbrella tree	Schefflera actinophylla *	
Brazilian pepper	Schinus terebinthifolius *	
Wire bluestem	Schizachyrium gracile	
Bluestem	Schizachyrium sanguineum	
Florida Keys nutrush	Scleria lithosperma	
Bahama senna	Senna mexicana var. chapman	ii
Coffee senna	Senna occidentalis *	
Sea purslane	Sesuvium portulacastrum	
Foxtail grass	Setaria parviflora	
Broomweed	Sida acuta	
Fringed fannetals	Sida ciliaris	
Saffron nlum	Siderovylon celastrinum	
Mastic	Sideroxylon foetidissimum	
Willow bustic	Sideroxylon solicifolium	
Paradise tree	Simarouba glauca	
Greenbrier	Smilar havanansis	
American black nightshade	Solanum americanum	
Rahama nightshada	Solanum bahamansa	12
* Non-native Species	solunum bunumense	12

## Plants

Common Name	Scientific Name	Primary Habitat Codes (for designated species)
Potato tree	Solanum erianthum	
Mullein nightshade	Solanum verbascifolium	
Necklace-pod	Sophora tomentosa var.	occidentalis *
Saltmeadow cordgrass	Sparting patens	<i>Sectuentaris</i>
Prickly cordgrass	Spartina spartinae	
Large leaf buttonweed	Spermacoce assurgens	
Buttonweed	Spermacoce verticillata	*
West Indian pinkroot	Spiselja anthelmia	
Coral dropseed grass	Sporobolus domingensis	
Dropseed	Sporobolus indicus var i	indicus *
West Indian dropseed	Sporobolus indicus var p	vramidalis *
Coastal dropseed	Sporobolus virginicus	
Blue porterweed	Stachytarnheta jamaicen	sis
St Augustine grass	Stenotaphrum secundatu	m *
Pencil flower	Stylosanthes hamata	
Sea blite	Sugeda linearis	
Bay-cedar	Succeda Uncertis Suriana maritima	
West Indian mahogany	Swietenia mahagoni	12
Tamarind	Tamarindus indicus *	12
Yellow elder	Tecoma stans *	
Tropical almond	Terminalia catanna *	
Portia	Thespesia populnea *	
Luckynut	These tia peruviana *	
Key thatch	Thrinax morrisii	12
Florida thatch palm	Thrinax radiata	12
Reflexed wild pine	Tillandsia balbisiana	
Stiff-leaved wild pine	Tillandsia fasciculata va	r. densispica
Twisted air plant	Tillandsia flexousa	12
Silvery wild pine	Tillandsia paucifolia	
Ball moss	Tillandsia recurvata	
Needle-leaved air plant	Tillandsia setacea	
Spanish moss	Tillandsia usneoides	
Giant wild pine	Tillandsia utriculata	
Soldier bush	Tournefortia volubilis	
Poison ivy	Toxicodendron radicans	
Oyster plant	Tradescantia spathacea	*
Wandering Jew	Tradescantia zebrina *	
West Indian trema	Trema lamarckianum	12
Florida trema	Trema micrantha	
Puncture weed	Tribulus cistoides *	
Mexican daisy	Tridax procumbens *	
Yellow alder	Turnera ulmifolia *	
Dominican panicum	Urochloa adspersa	
Signal grass * Non-native Species	Urochloa subquadripara	*
. Cultivated		

+ Cultivated

## Plants

		Primary Habitat Codes
Common Name	Scientific Name	(for designated species)
D 1 1		10
Pearl-berry	Vallesia antiliana	12
Ironweed	vernonia cinerea *	
Cow-pea	Vigna luteola	
Muscadine grape	Vitis rotundifolia	
Waltheria	Waltheria indica	
Wedelia	Wedelia trilobata *	
Hog-plum	Ximenia americana	
Japanese youngia	Youngia japonica *	
Spanish bayonet	Yucca aloifolia	
Wild lime	Zanthoxylum fagara	
Turf grass	Zoysia tenuifolia *	
Seagrass		
Shoal grass	Halodule wrightii	
Manatee grass	Syringodium filiforme	
Turtle grass	Thalassia testudinum	
Green Algae		
Mermaid's goblet	Acetabularia calveulus	
Mermaid's goblet	Acetabularia crenulata	
Weimald's goblet	Anadvomene sp	
	Anadyomene sp.	
	Avrainvillea sp. Ratophova ogrstadij	
	Caulorna curressoides	
	Caulerpa cupressolues	
	Caulerpa mexicana	
	Caulerpa puspiloides	
	Caulerpa prolifera	
	Caulerpa seriularioides	
	Caulerpa taxijolla Caulerpa vorti cillata	
	Clude a seal alua sea	
	Cladocephatus sp.	
	Ciadophora sp.	
	Coatum sp.	
	Cymopolia sp.	
	Dasyciaaus vermicularis	
	Diciyosphaeria sp.	
	Enteromorpha sp.	
	Halimea sp.	
	Neomeris sp.	
Shaving brush	Penicilius capitatus	
Shaving brush	Penicillus aumetosus	
	Knipocephalus phoenix	
	Uaotea cyathiformis	
	Udotea flabellum	
* Non-native Species	Ulva sp.	
Non-native species		

#### Plants

Common Name	Scientific Name	Primary Habitat Codes (for designated species)
	W. L	
Durane Alasa	Valonia sp.	
Brown Algae	Dictyota sp.	
G	Paaina sp.	
Sargassum	Sargassum sp.	
D 1 1	Turbinaria sp.	
Red algae	Acanthophora sp.	
	Amphiroa sp.	
	Bostrychia sp.	
	Ceramium sp.	
	Dasya sp.	
	Goniolithon strictum	
	Gracilaria sp.	
	Heterosyphonia sp.	
	Jania sp.	
	Laurencia sp.	
	Lithothamnium sp.	
	Polysiphonia sp.	
	Porphyra sp.	
Blue Green Algae	Anacystis sp.	
	Coccochloris sp.	
	Entophysalis sp.	
	Microcoleus sp.	
Black band	Phormidium corallyticum	
	Spirulina sp.	

\* Non-native Species

## Animals

Common Name	Scientific Name	Primary Habitat Codes (for all species)
	Scientific Punic	(ior an species)
Sponges		
Tube sponge	Callyspongia vaginalis	68,69,70,71
Chicken liver sponge	Chondrilla nucula	68,69,70,71
Red boring sponge	Cliona lampa	68,69,70,71
White sponge	Geodia gibberosa	68,69,70,71
Red sponge	Haliclona rubens	68,69,70,71
Green sponge	Haliclona viridis	68,69,70,71
Vase sponge	Ircinia campana	68,69,70,71
Stinker sponge	Ircinia fasciculata	68,69,70,71
Cake sponge	Ircinia strobilina	68,69,70,71
Do-not-touch-me sponge	Neofibularia nolitangere	68,69,70,71
Loggerhead sponge	Spheciospongia vesparia	68,69,70,71
Grass sponge	Spongia graminea	68,69,70,71
Reef sponge	Spongia obliqua	68,69,70,71
Fire sponge	Tedania ignis	68,69,70,71
Candle sponge	Verongia fistularis	68,69,70,71
Hydrozoa		
Fire coral	Millepora alcicornis	70
Fire coral	Millepora complanata	70
Portuguese man-of-war	Physalia physalis	70
Nthozoa - Anemones And Zoa	inthids	
Ringed anemone	Bartholomea annulata	69,70
Warty sea anemone	Bunodosoma cavernata	69,70
Pink-tipped anemone	Condylactis gigantea	69,70
Speckled anemone	Epicystes crucifera	69,70
Knobby zoanthid	Palythoa mammilosa	69,70
Porous false plexaura	Pseudoplexaura porosa	69,70
Purple sea plume	Pseudopterogorgia acerosa	69,70
Slimy sea plume	Pseudopterogorgia americana	69,70
Sea feather	Pseudopterogorgia bipinnata	69,70
Angular sea whip	Pterogorgia anceps	69,70
Yellow sea whip	Pterogorgia citrina	69,70
Anthozoa - Stony Corals		
Staghorn coral	Acropora cervicornis	70
Staghorn coral	Acropora prolifera	70
Leaf coral	Agaricia agaricites	70
Dwarf cup coral	Astrangia solitaria	70
Tube coral	Cladocora arbuscula	69,70
Rose coral	Colpophyllia amaranthus	70
Large grooved brain coral	Colpophyllia natans	70
Star coral	Dichocoenia stokesii	70
Knobbed brain coral	Diploria clivosa	70
* Non-native Species		

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## Animals

		Primary Habitat Codes
Common Name	Scientific Name	(for all species)
Drain agral	Dialogia laburinthiformia	70
Blalli colai	Diploria idoyrininijormis	70
Symmetrical brain coral	Dipioria sirigosa Eugenilia facticiata	70
Flower coral	Eusmilia jasiigiala	/0
Golibali coral	Favia jragum	08,09,71
Cactus coral	Isophyllia sinuosa Madamain daamatin	70
Green cactus coral	Madracis decactis	/0
Common rose coral	Manicina areolata	68,69,70,71
Butterprint brain coral	Meandrina meandrites	70
Common star coral	Montastrea annularis	70
Large star coral	Montatrea cavernos	70
Large flower coral	Mussa angulosa	70
Large cactus coral	Mycetophyllia lamarckiana	70
Ivory bush coral	Oculina diffusa	69,70
Porous coral	Porites astreoides	69,70
Small finger coral	Porites divaricata	68,69,70,71
Clubbed finger coral	Porites porites	68,69,70,71
Finger coral	Porites furcata	68,69,70,71
Starlet coral	Siderastrea radians	69,70
Starlet coral	Siderastrea siderea	70
Lobed star coral	Solenastrea hvades	69,70
Smooth star coral	Solenastrea bournoni	69.70
Blushing star coral	Stephanocoenia michelini	69,70
Polychaetes		
I ugworm	Arenicola cristata	77
Black-spotted feather duster	Branchiomma nigromaculata	70
Medusa worm	Loimia madusa	70
Star faather worm	Pomatostagus stallatus	70
Dandad faathar dustar	Sabella melanostigma	70
Magnificant faathar dustar	Sabella melanosligina Sabellastanto magnifica	70
Magnificent leather duster	Sabellastarie magnifica	70
Horned feather worm	Spirobranchus giganteus	/0
Mollusks		
Faust tellin	Acrophagia fausta	68,69,70,71,77
Spotted sea hare	Aplysia dactylomela	68,69,70,71,77
Pen shell	Atrina sp.	68,69,70,71,77
Black horn shell	Batillaria minima	68,69,70,71,77
Cross-barred chione	Chione cancellata	68,69,70,71,77
Chiton	Chiton sp.	68,69,70,71,77
Great white lucine	Codakia orbicularis	68,69,70,71,77
Measled cowry	Cypraea zebra	68,69,70,71,77
Tulip shell	Fasciolaria hunteria	68,69,70,71,77
Rough file shell	Lima scabra scabra	68,69,70,71,77
Coffee bean snail	Melampus coffeus	76
Bleeding tooth	Nerita peloronta	76
* Non-native Species	1	

