John Pennekamp Coral Reef State Park

Advisory Group Draft
Unit Management Plan

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL PROTECTION

Division of Recreation and Parks
August 2018

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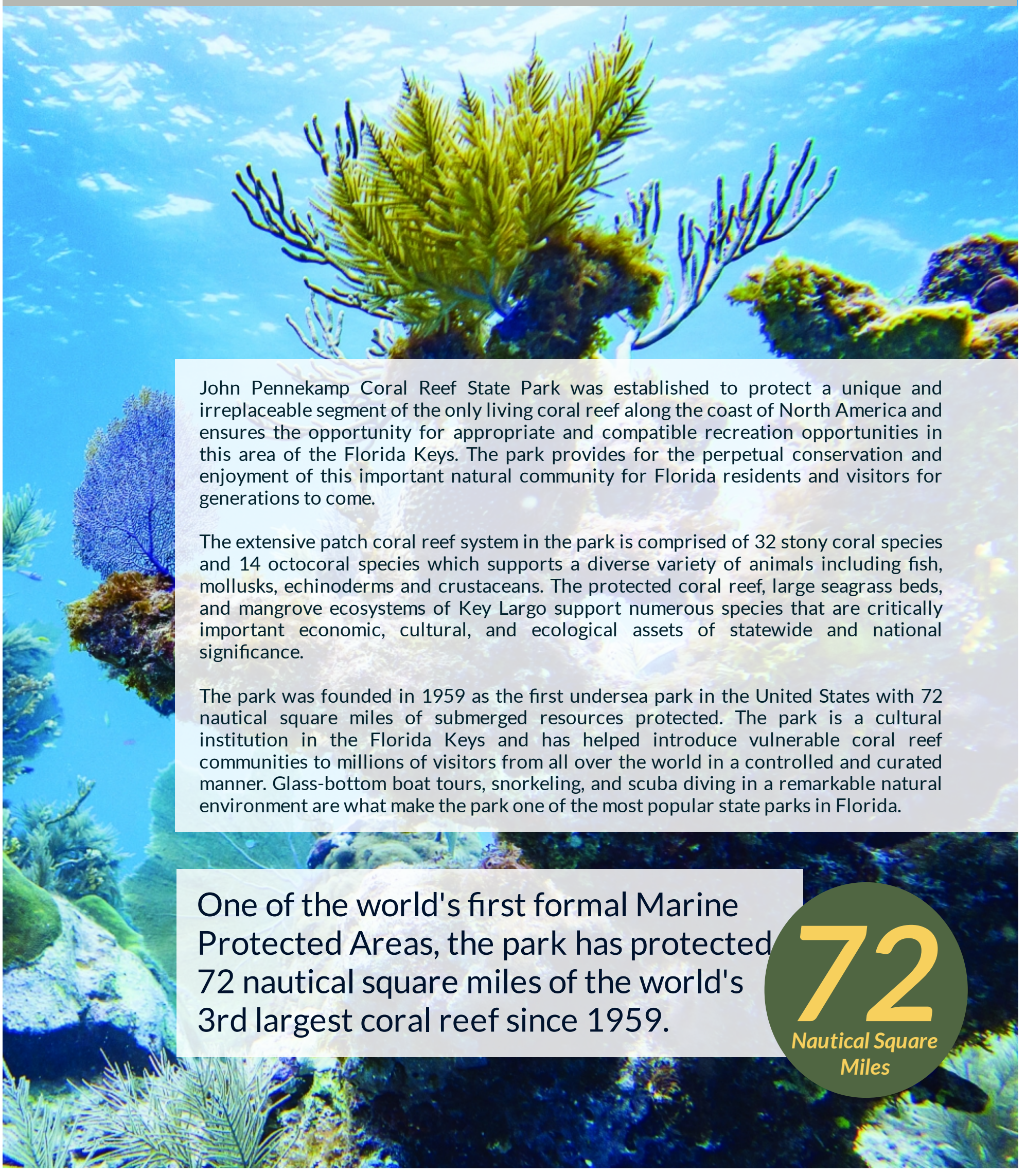
America's first undersea park



John Pennekamp Coral Reef State Park was established to protect a unique and irreplaceable segment of the only living coral reef along the coast of North America and ensures the opportunity for appropriate and compatible recreation opportunities in this area of the Florida Keys. The park provides for the perpetual conservation and enjoyment of this important natural community for Florida residents and visitors for generations to come.

The extensive patch coral reef system in the park is comprised of 32 stony coral species and 14 octocoral species which supports a diverse variety of animals including fish, mollusks, echinoderms and crustaceans. The protected coral reef, large seagrass beds, and mangrove ecosystems of Key Largo support numerous species that are critically important economic, cultural, and ecological assets of statewide and national significance.

The park was founded in 1959 as the first undersea park in the United States with 72 nautical square miles of submerged resources protected. The park is a cultural institution in the Florida Keys and has helped introduce vulnerable coral reef communities to millions of visitors from all over the world in a controlled and curated manner. Glass-bottom boat tours, snorkeling, and scuba diving in a remarkable natural environment are what make the park one of the most popular state parks in Florida.

One of the world's first formal Marine Protected Areas, the park has protected 72 nautical square miles of the world's 3rd largest coral reef since 1959.

72

Nautical Square Miles

Established in 1959, John Pennekamp Coral Reef State Park is the first undersea park in the United States, and encompasses approximately 72 nautical square miles. The park was created to protect and preserve a portion of the only living coral reef in the continental United States. The park extends three miles into the Atlantic Ocean, is approximately 21 miles in length and is adjacent to and within the Florida Keys National Marine Sanctuary. The park is named for one of the early proponents of the preservation of its reef, John D. Pennekamp, a Miami newspaper editor who helped Marjory Stoneman Douglas establish Everglades National Park. The park contains a wide variety of tropical vegetation, shorebirds, and marine life. The coral reefs are among the most beautiful and diverse of all living natural communities and are made of many tiny animals called polyps. Stony corals, such as star coral and brain coral, secrete a limestone skeleton around their bodies. These skeletons remain after death and provide the foundation for new polyp growth. Octocorals, such as sea fans and seaplumes, are flexible and sway gracefully in the ocean current as they feed on plankton. Sponges, shrimps, crabs, turtles, lobsters and hundreds of species of fish live among the corals. These reefs occur only in shallow oceans having clear, warm waters. It took approximately 5,000 years for this coral reef to form. At the reef, snorkelers delight in seeing many colorful tropical fish and corals. Anglers can fish for a wide variety of species in diverse habitats.

Located in the fabulous Florida Keys, the park's upland areas offer visitors a unique experience in the mangrove swamps and tropical hammocks. The Visitor Center features a 30,000-gallon saltwater aquarium, nature exhibits and a theater. Nature walks are available along the Mangrove, Wild Tamarind and Grove trails. A 2.5-mile canoe trail winds through the mangrove swamp. Underwater at Cannon Beach, artifacts from a 1715 Spanish shipwreck, featuring an anchor and cannons, may be viewed. Marine life, including crabs and fish, may be observed in the seagrass beds.

INTRODUCTION

John Pennekamp Coral Reef State Park is located in Monroe County on Key Largo (see Vicinity Map). Access to the park from is from U.S. Highway 1, also known as the Overseas Highway, at Mile Marker 102.5 (see Reference Map). This upland portion provides public access to the 72 square miles of submerged resources managed by the park. The Vicinity Map also reflects significant land and water resources existing near the park.

John Pennekamp Coral Reef State Park was initially acquired by the Florida Board of Parks and Historic Memorials on December 3, 1959 as a dedication. Currently, the park comprises 63,839.67 acres. The Board of Trustees of the Internal Improvement Trust Fund (Trustees) hold fee simple title to the park and on January 23, 1968, the Trustees leased (Lease Number 3627) the property to DRP under a 99-year lease. The current lease will expire on January 22, 2067.

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. Currently the park contains approximately 63,839.67 acres.

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

Purpose and Significance of the Park

John Pennekamp Coral Reef State Park was established to protect a unique and irreplaceable segment of the only living coral reef along the coast of North America and ensures the opportunity for appropriate and compatible recreation opportunities in this area of the Florida Keys. The park provides for the perpetual conservation and enjoyment of this important community for Florida residents and visitors for generations to come.

Park Significance

- The park was founded in 1960 as the first undersea park in the United States with 72 nautical square miles of submerged resources protected; most notably part of the only living coral reef system in North America.

- The visitor center features numerous attractions that showcase and interpret the park's natural resources, including a large aquarium, auditorium, theater and nature exhibits. Man-made beaches feature several shipwreck artifacts from the 1600s and 1700s.

- One-of-a-kind opportunities to snorkel and scuba dive in a remarkable natural environment are what make this park attractive to large numbers of visitors annually. Glass-bottom boat tours make viewing the reefs accessible to many in a comfortable setting.