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## Animals

		Primary Habitat Codes
Common Name	Scientific Name	(for all species)
Checkered nerite	Nerita tessellata	76
Common reef octopus	Octopus briareus	68,69,70,71,77
Common octopus	Octopus vulgaris	68,69,70,71,76,77
Pearl oyster	Pinctada radiata	68,69,71,76
Sargassum nudibranch	Scyllea pelagica	68,69,70,71,77
Reef squid	Sepioteuthis sepioidea	68,69,70,71,77
Milk conch	Strombus costatus	70,71
Queen conch	Strombus gigas	70,71
Hawkwing conch	Strombus raninus	70,71
Knobby periwinkle	Tectarius muricatus	68,69,70,71,77
Common lettuce slug	Tridachia crispata	68,69,70,71,77
Crustacea		
Red Snapping shrimp	Alpheus armatus	68,69,70,71
Mangrove crab	Aratus pisonii	76
Ivory barnacle	Balanus eburneus	68,69,70,71,77
Blue crab	Callinectes sapidus	68,71,76,77
Land crab	Cardisoma guanhumi	76
Fragile barnacle	Chthamalus fragilis	68,69,70,71,77
Land hermit crab	Coenobita clypeatus	76
Mangrove crab	Goniopsis cruentata	76
Goose barnacle	Lepas anatifera	68,69,70,71,77
Sea roach	Ligia exotica	76,77
Stone crab	Menippe mercenaria	69,68,71,77
Spiny lobster	Panulirus argus	68,69,70,71,77
Rock lobster, spotted crawfish	Panulirus guttatus	68,69,70,71,77
Pink shrimp	Penaeus duorarum	71,77
Spanish lobster	Scyllarides aeguinoctiales	68,69,70,71,77
Slipper lobster	Scyllarides nodifer	68,69,70,71,77
Banded coral shrimp	Stenopus hispidus	68,69,70,71
Echinoderms		
Say's astropecten	Astropecten articulatus	68,69,70,71,77
Thorny starfish	Echinaster sentus	68,69,70,71,77
Common comet star	Linckia guildingii	68,69,70,71,77
Cushion star	Oreaster reticulatus	68,69,70,71,77
Brittle stars: Ophiuroidea		
Basket starfish	Astrophyton muricatum	68,69,70,71,77
Seagrass brittle star	Ophiactis quinqueradia	68,69,70,71,77
Slimy brittle star	Ophiomyxa flaccida	68,69,70,71,77
Reticulate brittle star	Ophionereis reticulata	68,69,70,71,77
Sea urchins,sand dollars,heart u	ırchins: Echinoidea	
Common arbacia	Arbacia punctulata	68,69,70,71,77
Long-spined urchin * Non-native Species	Diadema antillarum	68,69,70,71,77

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## Animals

		Primary Habitat Codes
Common Name	Scientific Name	(for all species)
Deals he wine conclusion		
Kock-boring urchin	Echinometra lucunter	08,09,70,71,77
Variegated urching	Lytechinus variegatus Mollita avinavioan orfonata	68,69,70,71,77
West Indian son bisouit	Menna yantuisosa	68,69,70,71,77
west indian sea discuit	Meoma ventricosa	08,09,70,71,77
Sea cucumbers: Holothuroidea		
Florida sea cucumber	Holothuria floridana	68,69,70,71,77
Tunicates		
Black tunicate	Ascidia nigra	68,69,70,71,77
Mangrove tunicate	Ecteinascidia turbinata	76
TERRI	ESTRIAL INVERTEBRATES	
Arthropods: Insects		
Moths and Butterflies	Acalyptris gilvafascia	4,12,81
	Acrocercops	4,12,81
Gulf fritillary	Agraulis vanillae	4,12,81
-	Antispila eugeniella	4,12,81
	Bedellia minor	4,12,81
	Bucculatrix n. sp.	4,12,81
	Caloptilia n. sp.	4,12,81
	Chilocampyla dveriella	4,12,81
	Coptodisca n. sp.	4,12,81
	Cosmonterigid	4 12 81
	Cremastobombvci sp.	4,12,81
Julia	Drvas julia largo	4 12 81
	Elachistid	4 12 81
	Epimencis fraternaria	4 12 81
	Epimencis detexta	4 12 81
Zebra	Heliconius charitonius tucker	4 12 81
Miami blue butterfly	Hemiargus thomasi	4 12 81
	Leucontera quettardella	4 12 81
	Metriochroa n sn	4 12 81
	Nematocampa filamentaria	4 12 81
	Neurostrota n sp	4 12 81
	Opostega kempella	4 12 81
Giant swallowtail	Panilio cresphontes	4 12 81
Gluit Swullow tuli	Parectona n sn	4 12 81
	Pebons inomoege	4 12 81
	Stilhosis sn	4 12 81
	Stiomella gossvnii	4 12 81
	Stigmellan sn	4 17 81
	Sugmena n. sp. Tischeria sn	т,12,01 Д 12 81
• /		7,12,01
Ants	Aphaenogaster carolinensis	3,12,81
* Non-native Species		
+ Cultivated	ΔΔ_1Δ	

## Animals

		Primary Habitat Codes
Common Name	Scientific Name	(for all species)
	Brachymyrmex depilis	3,12,81
	Brachymyrmex obscurior	3,12,81
	Camponotus floridanus	3,12,81
	Camponotus planatus	3,12,81
	Conomyrma bureni	3,12,81
	Crematogaster ashmeadi	3,12,81
	Cyphomyrmex minutus	3,12,81
	Hvpoponera inexorata	3,12,81
	Leptothorax allardvcei	3,12,81
	Leptothorax torrei	3 12 81
	Monomorium floricola	3 12 81
	Odotomachus ruginodis	3 12 81
	Paratrachina hourbonica	3 12 81
	Paratrachina quatomalonsis	3 12 81
	Panatuaching longicomig	2 12 91
	I druitechind longicornis	2 12 91
		3,12,01
	Pseudomyrmex elongatus	3,12,81
	Pseudomyrmex mexicanus	3,12,81
Fire ant	Solenopsis geminata	3,12,81
Fire ant	Solenopsis invicta	3,12,81
Fire ant	Solenopsis tennesseensis	3,12,81
Fire ant	Solenopsis sp.,near texana	3,12,81
	Strumigenys eggersi	3,12,81
	Strumigenys gundalachi	3,12,81
	Trachymyrmex jamaicensis	3,12,81
	Wasmannia auropunctata	3,12,81
Mosquitos	Aedes sollicitans	All
Black saltmarsh mosquito	Aedes taeniorhychus	All
	·····	
Monuses: Tree Shans		12
Many-lined forest shall	Drymaeus multilineatus	12
Florida tree snall	Liguus fasciatus	12
Banded tree snall	Orthalicus floridensis	12
Stock Island tree snall	Orthalicus reses reses	12
Cuban caracole snail *	Zacrysia provisoria	12
	MAMMALS	
Terrestrial		
Opossum	Didelphis marsupialis	12
Raccoon	Procyon lotor	12,76
Norway rat *	Rattus norvegicus	12.81
Black rat *	Rattus rattus	12 81
Eastern grey squirrel	Sciurus carolinensis	12
* Non-native Species		

## Animals

		<b>Primary Habitat Codes</b>
Common Name	Scientific Name	(for all species)
Marine		
West Indian manatee	Trichechus manatus latirostris	68,69,70,71,77
Atlantic bottlenose dolphin	Tursiops truncatus	68,69,70,71,77
RI	EPTILES & AMPHIBIANS	
Terrestrial		
Green anole	Anolis carolinensis carolinensis	3,12,81
Knight anole****	Anolis equestris equestris	12,81
Bahamian brown anole*	Anolis sagrei ornatus	3,12,81
Florida soft-shelled turtle	Apalone ferox	81
common boa constrictor****	Boa constrictor	81
Giant toad *	Bufo marinus	3,12,81
Southern black racer	Coluber constrictor priapus	3,4,12,81
Eastern diamondback rattlesnake	Crotalus adamanteus	3,4,12
Southern ringneck snake	Diadophis punctatus punctatus	3,4,12,81
Eastern indigo snake**	Drymarchon corais couperi	12
red rat snake	Elaphe guttata guttata	3,12,81
greenhouse frog*	Eleutherodactylus p. planirostris	81
Florida Keys mole skink	Eumeces egregius egregius	81,3
Southeastern five-lined skink	Eumeces inexpectatus	3,12
Eastern narrow-mouthed toad	Gastrophryne carolinensis	81,12
Tokay gecko *	Gecko gecko	12,81
Indo-Pacific gecko	Hemidactylus garnotii	81
Mediterranean gecko *	Hemidactylus turcicus turcicus	3,12,81
green tree frog	Hyla cinerea	81
Cuban treefrog	Hyla septentrionalis	3,12,81
green iguana*	Iguana iguana	81
Northern curly-tailed lizard***	Leiocephalus carinatus armouri	01.10.0
Eastern coral snake	Micrurus fulvius fulvius	81,12,3
mangrove salt marsh snake	Nerodia clarkii compressicauda	4,/5,/6,81
Branminy blind snake	Ramphotyphlops braminus	81
Reef gecko	Sphaerodactylus notatus notatus	3,12,81
Elorida hay turtla	Tantitia ootitica Tantanana agualing hausi	12
	Terrapene carolina bauri	12
Marine	<i>C и и</i>	
Loggernead sea turtle	Caretta caretta	68,69,70,71,77
Green sea turtle	Chelonia mydas	68,69,70,71,77
American crocodile	Crocodylus acutus	/1,/6
Leatherback sea turtle	Dermochelys coriacea	68,69,70,71,77
Hawksbill sea turtle	Eretmochelys imbricata	68,69,70,71,77
Ridley sea turtle	Lepidochelys kempi	68,69,70,71,77
Mangrove water snake	Natrix fasciata compressicauda	<i>u</i> 76
	FISH	
Sergeant major	Abudefduf saxatilis	68,69,70,71,77
Blennies	Acanthemblemaria spp.	
* Non-native Species		
+ Cultivated	A 4 - 16	

## Animals

Common Name	Scientific Name	Primary Habitat Codes (for all species)
Surgeonfish	Acanthurus bahianus	68.69.70.71.77
Doctorfish	Acanthurus chirurgus	68,69,70,71,77
Blue tang	Acanthurus coeruleus	68,69,70,71,77
Eagle ray	Aetobatus narinari	68,69,70,71,77
Key worm eel	Ahlia egmontis	
Bonefish	Albula vulpes	68,69,70,71,77
Orange filefish	Aleterus schoepfi	68,69,70,71,77
Scrawled filefish	Aluterus scriptus	68,69,70,71,77
Black margate	Anisotremus surinamensis	
Porkfish	Anisotremus virginicus	68,69,70,71,77
Flamefish	Apogon maculatus	
Sheepshead	Archosargus probatocephalus	
Sea bream	Archosargus rhomboidalis	68,69,70,71,77
Conchfish	Astrapogon stellatus	
Hardhead silverside	Atherinomorus stipes	
Trumpetfish	Aulostomus maculatus	68,69,70,71,77
Gray triggerfish	Balistes capriscus	
Queen triggerfish	Balistes vetula	
Spotfin hogfish	Bodianus pulchellus	68,69,70,71,77
Spanish hogfish	Bodianus rufus	68,69,70,71,77
Peacock flounder	Bothus lunatus	
Jolthead porgy	Calamus bajonado	
Saucereye porgy	Calamus calamus	68,69,70,71,77
Lancer dragonet	Callionymus bairdi	
Ocean triggerfish	Canthidermis sufflamen	
Sharpnose puffer	Canthigaster rostrata	68,69,70,71,77
Yellow jack	Caranx bartholomaei	68,69,70,71,77
Blue runner	Caranx crysos	68,69,70,71,77
Bar jack	Caranx ruber	68,69,70,71,77
Reef shark	Carcharhinus springeri	68,69,70,71,77
Snook	Centropomus undecimalis	68,69,70,71,77
Bluethroat pikeblenny	Chaenopsis ocellatus	
Atlantic spadefish	Chaetodiperus faber	68,69,70,71,77
Foureye butterflyfish	Chaetodon capistratus	68,69,70,71,77
Spotfin butterflyfish	Chaetodon ocellatus	68,69,70,71,77
Reef butterflyfish	Chaetodon sedentarius	68,69,70,71,77
Banded butterflyfish	Chaetodon striatus	68,69,70,71,77
Dolphin	Coryphaena hippurus	68,69,70,71,77
Colon goby	Coryphopterus dicrus	68,69,70,71,77
Bridled goby	Coryphopterus glaucofraenum	68,69,70,71,77
Masked goby	Coryphopterus personatus	68,69,70,71,77
Unknown goby	Coryphopterus sp.	68,69,70,71,77
Whitenose pipefish	Cosmocampus albirostris	
Bluelip parrotfish * Non-native Species	Cryptotomus roseus	68,69,70,71,77

+ Cultivated

## Animals

Common Name Scientific Name		Primary Habitat Codes (for all species)	
Sea trout	Cynoscion nebulosus	68,69,70,71,77	
Flyingfish	Cypselurus spp.		
Southern stingray	Dasyatis americana	68,69,70,71,77	
Balloonfish	Diodon holocanthus	68,69,70,71,77	
Porcupinefish	Diodon hystrix	68,69,70,71,77	
Sand perch	Diplectrum formosum		
Spottail pinfish	Diplodus holbrooki	68,69,70,71,77	
Sharksucker	<i>Echeneis naucrates</i>	68,69,70,71,77	
Sailfin blenny	Emblemaria pandionis		
Rock hind	Epinephelus adscensionis	68,69,70,71,77	
Graysby	<i>Epinephelus cruentatus</i>	68,69,70,71,77	
Red hind	Epinephelus guttatus		
Red grouper	<i>Epinephelus morio</i>	68,69,70,71,77	
Nassau grouper	Epinephelus striatus	68,69,70,71,77	
High-hat	Equetus acuminatus		
Spotted drum	Equetus punctatus	68,69,70,71,77	
Mosquitofish	Gambusia affinis		
Mangrove gambusia	Gambusia rhixophorae		
Yellowfin mojarra	Gerres cinereus	68,69,70,71,77	
Saddle stargazer	Gilleuuls rubrocinctus		
Nurse shark	Ginglymostoma cirratum	68,69,70,71,77	
Goldspot goby	Gnatholepis thompsoni	68,69,70,71,77	
Skilletfish	Gobiesox strumosus		
Dash goby	Gobionellus saepepallens		
Rockcut goby	Gobiosoma grosvenori		
Tiger goby	Gobiosoma macrodon		
Neon goby	Gobiosoma oceanops	68,69,70,71,77	
Green moray	Gymnothorax funebris	68,69,70,71,77	
Spotted moray	Gymnothorax moringa	68,69,70,71,77	
Purplemouth moray	Gymnothorax vicinus		
Tomtate	Haemulon aurolineatum	68,69,70,71,77	
Caesar grunt	Haemulon carbonarium	68,69,70,71,77	
Smallmouth grunt	Haemulon chrvsargvreum	68.69.70.71.77	
French grunt	Haemulon flavolineatum	68,69,70,71,77	
Spanish grunt	Haemulon macrostomum	68,69,70,71,77	
Cottonwick	Haemulon melanurum	68,69,70,71,77	
Sailor's choice	Haemulon parra	68.69.70.71.77	
White grunt	Haemulon plumieri	68,69,70,71,77	
Bluestriped grunt	Haemulon sciurus	68,69,70,71,77	
Slippery dick	Halichoeres bivittatus	68,69,70,71,77	
Yellowhead wrasse	Halichoeres garnoti	68,69,70,71,77	
Clown wrasse	Halichoeres maculipinna	68,69,70,71,77	
Blackear wrasse	Halichoeres poevi		
Puddingwife * Non-native Species	Halichoeres radiatus	68,69,70,71,77	

## Animals

Common Name	Scientific Name	Primary Habitat Codes (for all species)
False pilchard	Harengula clupeola	
Wrasse blenny	Hemiemblemaria simulus	
Rosv razorfish	Hemipteronotus martinicensis	68.69.70.71.77
Green razorfish	Hemipteronotus splendens	
Ballyhoo	Hemiramphus brasiliensis	68,69,70,71,77
Lined seahorse	Hippocampus erectus	
Dwarf seahorse	Hippocampus zosterae	
Blue angelfish	Holacanthus bermudensis	68,69,70,71,77
Queen angelfish	Holacanthus ciliaris	68,69,70,71,77
Longspine squirrelfish	Holocentrus rufus	
Oyster blenny	Hypleurochilus aequipinnis	
Barred blenny	Hypleurochilus bermudensis	
Blue hamlet	Hypoplectrus gemma	
Indigo hamlet	Hypoplectrus indigo	
Black hamlet	Hypoplectrus nigricans	68,69,70,71,77
Barred hamlet	Hypoplectrus puella	68,69,70,71,77
Butter hamlet	Hypoplectrus unicolor	68,69,70,71,77
Blue goby	Ioglossus calliurus	
Bermuda chub	Kyphosus sectartrix	68,69,70,71,77
Hogfish	Lachnolaimus maximus	68,69,70,71,77
Spotted trunkfish	Lactophrys bicaudalis	68,69,70,71,77
Honeycomb cowfish	Lactophrys polygonia	68,69,70,71,77
Scrawled cowfish	Lactophrys quadricornis	
Smooth trunkfish	Lactophrys triqueter	
Pinfish	Lagodon rhomboides	
Mutton snapper	Lutjanus analis	68,69,70,71,77
Schoolmaster	Lutjanus apodus	68,69,70,71,77
Blackfin snapper	Lutjanus buccanella	68,69,70,71,77
Cubera snapper	Lutjanus cyanopterus	68,69,70,71,77
Gray snapper	Lutjanus griseus	68,69,70,71,77
Dog snapper	Lutjanus jocu	68,69,70,71,77
Mahogany snapper	Lutianus mahogoni	68,69,70,71,77
Lane snapper	Lutianus synagris	68,69,70,71,77
Rosy blenny	Malacoctenus macrops	68,69,70,71,77
Saddled blenny	Malacoctenus triangulatus	
Tarpon	Megalops atlanticus	68,69,70,71,77
Seminole goby	Microgobius carri	
Banner goby	Microgobius microlepis	
Fringed filefish	Monacanthus ciliatus	
Black mullet	Mugil cephalus	68.69.70.71.77
Black grouper	Mycteroperca bonaci	68,69,70.71.77
Gag	<i>Mycteroperca microlenis</i>	68,69.70.71.77
Scamp	<i>Mycteroperca phenax</i>	68.69.70.71 77
Yellowfin grouper	Mycteroperca venenosa	
* Non-native Species	,	

+ Cultivated

## Animals

Common Name	Scientific Name	Primary Habitat Codes (for all species)
Orangespotted goby	Nes longus	
Yellowtail snapper	Ocvurus chrysurus	68 69 70 71 77
Reef croaker	Odontoscion dentex	68 69 70 71 77
Leatheriacket	Oligonlites saurus	00,09,70,71,77
Redlin blenny	Ophioblennius atlanticus	68 69 70 71 77
Yellowhead jawfish	Opistognathus aurifrons	
Mottled jawfish	Opistognathus maxillosus	
Dusky jawfish	Opistognathus whitehursti	
Gulf toadfish	Opsanus heta	
Seaweed blenny	Parablennius marmoreus	
Grav angelfish	Pomacanthus arcuatus	68 69 70 71 77
French angelfish	Pomacanthus paru	68 69 70 71 77
Longfin damselfish	Pomacentrus dienceaus	
Dusky damselfish	Pomacentrus fuscus	68.69.70.71.77
Beaugregory	Pomacentrus leucostictus	68.69.70.71.77
Bicolor damselfish	Pomacentrus partitus	68.69.70.71.77
Three spot damselfish	Pomacentrus planifrons	68 69 70 71 77
Cocoa damselfish	Pomacentrus variabilis	68 69 70 71 77
Spotted goatfish	Pseudupeneus maculatus	68 69 70 71 77
Spanish sardine	Sardinella aurita	
Midnight parrotfish	Scarus coelestinus	68.69.70.71.77
Blue parrotfish	Scarus coeruleus	68.69.70.71.77
Striped parrotfish	Scarus croicensis	68.69.70.71.77
Rainbow parrotfish	Scarus guacamaia	68.69.70.71.77
Princess parrotfish	Scarus taeniopterus	68.69.70.71.77
Oueen parrotfish	Scarus vetula	68.69.70.71.77
Molly miller	Scartella cristata	
Cero mackerel	Scomberomorus regalis	
Spotted scorpionfish	Scorpaena plumieri	
Lantern bass	Serranus baldwini	
Tobaccofish	Serranus tabacarius	
Harlequin bass	Serranus tigrinus	
Greenblotch parrotfish	Sparisoma atomarium	68.69.70.71.77
Redband parrotfish	Sparisoma aurofrenatum	68,69,70,71,77
Redtail parrotfish	Sparisoma chrvsopterum	68,69,70,71,77
Bucktooth parrotfish	Sparisoma radians	68,69,70,71,77
Yellowtail parrotfish	Sparisoma rubripinne	68.69.70.71.77
Stoplight parrotfish	Sparisoma viride	68,69,70,71,77
Bandtail puffer	Sphoeroides spengleri	68,69,70,71,77
Great barracuda	Sphyraena barracuda	68,69,70,71,77
Hammerhead shark	Sphyrna lewini	68,69,70,71,77
Bonnethead shark	Sphyrna tiburo	68,69,70,71,77
Redfin needlefish	Strongylura notata	
Sand diver * Non-native Species	Synodus intermedius	68,69,70,71,77

+ Cultivated

## Animals

		Primary Habitat Codes
Common Name	Scientific Name	(for all species)
Bluehead	Thalassoma bifasciatum	68 69 70 71 77
Permit	Trachinotus falcatus	68 69 70 71 77
Houndfish	Tylosurus crocodilus	68 69 70 71 77
Vellow stingray	Urolophus jamaicensis	68 69 70 71 77
Tenow sungray	BIDDE	00,09,70,71,77
	BIRDS	
Loons	<b>7</b>	
Common loon	Gavia immer	Migratory
Pelicans		
Brown pelican	Pelecanus occidentalis	68,69,71,76,77
Cormorants		
Double-crested cormorant	Phalacrocorax auritus	68,69,71,76,77
Frigatebirds		
Magnificent frigatebird	Fregata magnificens	Migratory
Herons		
Great blue heron	Ardea herodias	71,76,77
Great white heron	Ardea herodias occidentalis	71,76,77
Wurdemann's heron	Ardea wurdemanni	71,76,77
Cattle egret	Bubulcus ibis	71,76,77
Green heron	Butorides virescens virescens	71,76,77
Great egret	Casmerodius albus	71,76,77
Little blue heron	Egretta caerulea	71,76,77
Reddish egret	Egretta rufescens	71,76,77
Snowy egret	Egretta thula	71,76,77
Tricolor heron	Egretta tricolor	71.76.77
Yellow-crowned night heron	Nvcticorax violaceus	71.76.77
Ibis and Spoonbills	ý	· · · · · ·
Roseate spoonbill	Aiaia aiaia	71 76 77
White ibis	Eudocimus albus	71 76 77
Woodstork	Mucteria americana	Migratory
Ducks	niyeter ta anter teana	inigiatory
Redbreasted merganser	Mergus servator	Migratory
Vultures		inigiatory
Turkey vulture	Cathartes aura	Migratory
Hawks and Eagles	Catharies and	migratory
Sharn-shinned hawk	Acciniter strictus	Migratory 12
Red_tailed hawk	Rutao jamaicansis	Migratory 12
Pod shouldared hawk	Buteo lineatus	Migratory 12
Broad-winged hawk	Buteo platintaria platintaria	Migratory 12
Marsh hawk	Circus eveneus hudsonius	Migratory 12 76
Iviai Sii Hawk Dold ooglo	Uncus cyuneus nuusonnus Haliaootua loucocombaluz	Migratory 12.76
Datu eagle	nutueetus teucocephatus	wingratory,12,70
Ospreys	Dury line hali	A 11
Osprey	Panaion haliaetus	All
* Non-native Species		