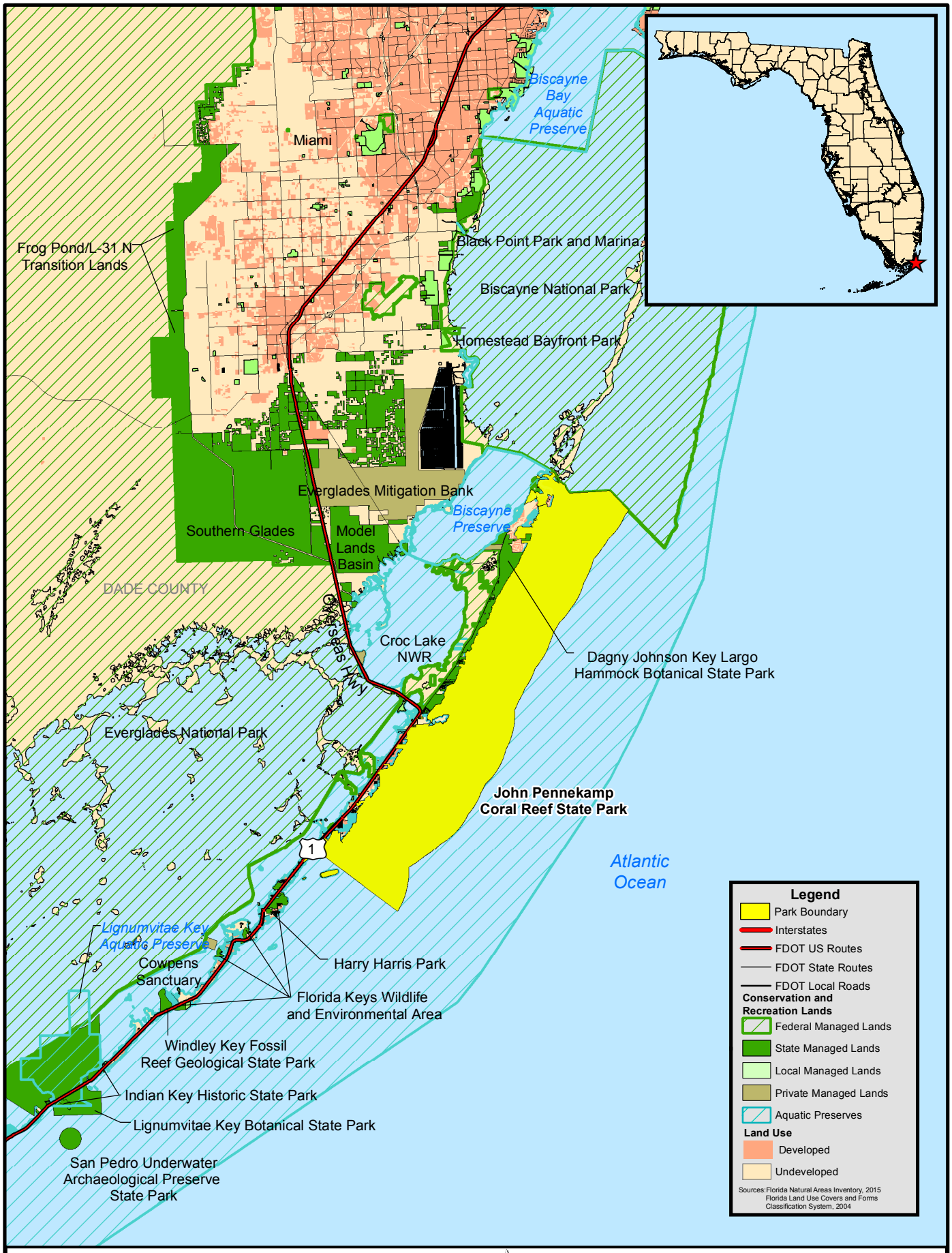
- The extensive patch coral reef system in the park is comprised of 32 stony coral species and 14 octocoral species which supports a diverse variety of animals including fish, mollusks, echinoderms and crustaceans. The protected coral reef, large seagrass beds, and mangrove ecosystems of Key Largo support numerous species that are commercially and recreationally important to the regional economy.

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

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 goals, objectives, actions and criteria or standards that guide each aspect of park administration, and sets forth the specific measures that will be implemented to meet management objectives and provide balanced public utilization. The plan is intended to meet the requirements of Sections 253.034 and 259.032, Florida Statutes, Chapter 18-2, Florida Administrative Code, and is intended to be consistent with the State Lands Management Plan. With approval, this management plan will replace the 2004 approved plan.