# Animals

		Primary Habitat Codes
Common Name	Scientific Name	(for all species)
Feleens		
Faicons Deregrine felcen	Ealao navagrinus	Migrotory
Southoostern American kestral	Falco peregrinus	Migratory
Deile Cellinules and Coats	Faico sparverius paulus	wingratory
A mariaan agat	Euliag amoniogna	Migrotomy
Clamon mil	Fullca americana Dallas longingstris	Migratory
	Ratius tongirostris	wingratory
Plovers		77.01
Ruddy turnstone	Arenaria interpres	//,81
Piping plover	Charadrius melodus	//,81
Semi-palmated plover	Charadrius semipalmatus	77,81
Killdeer	Charadrius vociferus	77,81
Sandpipers		
Spotted sandpiper	Actitis macularia	77,81
Sanderling	Calidris alba	77,81
Western sandpiper	Calidris mauri	77,81
Least sandpiper	Calidris minutilla	77,81
Semi-palmated sandpiper	Calidris pusilla	77,81
Willet	Catoptrophorus semipalmatus	77,81
Short-billed dowitcher	Limnodromus griseus	77,81
Solitary sandpiper	Tringa solitaria	77,81
Avocets and Stilts	C .	
Black-necked stilt	Himantopus mexicanus	77,81
Avocet	Recurvirostra americana	77,81
Gulls and Terns		
Herring gull	Larus argentatus	68,69,70,71,77,81
Laughing gull	Larus atricilla	68,69,70,71,77,81
Ring-billed gull	Larus delawarensis	68,69,70,71,77,81
Black skimmer	Rynchops niger	68.69.70.71.77
Least tern	Sterna antillarum	68 69 70 71 77
Caspian tern	Sterna caspia	68 69 70 71 77
Roseate tern	Sterna dougallii	
Sooty tern	Sterna fuscata	68 69 70 71 77
Common tern	Sterna hirundo	68 69 70 71 77
Roval tern	Sterna maxima	68 69 70 71 77
Sandwich tern	Sterna sandvicensis	68 69 70 71 77
Pigeons and Doves	Sterna sanavicensis	00,07,70,71,77
Ring necked dove*	Strantonalia sn	12 81 82
White growned pigeon	Columbia loucoconhala	12,01,02
Ground dovo	Columbia reasoning	12,70
Maximin a davia	Columbina passerina	12,01
	Zenaiua mucroura	12,81
	C	10.76
Mangrove cuckoo	Coccyzus minor	12,76
Uwis	<i>T</i> , 11	10
Barn OWI	Tyto alba	12

+ Cultivated

## Animals

		Primary Habitat Codes
Common Name	Scientific Name	(for all species)
Goatsuckers		2.10
Chuck-will's widow	Caprimulgus carolinensis	3,12
Common night hawk	Chordeiles minor	3,12
Kingfishers		74
Belted kingfisher	Ceryle alcyon	/6
Woodpeckers		10
Red-bellied woodpecker	Melanerpes carolinus	12
Yellow-bellied sapsucker	Sphyrapicus varius	12
Flicker	Colapes auratus	Migratory
Flycatchers	_	
Gray kingbird	Tyrannus dominicensis	3,12,76,81
Eastern kingbird	Tyrannus tyrannus	3,12,76,81
Swallows		
Barn swallow	Hirundo rustica	Migratory
Crows and Jays		
Blue Jay	Cyanocitta cristata	12,81,Migratory
Thrashers		
Gray catbird	Dumetella carolinensis	3,12,81
Mockingbird	Mimus polyglottos	3,12,81
Brown thrasher	Toxostoma rufum	3,12,81
Vireos		
Black-whiskered vireo	Vireo altiloquus	12
White-eyed vireo	Vireo griseus	12
Wood Warblers		
Black-throated blue warbler	Dendroica caerulescens	3,4,12,76
Yellow-rumped warbler	Dendroica coronata	3,4,12,76
Prairie warbler	Dendroica discolor	3,4,12,76
Yellow-throated warbler	Dendroica dominica	3,4,12,76
Kirtland's warbler	Dendroica kirtlandii	3,4,12,76
Palm warbler	Dendroica palmarum	3,4,12,76
Worm-eating warbler	Helmitheros vermivorous	3,4,12,76
Black and white warbler	Mniotilta varia	3,4,12,76
Northern parula	Parula americana	3,4,12,76
American redstart	Setophaga ruticilla	3,4,12,76
Gnatcatchers	1 0	
Blue-gray gnatcatcher	Polioptila caerulea	3,4,12,76
Blackbirds	-	
Red-winged blackbird	Agelaius phoeniceus	12,81
Common grackle (Purple G.)	Quiscalus quiscula	12,81
Weaver Finches	~ 1	
House sparrow	Passer domesticus	12,81
Buntings		,
American goldfinch	Carduelis tristis	3.4.12
Indigo bunting	Passerina cyanea	3,4,1
* Non-native Species	-	

+ Cultivated

Animals

**Common Name** 

Scientific Name

Primary Habitat Codes (for all species)

\* Non-native Species

#### <u>Terrestrial</u>

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

#### **Palustrine**

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

#### **Lacustrine**

- **43** Clastic Upland Lake
- 44 Coastal Dune Lake
- 45 Coastal Rockland Lake

#### **Lacustrine**

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

#### **Riverine**

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

#### **Estuarine**

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

#### <u>Marine</u>

- 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 Terrestral Cave

#### **Miscellaneous**

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

Addendum 5—Designated Species List

# **Designated Species**

#### Plants

Common Name/	<b>Designated Species Status</b>		
Scientific Name	FDA	USFWS	FNAI
	ΙT		
Golden leather tern	LI		05.02
Acrostichum aureum			63,83
Locustberry	τŢ		$C^{2}$ $C^{2}$
Byrsonima lucida	LI		63,83
	ΙP		CACES2
Canella winterana	LE		6465,82
Rnacoma	τŢ		CE 92
Crossopetaium rhacoma	LI		65,53
Milkbark	ΙP		$C^{2}C^{4}S^{2}$
Drypetes alversijolia	LE		0304,82
Dollar orchid	ΙP		
Encyclia boothiana var. erythronioides	LE		G414,S1
Wild cotton	ΙP		CACES2
Gossypium hirsutum	LE		6465,83
Lignum vitae	τr		C 4 C 5 C 2
Gualacum sanctum	LE		6465,82
Prickly apple cactus	ΙP		C20 52
Harrisia simpsonii	LE		G2Q,82
white ironwood	ΙP		C2C5 81
Elevide V and india	LE		0303, 51
Fiorida Keys indigo	IE		C 59T1 C1
Inalgofera mucronata var. keyensis	LE		65/11,51
Skyblue morning glory (clustervine)	τr		
Jaquemontia pentantnos	LE		65,52
	τŢ		C 4 S 2
Jacquinia keyensis	LI		64,83
Wild dilly	τŢ		C 4 0 S 2
Maniikara jaimiqui subsp. emarginata	LI		G4Q,83
Passionilower, whitish	ΙP		C A C 1
Passifiora multifiora	LE		64,51
Banamian treecactus	ΙP		C2 C1
Pliosocereus banamensis	LE		63,51
Swartz's shoutbean	ΙP		C2 C1
Knynchosla swartzii	LE		62,51
Maldenbush Crucia Latranaia	ΙP		C 4 S 2
Savia banamensis	LE		64,52
Florida boxwood (yellowood)	ΙP		CE 93
Schuejjeria jrulescens	LE		03,52
Solamum bahamanaa			CSTU OU
Wast Indian mahagany			031H,5H
west mutan manogany	ΙT		$C^{2}C^{4}C^{2}$
Swietenia managoni	LI		0304,82

# **Designated Species**

#### Plants

Common Name/	<b>Designated Species Status</b>		
Scientific Name	FDA	USFWS	FNAI
Key thatch			
Thrinax morrisii	LE		G4G5,S3
Florida thatch palm			
Thrinax radiata	LE		G4G5,S2
Twisted air plant			
Tillandsia flexousa	LT		G4,S3
West Indian trema			
Trema lamarckianum	LE		G5,S2
Pearl-berry			
Vallesia antillana	LE		G4,S1

# **Designated Species**

#### Animals

Common Name/	<b>Designated Species Status</b>			
Scientific Name	FFWCC	USFWS	FNAI	
	FISH			
Mangrove gambusia				
Gambusia rhixophorae			G3,S3	
	REPTILES			
Atlantic loggerhead turtle				
Caretta caretta caretta	LT	LT	G3, S3	
Atlantic green turtle	IF	ΙE	$C_{2}$ $C_{2}$	
Chelonia myaas myaas	LE	LE	63, 82	
Dermochelug conigoog	LE	ΙE	$C^{2}$ S2	
American crocodile	LE	$\Gamma \Sigma$	05, 52	
Crocodylus acutus	IF	IF	G2 S1	
Hawkshill sea turtle	LL		02,51	
Eretmochelys imbricata	LE	LE	G3 S1	
Kemp's ridley turtle			05,51	
Lepidochelvs kempi	LE	LE	G1.S1	
	BIBUS		,	
	<b>DIRDS</b>			
Roseate Spoonbill				
Ajaia Ajaja	LS		G5, S2 S3	
Great Egret			~ - ~ .	
Ardea alba			G5,S4	
Little Blue Heron			~ ~ ~ .	
Egretta caerulea	LS		G5,S4	
Reddish Egret	I C			
Egretta rufescens	LS		G4, S2	
Snowy Egret	I C			
Egretta thula	LS		65, 54	
Expertent tricolor	IS		C5 S4	
Egrella Iricolor White Ibis	LS		05,54	
Fudocimus albus	IS		G5 \$4	
Merlin	LS		05,54	
Falco columbarius			G4 SU	
American Ovstercatcher			04,50	
Haematorus palliatus	LS		G5 S3	
Wood Stork			35,55	
Mvcteria americana	LE	LE	G4. S2	
Osprey			, ~_	
Pandion haliaetus	LS		G5,S3, S4	

# **Designated Species**

#### Animals

Common Name/	<b>Designated Species Status</b>			
Scientific Name	FFWCC	USFWS	FNAI	
Proven Policon				
Pelecanus occidentalis	IS		G4 \$3	
Black Skimmer	LO		04,55	
Rynchops niger	LS		G5 S3	
American Redstart	20		30,20	
Setophaga ruticilla			G5,S3	
Least Tern				
Sterna antillarum	LT		G4, S3	
Royal Tern				
Sterna maxima			G5,S3	
	MAMMALS			
West Indian manatee				
Trichechus manatus latirostris	LE	LE	G2,S2	
IN	VERTEBRATES		,	
Staghorn coral				
Acronora cervicornis			G3 S?	
Staghorn coral			05,5.	
Acropora prolifera			G3,S?	
Leaf coral (lettuce coral)			,	
Agaricia agaricites			G4,S?	
Large grooved brain coral				
Colpophyllia natans			G3G4,S?	
Knobbed brain coral				
Diploria clivosa			G4G5,S?	
Brain coral			C 4 C 9	
Diploria labyrinthiformis			G4,S?	
Diploria strigosa			G4 \$2	
Flower coral			04,51	
Eusmilia fastigiata			G3G4 S?	
Butterprint brain coral				
Meandrina meandrites			G4,S?	
Common star coral				
Montastrea annularis			G5,S?	
Large star coral				
Montastrea cavernosa			G5,S?	
Large flower coral				
Mussa angulosa			G3,G4,S?	
Starlet coral			CASO	
Siaerastrea siaerea			04,8?	

**Designated Species** 

Animals

Common Name/ Scientific Name <u>Designated Species Status</u> FFWCC USFWS FNAI

### DECAPODA

Mangrove tree crab Aratus pisonii

G5,S2S3

#### 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 <u>element</u> 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 <u>element occurrence</u> (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

<ul> <li>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.</li> <li>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.</li> <li>G4 = apparently secure globally (may be rare in parts of range)</li> <li>G5 = demonstrably secure globally (may be rare in parts of range)</li> <li>G6 = demonstrably secure globally (may be rare in parts of range)</li> <li>G6 = demonstrably secure globally (may be rare in parts of range)</li> <li>G8 = demonstrably secure globally</li> <li>G4 = of historical occurrence throughout its range, may be rediscovered (e.g., ivory-billed woodpecker)</li> <li>GX = believed to be extinct throughout range</li> <li>GX = tentative rank (e.g., G27)</li> <li>G#G# = range of rank; insufficient data to assign specific global rank (e.g., G2G3)</li> <li>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)</li> <li>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)</li> <li>G#T#Q = same as above, but validity as subspecies or variety is questioned.</li> <li>GU = due to lack of information, no rank or range can be assigned (e.g., GUT2).</li> <li>G7 = not yet ranked (temporary)</li> <li>S1 = Critically imperiled in Florida because of extreme rarity (5 or fewer occurrences or less than 1000 individuals) or because of rulnerability to extinction due to some natural or man-made factor.</li> <li>S2 = Imperiled in Florida because of rarity (6 to 20 occurrences or less than 10,000 individuals) or found loca</li></ul>	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
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	S?	=	not yet ranked (temporary)
# Rank Explanations For FNAI Global Rank, FNAI State Rank, Federal Status, And State Status

LEGAL STATUS							
Ν	=	Not currently listed, nor currently being considered for listing, by state or federal agencies.					
FEDERAL	(Li	isted 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.					
С	=	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) T(S/A)	= =	Endangered due to similarity of appearance. Threatened due to similarity of appearance.					
<u>STATE</u>							
<u>Animals</u>		(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.					
<u>Plants</u>		(Listed by the Florida Department of Agriculture and Consumer Services - FDACS)					
LE	=	Listed as Endangered Plants in the Preservation of Native Flora of Florida Act. Defined as species of plants native to the state that are in imminent danger of extinction within the state, the survival of which is unlikely if the causes of a decline in the number of plants continue, and includes all species determined to be endangered or threatened pursuant to the Federal Endangered Species Act of 1973.as amended.					
LT	=	Listed as Threatened Plants in the Preservation of Native Flora of Florida Act. Defined as species native to the state that are in rapid decline in the number of plants within the state, but which have not so decreased in such number as to cause them to be endangered.					

Addendum 6—Priority Schedule And Cost Estimates

### **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.

### **Resource Management**

- 1. Remove fill from selected former wetland areas to restore the original topography of the area. 10 15 years. Estimated Cost: \$1,000,000.
- 2. Restore natural communities through exotic removal and replanting of appropriate native species. 2 10 years. Estimated Cost: \$200,000.
- **3.** Remove illegally dumped trash and implement measures that will discourage future dumping. 0 2 year. **Estimated Cost: \$75,000**.
- 4. Protect designated plants and animals and sensitive natural communities by working cooperatively with park patrol and other local law enforcement agencies to maintain sufficient levels of staff patrol. 0 10 years. Estimated Cost: \$ 5,000.
- 5. Monitor and inventory plant and animal species and designate areas of critical habitat for listed species. 2 10 years. Estimated Cost: \$ 25,000.
- 6. Conduct a comprehensive cultural resource survey of newly acquired sites. 0 2 years. Estimated Cost: \$ 10,000.
- 7. Replacement/Maintenance of regulatory buoy system. Estimated Cost: \$25,000 annually.

Total Estimated Cost: \$1,315,000 plus \$25,000 per year in recurring costs.

# John Pennekamp Coral Reef State Park

# **Capital Improvements**

Item	Quantity	y Unit	Unit Price	Multiplier	· Amount
Campground					
Convert Restroom to Picnic Sh	elter 1.000	ea.	\$60,000.00	1.50	\$90,000.00
Field Research Support Facil	ity				
Campsite Restroom	1.000	ea.	\$200,000.00	1.50	\$300,000.00
Classroom / Dining Shelter	1.000	ea.	\$75,000.00	1.50	\$112,500.00
Primitive Cabins	10.000	ea.	\$40,000.00	1.50	\$600,000.00
Small Laboratory Facility	1.000	ea.	\$60,000.00	1.50	\$90,000.00
Stabilized Parking (10 Car)	1.000	per 10	\$2,500.00	1.50	\$3,750.00
Primitive Camps					
Composting (Clivus) Restroom	3.000	ea.	\$20,000,00	1.50	\$90.000.00
Stabilized Tent Sites	6.000	ea.	\$500.00	1.50	\$4,500.00
Shaw Tract					
Interpretive Display / Kiosk	1.000	ea.	\$20,000.00	1.50	\$30,000.00
Medium Picnic Shelter	1.000	ea.	\$36,000.00	1.50	\$54,000.00
Nature Trail	1320.000	LF	\$2.00	1.50	\$3,960.00
Support Facilities					
Engineering Study	1.000	ea.	\$30,000.00	1.50	\$45,000.00
Visitor Center					
Expand Visitor Center	1.000	SF	\$412,000.00	1.50	\$618,000.00
			Sub-To	tal	\$2,041,710.00
20 Percent Design, Permitting & Contingency Fee \$408,34					
			To	tal	\$2,450,052.00

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. All items fall in the new facility construction category © of the uniform cost accounting system required by ch. 259.037 F.S.

# ADDITIONAL INFORMATION

**FNAI Descriptions** 

DHR Cultural Management Statement

2000 Land Management Review Report

This summary presents the hierarchical classification and brief descriptions of 82 Natural Communities developed by Florida Natural Areas Inventory and identified as collectively constituting the original, natural biological associations of Florida.

A Natural Community is defined as a distinct and recurring assemblage of populations of plants, animals, fungi and microorganisms naturally associated with each other and their physical environment. For more complete descriptions, see Guide to the Natural Communities of Florida, available from Florida Department of Natural Resources.

The levels of the hierarchy are:

Natural Community Category - defined by hydrology and vegetation.

Natural Community Groups - defined by landform, substrate, and vegetation.

**Natural Community Type** - defined by landform and substrate; soil moisture condition; climate; fire; and characteristic vegetation.

TERRESTRIAL COMMUNITIES

XERIC UPLANDS COASTAL UPLANDS MESIC UPLANDS ROCKLANDS MESIC FLATLANDS

PALUSTRINE COMMUNITIES

WET FLATLANDS SEEPAGE WETLANDS FLOODPLAIN WETLANDS BASIN WETLANDS LACUSTRINE COMMUNITIES

RIVERINE COMMUNITIES

SUBTERRANEAN COMMUNITIES

MARINE/ESTUARINE COMMUNITIES

Definitions of Terms Used in Natural Community Descriptions

**TERRESTRIAL** - Upland habitats dominated by plants which are not adapted to anaerobic soil conditions imposed by saturation or inundation for more than 10% of the growing season.

**XERIC UPLANDS** - very dry, deep, well-drained hills of sand with xeric-adapted vegetation.

**Sandhill** - upland with deep sand substrate; xeric; temperate; frequent fire (2-5 years); longleaf pine and/or turkey oak with wiregrass understory.

**Scrub** - old dune with deep fine sand substrate; xeric; temperate or subtropical; occasional or rare fire (20 - 80 years); sand pine and/or scrub oaks and/or rosemary and lichens.

**Xeric Hammock** - upland with deep sand substrate; xeric-mesic; temperate or subtropical; rare or no fire; live oak and/or sand live oak and/or laurel oak and/or other oaks, sparkleberry, saw palmetto.

**COASTAL UPLANDS** - substrate and vegetation influenced primarily by such coastal (maritime) processes as erosion, deposition, salt spray, and storms.

**Beach Dune** - active coastal dune with sand substrate; xeric; temperate or subtropical; occasional or rare fire; sea oats and/or mixed salt-spray tolerant grasses and herbs.

**Coastal Berm** - old bar or storm debris with sand/shell substrate; xeric-mesic; subtropical or temperate; rare or no fire; buttonwood, mangroves, and/or mixed halophytic herbs and/or shrubs and trees.

**Coastal Grassland** - coastal flatland with sand substrate; xeric-mesic; subtropical or temperate; occasional fire; grasses, herbs, and shrubs with or without slash pine and/or cabbage palm.

**Coastal Rock Barren** - flatland with exposed limestone substrate; xeric; subtropical; no fire; algae, mixed halophytic herbs and grasses, and/or cacti and stunted shrubs and trees.

**Coastal Strand** - stabilized coastal dune with sand substrate; xeric; subtropical or temperate; occasional or rare fire; dense saw palmetto and/or seagrape and/or mixed stunted shrubs, yucca, and cacti.

**Maritime Hammock** - stabilized coastal dune with sand substrate; xeric-mesic; subtropical or temperate; rare or no fire; mixed hardwoods and/or live oak.

**Shell Mound** - Indian midden with shell substrate; xeric-mesic; subtropical or temperate; rare or no fire; mixed hardwoods.

**MESIC UPLANDS** - dry to moist hills of sand with varying amounts of clay, silt or organic material; diverse mixture of broadleaved and needleleaved temperate woody species.

**Bluff** - steep slope with rock, sand, and/or clay substrate; hydric-xeric; temperate; sparse grasses, herbs and shrubs.

**Slope Forest** - steep slope on bluff or in sheltered ravine; sand/clay substrate; mesic-hydric; temperate; rare or no fire; magnolia, beech, spruce pine, Shumard oak, Florida maple, mixed hardwoods.

**Upland Glade** - upland with calcareous rock and/or clay substrate; hydric-xeric; temperate; sparse mixed grasses and herbs with occasional stunted trees and shrubs, e.g., eastern red cedar.

**Upland Hardwood Forest** - upland with sand/clay and/or calcareous substrate; mesic; temperate; rare or no fire; spruce pine, magnolia, beech, pignut hickory, white oak, and mixed hardwoods.

**Upland Mixed Forest** - upland with sand/clay substrate; mesic; temperate; rare or no fire; loblolly pine and/or shortleaf pine and/or laurel oak and/or magnolia and spruce pine and/or mixed hardwoods.

**Upland Pine Forest** - upland with sand/clay substrate; mesic-xeric; temperate; frequent or occasional fire; longleaf pine and/or loblolly pine and/or shortleaf pine, southern red oak, wiregrass.

**ROCKLANDS** - low, generally flat limestone outcrops with tropical vegetation; or limestone exposed through karst activities with tropical or temperate vegetation.

**Pine Rockland** - flatland with exposed limestone substrate; mesic-xeric; subtropical; frequent fire; south Florida slash pine, palms and/or hardwoods, and mixed grasses and herbs.

**Rockland Hammock** - flatland with limestone substrate; mesic; subtropical; rare or no fire; mixed tropical hardwoods, often with live oak.

**Sinkhole** - karst feature with steep limestone walls; mesic-hydric; subtropical or temperate; no fire; ferns, herbs, shrubs, and hardwoods.

**MESIC FLATLANDS** - flat, moderately well-drained sandy substrates with admixture of organic material, often with a hard pan.

**Dry Prairie** - flatland with sand substrate; mesic-xeric; subtropical or temperate; annual or frequent fire; wiregrass, saw palmetto, and mixed grasses and herbs.

Mesic Flatwoods - flatland with sand substrate; mesic; subtropical or temperate; frequent fire; slash

pine and/or longleaf pine with saw palmetto, gallberry and/or wiregrass or cutthroat grass understory.

**Prairie Hammock** - flatland with sand/organic soil over marl or limestone substrate; mesic; subtropical; occasional or rare fire; live oak and/or cabbage palm.

**Scrubby Flatwoods** - flatland with sand substrate; xeric-mesic; subtropical or temperate; occasional fire; longleaf pine or slash pine with scrub oaks and wiregrass understory.

**PALUSTRINE** - Wetlands dominated by plants adapted to anaerobic substrate conditions imposed by substrate saturation or inundation during 10% or more of the growing season. Includes non-tidal wetlands; tidal wetlands with ocean derived salinities less than 0.5 ppt and dominance by salt-intolerant species; small (less than 8 ha), shallow (less than 2 m deep at low water) water bodies without wave-formed or bedrock shoreline; and inland brackish or saline wetlands.

WET FLATLANDS - flat, poorly drained sand, marl or limestone substrates.

**Hydric Hammock** - lowland with sand/clay/organic soil, often over limestone; mesic-hydric; subtropical or temperate; rare or no fire; water oak, cabbage palm, red cedar, red maple, bays, hackberry, hornbeam, blackgum, needle palm, and mixed hardwoods.

**Marl Prairie** - flatland with marl over limestone substrate; seasonally inundated; tropical; frequent to no fire; sawgrass, spikerush, and/or mixed grasses, sometimes with dwarf cypress.

**Wet Flatwoods** - flatland with sand substrate; seasonally inundated; subtropical or temperate; frequent fire; vegetation characterized by slash pine or pond pine and/or cabbage palm with mixed grasses and herbs.

**Wet Prairie** - flatland with sand substrate; seasonally inundated; subtropical or temperate; annual or frequent fire; maidencane, beakrush, spikerush, wiregrass, pitcher plants, St. John's wort, mixed herbs.

**SEEPAGE WETLANDS** - sloped or flat sands or peat with high moisture levels maintained by downslope seepage; wetland and mesic woody and/or herbaceous vegetation.

**Baygall** - wetland with peat substrate at base of slope; maintained by downslope seepage, usually saturated and occasionally inundated; subtropical or temperate; rare or no fire; bays and/or dahoon holly and/or red maple and/or mixed hardwoods.

**Seepage Slope** - wetland on or at base of slope with organic/sand substrate; maintained by downslope seepage, usually saturated but rarely inundated; subtropical or temperate; frequent or occasional fire; sphagnum moss, mixed grasses and herbs or mixed hydrophytic shrubs.

**FLOODPLAIN WETLANDS** - flat, alluvial sand or peat substrates associated with flowing water courses and subjected to flooding but not permanent inundation; wetland or mesic woody and herbaceous vegetation.

**Bottomland Forest** - flatland with sand/clay/organic substrate; occasionally inundated; temperate; rare or no fire; water oak, red maple, beech, magnolia, tuliptree, sweetgum, bays, cabbage palm, and mixed hardwoods.

**Floodplain Forest** - floodplain with alluvial substrate of sand, silt, clay or organic soil; seasonally inundated; temperate; rare or no fire; diamondleaf oak, overcup oak, water oak, swamp chestnut oak, blue palmetto, cane, and mixed hardwoods.

**Floodplain Marsh** - floodplain with organic/sand/alluvial substrate; seasonally inundated; subtropical; frequent or occasional fire; maidencane, pickerelweed, sagittaria spp., buttonbush, and mixed emergents.

**Floodplain Swamp** - floodplain with organic/alluvial substrate; usually inundated; subtropical or temperate; rare or no fire; vegetation characterized by cypress, tupelo, black gum, and/or pop ash.

**Freshwater Tidal Swamp** - river mouth wetland, organic soil with extensive root mat; inundated with freshwater in response to tidal cycles; rare or no fire; cypress, bays, cabbage palm, gums and/or cedars.

**Slough** - broad, shallow channel with peat over mineral substrate; seasonally inundated, flowing water; subtropical; occasional or rare fire; pop ash and/or pond apple or water lily.

**Strand Swamp** - broad, shallow channel with peat over mineral substrate; seasonally inundated, flowing water; subtropical; occasional or rare fire; cypress and/or willow.

**Swale** - broad, shallow channel with sand/peat substrate; seasonally inundated, flowing water; subtropical or temperate; frequent or occasional fire; sawgrass, maidencane, pickerelweed, and/or mixed emergents.

**BASIN WETLANDS** - shallow, closed basin with outlet usually only in time of high water; peat or sand substrate, usually inundated; wetland woody and/or herbaceous vegetation.

**Basin Marsh** - large basin with peat substrate; seasonally inundated; temperate or subtropical; frequent fire; sawgrass and/or cattail and/or buttonbush and/or mixed emergents.

**Basin Swamp** - large basin with peat substrate; seasonally inundated, still water; subtropical or temperate; occasional or rare fire; vegetation characterized by cypress, blackgum, bays and/or mixed hardwoods.

**Bog** - wetland on deep peat substrate; moisture held by sphagnum mosses, soil usually saturated, occasionally inundated; subtropical or temperate; rare fire; sphagnum moss and titi and/or bays and/or dahoon holly, and/or mixed hydrophytic shrubs.

**Coastal Interdunal Swale** - long narrow depression wetlands in sand/peat-sand substrate; seasonally inundated, fresh to brackish, still water; temperate; rare fire; graminoids and mixed wetland forbs.

**Depression Marsh** - small rounded depression in sand substrate with peat accumulating toward center; seasonally inundated, still water; subtropical or temperate; frequent or occasional fire; maidencane, fire flag, pickerelweed, and mixed emergents, may be in concentric bands.

**Dome Swamp** - rounded depression in sand/limestone substrate with peat accumulating toward center; seasonally inundated, still water; subtropical or temperate; occasional or rare fire; cypress, blackgum, or bays, often tallest in center.

**LACUSTRINE** - Non-flowing wetlands of natural depressions lacking persistent emergent vegetation except around the perimeter.

**Clastic Upland Lake** - generally irregular basin in clay uplands; predominantly with inflows, frequently without surface outflow; clay or organic substrate; colored, acidic, soft water with low mineral content (sodium, chloride, sulfate); oligo-mesotrophic to eutrophic.

**Coastal Dune Lake** - basin or lagoon influenced by recent coastal processes; predominantly sand substrate with some organic matter; salinity variable among and within lakes, and subject to saltwater intrusion and storm surges; slightly acidic, hard water with high mineral content (sodium, chloride).

**Coastal Rockland Lake** - shallow basin influence by recent coastal processes; predominantly barren oolitic or Miami limestone substrate; salinity variable among and within lakes, and subject to saltwater intrusion, storm surges and evaporation (because of shallowness); slightly alkaline, hard water with

high mineral content (sodium, chloride).

**Flatwoods/Prairie Lake** - generally shallow basin in flatlands with high water table; frequently with a broad littoral zone; still water or flow-through; sand or peat substrate; variable water chemistry, but characteristically colored to clear, acidic to slightly alkaline, soft to moderately hard water with moderate mineral content (sodium, chloride, sulfate); oligo-mesotrophic to eutrophic.

**Marsh lake** - generally shallow, open water area within wide expanses of freshwater marsh; still water or flow-through; peat, sand or clay substrate; occurs in most physiographic regions; variable water chemistry, but characteristically highly colored, acidic, soft water with moderate mineral content (sodium, chloride, sulfate); oligo-mesotrophic to eutrophic.

**River Floodplain Lake** - meander scar, backwater, or larger flow-through body within major river floodplains; sand, alluvial or organic substrate; colored, alkaline or slightly acidic, hard or moderately hard water with high mineral content (sulfate, sodium, chloride, calcium, magnesium); mesotrophic to eutrophic.

**Sandhill Upland Lake** - generally rounded solution depression in deep sandy uplands or sandy uplands shallowly underlain by limestone; predominantly without surface inflows/outflows; typically sand substrate with organic accumulations toward middle; clear, acidic moderately soft water with varying mineral content; ultra-oligotrophic to mesotrophic.

**Sinkhole Lake** - typically deep, funnel-shaped depression in limestone base; occurs in most physiographic regions; predominantly without surface inflows/outflows, but frequently with connection to the aquifer; clear, alkaline, hard water with high mineral content (calcium, bicarbonate, magnesium).

**Swamp Lake** - generally shallow, open water area within basin swamps; still water or flow-through; peat, sand or clay substrate; occurs in most physiographic regions; variable water chemistry, but characteristically highly colored, acidic, soft water with moderate mineral content (sodium, chloride, sulfate); oligo-mesotrophic to eutrophic.

**RIVERINE** - Natural, flowing waters from their source to the downstream limits of tidal influence and bounded by channel banks.

**Alluvial Stream** - lower perennial or intermittent/seasonal watercourse characterized by turbid water with suspended silt, clay, sand and small gravel; generally with a distinct, sediment-derived (alluvial) floodplain and a sandy, elevated natural levee just inland from the bank.

**Blackwater Stream** - perennial or intermittent/seasonal watercourse characterized by tea-colored water with a high content of particulate and dissolved organic matter derived from drainage through swamps and marshes; generally lacking an alluvial floodplain.

**Seepage Stream** - upper perennial or intermittent/seasonal watercourse characterized by clear to lightly colored water derived from shallow groundwater seepage.

**Spring-run Stream** - perennial watercourse with deep aquifer headwaters and characterized by clear water, circumneutral pH and, frequently, a solid limestone bottom.

**SUBTERRANEAN** - Twilight, middle and deep zones of natural chambers overlain by the earth's crust and characterized by climatic stability and assemblages of trogloxenic, troglophilic, and troglobitic organisms.

**Aquatic Cave** - cavernicolous area permanently or periodically submerged; often characterized by troglobitic crustaceans and salamanders; includes high energy systems which receive large quantities

of organic detritus and low energy systems.

**Terrestrial Cave** - cavernicolous area lacking standing water; often characterized by bats, such as Myotis spp., and other terrestrial vertebrates and invertebrates; includes interstitial areas above standing water such as fissures in the ceiling of caves.

**MARINE/ESTUARINE** (The distinction between the Marine and Estuarine Natural Communities is often subtle, and the natural communities types found under these two community categories have the same descriptions. For these reasons they have been grouped together.) - Subtidal, intertidal and supratidal zones of the sea, landward to the point at which seawater becomes significantly diluted with freshwater inflow from the land.

**Consolidated Substrate** - expansive subtidal, intertidal and supratidal area composed primarily of nonliving compacted or coherent and relatively hard, naturally formed mass of mineral matter (e.g., coquina limerock and relic reefs); octocorals, sponges, stony corals, nondrift macrophytic algae, blue-green mat-forming algae and seagrasses sparse, if present.

**Unconsolidated Substrate** - expansive subtidal, intertidal and supratidal area composed primarily of loose mineral matter (e.g., coralgal, gravel, marl, mud, sand and shell); octocorals, sponges, stony corals, nondrift macrophytic algae, blue-green mat-forming algae and seagrasses sparse, if present.

**Octocoral Bed** - expansive subtidal area occupied primarily by living sessile organisms of the Class Anthozoa, Subclass Octocorallia (e.g., soft corals, horny corals, sea fans, sea whips, and sea pens); sponges, stony corals, nondrift macrophytic algae and seagrasses spares, if present.

**Sponge Bed** - expansive subtidal area occupied primarily by living sessile organisms of the Phylum Porifera (e.g., sheepswool sponge, Florida loggerhead sponge and branching candle sponge); octocorals, stony corals, nondrift macrophytic algae and seagrasses sparse, if present.

**Coral Reef** - expansive subtidal area with elevational gradient or relief and occupied primarily by living sessile organisms of the Class Hydrozoa (e.g., fire corals and hydrocorals) and Class Anthozoa, Subclass Zoantharia (e.g., stony corals and black corals); includes deepwater bank reefs, fringing barrier reefs, outer bank reefs and patch reefs, some of which may contain distinct zones of assorted macrophytes, octocorals, & sponges.

**Mollusk Reef** - substantial subtidal or intertidal area with relief from concentrations of sessile organisms of the Phylum Mollusca, Class Bivalvia (e.g., molluscs, oysters, & worm shells); octocorals, sponges, stony corals, macrophytic algae and seagrasses sparse, if present.

**Worm Reef** - substantial subtidal or intertidal area with relief from concentrations of sessile, tubicolous organisms of the Phylum Annelida, Class Polychaeta (e.g., chaetopterids and sabellarids); octocorals, sponges, stony corals, macrophytic algae and seagrasses sparse, if present.

**Algal Bed** - expansive subtidal, intertidal or supratidal area, occupied primarily by attached thallophytic or mat-forming prokaryotic algae (e.g, halimeda, blue-green algae); octocorals, sponges, stony corals and seagrasses sparse, if present.

**Grass Bed** - expansive subtidal or intertidal area, occupied primarily by rooted vascular macrophytes, (e.g., shoal grass, halophila, widgeon grass, manatee grass and turtle grass); may include various epiphytes and epifauna; octocorals, sponges, stony corals, and attached macrophytic algae sparse, if present.

**Composite Substrate** - expansive subtidal, intertidal, or supratidal area, occupied primarily by Natural Community elements from more than one Natural Community category (e.g., Grass Bed and Algal Bed species; Octocoral and Algal Bed species); includes both patchy and evenly distributed occurrences.

**Tidal Marsh** - expansive intertidal or supratidal area occupied primarily by rooted, emergent vascular macrophytes (e.g., cord grass, needlerush, saw grass, saltwort, saltgrass and glasswort); may include various epiphytes and epifauna.

**Tidal Swamp** - expansive intertidal and supratidal area occupied primarily by woody vascular macrophytes (e.g., black mangrove, buttonwood, red mangrove, and white mangrove); may include various epiphytes and epifauna.

### **DEFINITIONS OF TERMS Terrestrial and Palustrine Natural Communities**

### **Physiography**

Upland - high area in region with significant topographic relief; generally undulating

**Lowland** - low area in region with or without significant topographic relief; generally flat to gently sloping

**Flatland** - generally level area in region without significant topographic relief; flat to gently sloping **Basin** - large, relatively level lowland with slopes confined to the perimeter or isolated interior locations

**Depression** - small depression with sloping sides, deepest in center and progressively shallower towards the perimeter

**Floodplain** - lowland adjacent to a stream; topography influenced by recent fluvial processes **Bottomland** - lowland not on active floodplain; sand/clay/organic substrate

### **Hydrology**

**occasionally inundated** - surface water present only after heavy rains and/or during flood stages **seasonally inundated** - surface water present during wet season and flood periods **usually inundated** - surface water present except during droughts

### **Climatic Affinity of the Flora**

**tropical** - community generally occurs in practically frost-free areas **subtropical** - community generally occurs in areas that experience occasional frost, but where freezing temperatures are not frequent enough to cause true winter dormancy **temperate** - community generally occurs in areas that freeze often enough that vegetation goes into winter dormancy

### <u>Fire</u>

annual fire - burns about every 1-2 years
frequent fire - burns about every 3-7 years
occasional fire - burns about every 8-25 years
rare fire - burns about every 26-100 years
no fire - community develops only when site goes more than 100 years without burning

#### LATIN NAMES OF PLANTS MENTIONED IN NATURAL COMMUNITY DESCRIPTIONS

anise - Illicium floridanum bays: swamp bay -Persea palustris gordonia - Gordonia lasianthus sweetbay - Magnolia virgiana beakrush - Rhynchospora spp. beech - Fagus grandifolia blackgum - Nyssa biflora blue palmetto - Sabal minor bluestem - Andropogon spp. buttonbush - Cephalanthus occidentalis cabbage palm - Sabal palmetto cacti - Opuntia and Harrisia spp., predominantly stricta and pentagonus cane - Arundinaria gigantea or A. tecta cattail - Typha spp. cedars: red cedar - Juniperus silicicola white cedar - Chamaecyparis thyoides or C. henryi cladonia - Cladonia spp. cypress - Taxodium distichum dahoon holly - Ilex cassine diamondleaf oak - Quercus laurifolia fire flag - Thalia geniculata Florida maple - Acer barbatum gallberry - Ilex glabra qums: tupelo - Nyssa aquatica blackgum - Nyssa biflora Ogeechee gum - Nyssa ogeche hackberry - Celtis laevigata hornbeam - Carpinus caroliniana laurel oak - Quercus hemisphaerica live oak - Ouercus virginiana loblolly pine - Pinus taeda longleaf pine - Pinus palustris magnolia - Magnolia grandiflora maidencane - Panicum hemitomon

needle palm - Rhapidophyllum hystrix

overcup oak - Quercus lyrata pickerel weed - Pontederia cordata or P. lanceolata pignut hickory - Carya glabra pop ash - Fraxinus caroliniana pond apple - Annona glabra pond pine - Pinus serotina pyramid magnolia - Magnolia pyramidata railroad vine - Ipomoea pes-caprae red cedar - Juniperus silicicola red maple - Acer rubrum red oak - Quercus falcata rosemary - Ceratiola ericoides sagittaria - Sagittaria lancifolia sand pine - Pinus clausa saw palmetto - Serenoa repens sawgrass - Cladium jamaicensis scrub oaks - Quercus geminata, Q. chapmanii, Q. mvrtifolia,O, inopina sea oats - Uniola paniculata seagrape - Coccoloba uvifera shortleaf pine - Pinus echinata Shumard oak - Quercus shumardii slash pine - Pinus elliottii sphagnum moss - Sphagnum spp. spikerush - *Eleocharis* spp. spruce pine - Pinus glabra St. John's wort - Hypericum spp. swamp chestnut oak - Quercus prinus sweetgum - Liquidambar styraciflua titi - Cvrilla racemiflora, and Cliftonia monophylla tuliptree - Liriodendron tulipfera tupelo - Nyssa aquatica turkey oak - Quercus laevis water oak - Quercus nigra waterlily - Nymphaea odorata white cedar - Chamaecyparis thyoides white oak - Quercus alba willow - Salix caroliniana yucca - Yucca aloifolia

### A. <u>GENERAL DISCUSSION</u>

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

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

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

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

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

### B. STATUTORY AUTHORITY

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

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

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

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

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

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

- 1. Each state agency of the executive branch having direct or indirect jurisdiction over a proposed state or state-assisted undertaking shall, in accordance with state policy and prior to the approval of expenditure of any state funds on the undertaking, consider the effect of the undertaking on any historic property that is included in, or eligible for inclusion in, the <u>National Register of</u> <u>Historic Places</u>. Each such agency shall afford the division a reasonable opportunity to comment with regard to such an undertaking.
- 2. Each state agency of the executive branch shall initiate measures in consultation with the division to assure that where, as a result of state action or assistance carried out by such agency, a historic property is to be demolished or substantially altered in a way that adversely affects the character, form, integrity, or other qualities that contribute to [the] historical, architectural, or archaeological value of the property, timely steps are taken to determine that no feasible and prudent alternative to the proposed demolition or alteration exists, and, where no such alternative is determined to exist, to assure that timely steps are taken either to avoid or mitigate the adverse effects, or to undertake an appropriate archaeological salvage excavation or other recovery action to document the property as it existed prior to demolition or alteration.
- **3.** In consultation with the division [of Historical Resources], each state agency of the executive branch shall establish a program to locate, inventory, and evaluate all historic properties under the agency's ownership or control that appear to qualify for the National Register. Each such agency shall exercise caution to assure that any such historic property is not inadvertently

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

transferred, sold, demolished, substantially altered, or allowed to deteriorate significantly.

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

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

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

### C. MANAGEMENT POLICY

The choice of a management policy for archaeological and historic sites within state-owned or controlled land obviously depends upon a detailed evaluation of the characteristics and conditions of the individual sites and groups of sites within those tracts. This includes an interpretation of the significance (or potential significance) of these sites, in terms of social and political factors, as well as environmental factors. Furthermore, for historic structures architectural significance must be considered, as well as any associated historic landscapes.

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

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

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

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

- 1. State land managers shall coordinate all planned activities involving known archaeological or historic sites or potential site areas closely with the Division of Historical Resources in order to prevent any kind of disturbance to significant archaeological or historic sites that may exist on the tract. Under 267.061(1)(b), F.S., the Division of Historical Resources is vested with title to archaeological and historic resources abandoned on state lands and is responsible for administration and protection of such resources. The Division will cooperate with the land manager in the management of these resources. Furthermore, provisions of 267.061(2) and 267.13, F.S., combined with those in 267.061(3) and 253.034(4), F.S., require that other managing (or permitting) agencies coordinate their plans with the Division of Historical Resources at a sufficiently early stage to preclude inadvertent damage or destruction to known or potentially occurring, presently unknown archaeological and historic sites. The provisions pertaining to human burial sites must also be followed by state land managers when such remains are known or suspected to be present (see 872.02 and 872.05, F.S., and 1A-44, F.A.C.)
- 2. Since the actual resources are so poorly known, the potential impact of the managing agency's activities on historic archaeological sites may not be immediately apparent. Special field survey for such sites may be required to identify the potential endangerment as a result of particular management or permitting activities. The Division may perform surveys, as its resources permit, to aid the planning of other state agencies in their management activities, but outside archaeological consultants may have to be retained by the managing agency. This would be especially necessary in the cases of activities contemplating ground disturbance over large areas and unexpected occurrences. It should be noted, however, that in most instances Division staff's knowledge of known and expected site distribution is such that actual field surveys may not be necessary, and the project may be reviewed by submitting a project location map (preferably a 7.5 minute U.S.G.S. Quadrangle map or portion thereof) and project descriptive data, including detailed construction plans. To avoid delays, Division staff should be contacted to discuss specific project documentation review needs.
- **3.** In the case of known significant sites, which may be affected by proposed project activities, the managing agency will generally be expected to alter proposed management or development plans, as necessary, or else make special provisions to minimize or mitigate damage to such sites.
- 4. If in the course of management activities, or as a result of development or the permitting of dredge activities (see 403.918(2)(6)a, F.S.), it is determined that valuable historic or archaeological sites will be damaged or destroyed, the Division reserves the right, pursuant to 267.061(1)(b), F.S., to require salvage measures to mitigate the destructive impact of such activities to such sites. Such salvage measures would be accomplished before the Division would grant permission for destruction of the affected site areas. The funding needed to implement salvage measures would be the responsibility of the managing agency planning the site destructive activity. Mitigation of historic structures at a minimum involves the preparation of measured drawings and documentary photographs. Mitigation of archaeological resources involves the excavation, analysis and reporting of the project findings and must be planned to

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

occur sufficiently in advance to avoid project construction delays. If these services are to be contracted by the state agency, the selected consultant will need to obtain an Archaeological Research Permit from the Division of Historical Resources, Bureau of Archaeological Research (see 267.12, F.S. and Rules 1A-32 and 1A-46 F.A.C.).

- 5. For the near future, excavation of non-endangered (i.e., sites not being lost to erosion or development) archaeological site is discouraged. There are many endangered sites in Florida (on both private and public lands) in need of excavation because of the threat of development or other factors. Those within state-owned or controlled lands should be left undisturbed for the present with particular attention devoted to preventing site looting by "treasure hunters". On the other hand, the archaeological and historic survey of these tracts is encouraged in order to build an inventory of the resources present, and to assess their scientific research potential and historic or architectural significance.
- **6.** The cooperation of land managers in reporting sites to the Division that their field personnel may discover is encouraged. The Division will help inform field personnel from other resource managing agencies about the characteristics and appearance of sites. The Division has initiated a cultural resource management training program to help accomplish this. Upon request the Division will also provide to other agencies archaeological and historical summaries of the known and potentially occurring resources so that information may be incorporated into management plans and public awareness programs (See Management Implementation).
- **7.** Any discovery of instances of looting or unauthorized destruction of sites must be reported to the agent for the Board of Trustees of the Internal Improvement Trust Fund and the Division so that appropriate action may be initiated. When human burial sites are involved, the provisions of 872.02 and 872.05, F. S. and Rule 1A-44, F.A.C., as applicable, must also be followed. Any state agent with law enforcement authority observing individuals or groups clearly and incontrovertibly vandalizing, looting or destroying archaeological or historic sites within state-owned or controlled lands without demonstrable permission from the Division will make arrests and detain those individuals or groups under the provisions of 267.13, 901.15, and 901.21, F.S., and related statutory authority pertaining to such illegal activities on state-owned or controlled lands. County Sheriffs' officers are urged to assist in efforts to stop and/or prevent site looting and destruction.

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

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

- **1.** A property shall be used for its historic purpose or be placed in a new use that requires minimal change to the defining characteristics of the building and its site and environment.
- **2.** The historic character of a property shall be retained and preserved. The removal of historic materials or alterations of features and spaces that characterize a property shall be avoided.
- **3.** Each property shall be recognized as a physical record of its time, place and use. Changes that create a false sense of historical development, such as adding conjectural features or architectural elements from other buildings, shall not be undertaken.
- **4.** Most properties change over time; those changes that have acquired historic significance in their own right shall be retained and preserved.
- **5.** Distinctive features, finishes, and construction techniques or examples of craftsmanship that characterize a historic property shall be preserved.
- **6.** Deteriorated historic features shall be repaired rather than replaced. Where the severity of deterioration requires replacement of a distinctive feature, the new feature shall match the old in design, color, texture, and other visual qualities and, where possible, materials. Replacement of

missing features shall be substantiated by documentary, physical, or pictorial evidence.

- **7.** Chemical or physical treatments, such as sandblasting, that cause damage to historic materials shall not be used. The surface cleaning of structures, if appropriate, shall be undertaken using the gentlest means possible.
- **8.** Significant archaeological resources affected by a project shall be protected and preserved. If such resources must be disturbed, mitigation measures shall be undertaken.
- **9.** New additions, exterior alterations, or related new construction shall not destroy materials that characterize the property. The new work shall be differentiated from the old and shall be compatible with the massing, size, scale, and architectural features to protect the historic integrity of the property and its environment.
- **10.** New additions and adjacent or related new construction shall be undertaken in such a manner that if removed in the future, the essential form and integrity of the historic property and its environment would be unimpaired. (see <u>Secretary</u> of the Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings [Revised 1990]).

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

### D. MANAGEMENT IMPLEMENTATION

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

- **1.** All land managing agencies should contact the Division and send U.S.G.S. 7.5 minute quadrangle maps outlining the boundaries of their various properties.
- **2.** The Division will in turn identify site locations on those maps and provide descriptions for known archaeological and historical sites to the managing agency.
- **3.** Further, the Division may also identify on the maps areas of high archaeological and historic site location probability within the subject tract. These are only probability zones, and sites may be found outside of these areas. Therefore, actual ground inspections of project areas may still be necessary.
- **4.** The Division will send archaeological field recording forms and historic structure field recording forms to representatives of the agency to facilitate the recording of information on such resources.
- **5.** Land managers will update information on recorded sites and properties.
- **6.** Land managers will supply the Division with new information as it becomes available on previously unrecorded sites that their staff locate. The following details the kind of information the Division wishes to obtain for any new sites or structures that the land managers may report:

### A. Historic Sites

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

- (c) Number, type, and location of outbuildings, as well as date(s) of construction;
- (d) Notation if property has been moved;
- (e) Notation of known alterations to building.

### B. Archaeological Sites

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

### E. ADMINISTERING AGENCY

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

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

**Contact Person:** 

Susan M. Harp Historic Preservation Planner Telephone (850) 245-6333 Suncom 205-6333 FAX (850) 245-6437

# Land Management Review of John Pennekamp Coral Reef State Park

Monroe County (Lease No. 3627): July 26, 2000

Prepared by Division of State Lands Staff

William Howell, OMC Manager John Barrow, Environmental Specialist II Ginny Morris, Administrative Assistant

For

the John Pennekamp Coral Reef State Park Management Review Team

Final Report September 29, 2000

Land Manager:	DRP		
Area:	61,531 acres		
County:	Monroe County		
Mngt. Plan Revised:	3/20/1998		
Mngt. Plan Update Due:	3/20/2003		

Agency	Team member	Team member
Represented	Appointed	in attendance
DEP/DRP DEP South District DACS/DOF FWCC Soil and Water Conservation	Ms. Renate Skinner Mr. R.J. Helbling Mr. Bill Korn Mr. Robert Guerra	Ms. Renate Skinner Ms. Jennifer Ricks Mr. Bill Korn Mr. Robert Guerra
County Commission	Mr. Ralph R. Gouldy	Mr. Ralph R. Gouldy
Conservation Organization	Mr. George Dalrymple	Mr. George Dalrymple
Private Land Manager	Ms. Carol Ellis	Ms. Carol Ellis

### **Management Review Team Members**

# **Process for Implementing Regional Management Review Teams**

### Legislative Intent and Guidance:

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

### **Review Site**

The management review of John Pennekamp Coral Reef State Park considered approximately 61,531 acres in Monroe County that are managed by the Division of Recreation and Parks. The team evaluated the extent to which current management actions are sufficient, whether the land is being managed for the purpose for which it was acquired, and whether actual management practices, including public access, are in compliance with the management plan. The Division of Recreation and Parks revised the management plan on March 20, 1998, and the management plan update is due on March 20, 2003.

# **Review Team Determination**

- **1. Is the land being managed for the purpose for which it was acquired?** All team members agreed that the John Pennekamp Coral Reef State Park is being managed for the purpose for which it was acquired.
- 2. Are actual management practices, including public access, in compliance with the management plan? Six team members agreed that actual management practices, including public access, were in compliance with the management plan for this site, and one team disagreed.

# **Commendations to the Managing Agency**

The team commends the manager and staff for taking the initial steps in providing navigational aids and regulatory buoys to inform boaters and to protect coral reefs and seagrass beds.

### **Exceptional Management Actions**

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

- **1.** Fish Management Fishing Quality
- 2. Control of non-native invasive & problem species plants
- 3. Surface water quality monitoring
- 4. Recreational Opportunities
- **5.** Interpretive Facilities and Signs

# **Recommendations and Checklist Findings**

The management plan must include responses to the recommendation items that are identified below.

- **1.** The team recommends that the Division of Recreation and Parks procure more regulatory buoys including "no lobster" and "no combustion zone" buoys, and a full time staff member to maintain them.
- Manager's Response: Agree. The park can purchase buoys and hardware with monies from boat groundings, but park staff to maintain the buoys is needed. Park staffing allocations are contingent on DRP and DEP budget resources and priorities and also on legislative action.
- 2. The team recommends that the Division of Recreation and Parks should resolve legal issues related to boundary violations, such as fill spits, that have delayed restoration of marine habitat.
- Manager's Response: Agree. This is a complicated and lengthy legal process. Legal efforts are being made to resolve the problems.
- **3.** The team recommends that the Division of Recreation and Parks pursue Rattlesnake Key and Rodriguez Key as priority acquisitions.

- Manager's Response: Agree. The DRP has previously attempted to purchases these two parcels. Unfortunately, the current owners have not agreed to sell them. We are still interested since development of the parcels would impact park resources.
- **4.** The team recommends the Division of Recreation and Parks take steps to declare the site environmentally sensitive biologically highly productive and follow through with the County mosquito control district to develop an arthropod control plan that ensures protection of the endangered species and natural communities.
- Manager's Response: Agree. The area has already been declared environmentally sensitive and biologically highly productive. DRP is awaiting the submittal of a proposed arthropod control plan from Monroe County Mosquito Control. Any acceptable control plan must ensure maximum protection for the natural resources of the park.
- **5.** The team recommends that the Division of Recreation and Parks continue efforts to collect data on marine habitat and water quality to monitor resource condition and trends. Establish and refine a carrying capacity to use on "at risk" areas.
- Manager's Response: Agree. The DRP will review existing methods to consider how we could more effectively establish carrying capacities to limit impacts on "at risk" marine resources.
- **6.** The team recommends that the Division of Recreation and Parks develop minimum standards and time frames for monitoring of damaged and restored sites by the restoration contractor at the expense of the violator.
- Manager's Response: Agree. The park and district staff will work with the state attorney and Law Enforcement to pursue this goal.
- 7. The team recommends that the Division of Recreation and Parks should resolve the issue of commercial fishing as an "existing use" in the park despite it not being identified as a designated "compatible secondary use" in the current management plan.
- Manager's Response: Disagree. Although this use will be addressed in the next updated plan, our legal authorities to manage or control such activities are limited and if any changes are proposed, they must be based upon documented detrimental impacts of such uses on sensitive resources in the marine system.
- **8.** The team recommends the Division of Recreation and Parks evaluate the impacts of commercial fishing on the marine resources, within the park boundaries, and evaluate options to minimize any damaging practices.
- Manager's Response: Disagree. Commercial fishing is not a problem. Commercial lobstering can be studied to look at the need for possible control measures to minimize impacts.

# **Checklist findings**

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

- **1.** Ground water quality monitoring (p)
- Manager's Response: Disagree. Water quality issues are already covered in the plan. Extensive water quality monitoring has been done in coastal waters and monitoring of ground waters is considered unnecessary.
- **2.** Resource Protection poaching (p)
- Manager's Response: Disagree. The plan already addresses the presence of Law Enforcement. The park is actively patrolled to enforce rules and deter poaching. Park staff also helps by reporting any violations observed while performing daily duties.
- **3.** Adjacent Property Review permit reviews (p)
- Manager's Response: Disagree. The plan already covers this subject. Reviews of proposed permits are conducted on a regular basis by district and park staff.
- **4.** Existing Uses Commercial fishing (p)
- Manager's Response: Agree. Although already addressed, the next updated plan will provide more details. Only hook and line fishing is permitted. All state law limits are enforced on both recreational and commercial fishing interests.
- 5. Existing Uses Commercial Lobstering (p)
- Manager's Response: Agree. Although the plan already mentions this historic use, more details will be included in the next updated plan.
- 6. Resource Protection Law Enforcement Presence (f)
- Manager's Response: Disagree. A total of four officers and one lieutenant are currently assigned to our unit. However, the district and park staff will work with law enforcement management to provide more input on scheduling of patrols.
- 7. Management Resources Staff (f)
- Manager's Response: Agree. More staffing is needed to monitor our water resources. However, staffing allocations are contingent on DRP and DEP budget resources and priorities and also on legislative action.