The plan consists of three interrelated components: Resource Management Component, Land Use Component, and Implementation Component. The Resource Management Component provides a detailed inventory and assessment of



JOHN PENNEKAMP CORAL REEF STATE PARK

N

0 1.25 2.5 5 Miles

Florida Department of Environmental Protection
Division of Recreation and Parks

VICINITY MAP

Biscayne
National Park

Everglades Mitigation Bank

Card Sound

Southern
Glades

Model Lands Basin

Dagny Johnson
Key Largo Hammock
Botanical State Park

Florida Circumnavigational Saltwater Paddling Trail

Crocodile Lake
National Wildlife Refuge

Barnes Sound

KEY
LARGO

1

Everglades
National Park

FLORIDA KEYS OVERSEAS HERITAGE TRAIL

John Pennekamp
Coral Reef State Park

Florida Keys
National Marine
Sanctuary

Land Base

ATLANTIC OCEAN

LEGEND

- Park Boundary
- Florida Circumnavigational Saltwater Paddling Trail
- Managed Conservation Lands
- Florida Keys Overseas Heritage Trail
- US Routes
- Florida Keys National Marine Sanctuary

JOHN PENNEKAMP
CORAL REEF STATE PARK

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0 1.25 2.5 5 Miles

Florida Department of Environmental Protection
Division of Recreation and Parks
Date of aerial; 2011

DRAFT
REFERENCE MAP

the natural and cultural resources of the park. Resource management needs and issues are identified, and measurable management objectives are established for each of the park's management goals and resource types. This component provides guidance on the application of such measures as prescribed burning, exotic species removal, imperiled species management, cultural resource management and restoration of natural conditions.

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

The Implementation Component consolidates the measurable objectives and actions for each of the park's management goals. An implementation schedule and cost estimates are included for each objective and action. Included in this table are (1) measures that will be used to evaluate the DRP's implementation progress, (2) timeframes for completing actions and objectives and (3) estimated costs to complete each action and objective.

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

In accordance with 253.034(5) F.S., the potential of the park to accommodate secondary management purposes was analyzed. These secondary purposes were considered within the context of DRP's statutory responsibilities and the resource needs and values of the park. This analysis considered the park's natural and cultural resources, management needs, aesthetic values, visitation and visitor experiences. For this park, it was determined that accepting clean fill to assist with efforts to restore borrow pits and establishing coral nurseries to help with efforts to restore coral reefs as part of the park's natural community management and restoration activities could be accommodated in a manner that would be compatible and not interfere with the primary purpose of resource-based outdoor recreation and conservation. These compatible secondary management purposes are addressed in the Resource Management Component of the plan.

DRP has determined that uses such as, water resource development projects, water supply projects, stormwater management projects, linear facilities and sustainable agriculture and forestry, would not be consistent with this plan or the management purposes of the park.

In accordance with 253.034(5) F.S. the potential for generating revenue to enhance management was also analyzed. Visitor fees and charges are the principal source of revenue generated by the park. It was determined that accepting clean fill to assist with efforts to restore borrow pits and establishing coral nurseries to help with efforts to restore coral reefs as part of the park's natural community management and restoration activities could be appropriate at this park as additional sources of revenue for land management since they are compatible with the park's primary purpose of resource-based outdoor recreation and conservation. Generating revenue from consumptive uses that are not a byproduct of resource management activities is not contemplated in this management plan.

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

Management Program Overview

Management Authority and Responsibility

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

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

The Trustees have also granted management authority of certain sovereign submerged lands to the Division under Management Agreement MA 68-086 (as amended January 19, 1988). The management area includes a 400-foot zone from

the edge of mean high water where a park boundary borders sovereign submerged lands fronting beaches, bays, estuarine areas, rivers or streams. Where emergent wetland vegetation exists, the zone extends waterward 400 feet beyond the vegetation. The agreement is intended to provide additional protection to resources of the park and nearshore areas and to provide authority to manage activities that could adversely impact public recreational uses.

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

Park Management Goals

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

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

Management Coordination

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

The Florida Fish and Wildlife Conservation Commission (FWC) assists staff in the enforcement of state laws pertaining to wildlife, marine fish and other aquatic life existing within the park. In addition, the FWC aids DRP with wildlife management programs, including imperiled species management. The Florida Department of State (FDOS), Division of Historical Resources (DHR) assists staff to ensure protection of archaeological and historical sites. The Florida Department of Environmental Protection (DEP), Florida Coastal Office (FCO) aids staff in aquatic preserves management programs. The DEP, Bureau of Beaches and Coastal Systems aids staff in planning and construction activities seaward of the Coastal

Construction Control Line (CCCL). In addition, the Bureau of Beaches and Coastal Systems aid the staff in the development of erosion control projects.

Public Participation

DRP provided an opportunity for public input by conducting a general public meeting and an advisory group meeting to present the draft management plan to the public. These meetings were held on Tuesday, August 21 and Wednesday, August 22, 2018, respectively. Meeting notices were published in the Florida Administrative Register, August 13, 2018, Volume 44, Issue 157, included on the Department Internet Calendar, posted in clear view at the park, and promoted locally. The purpose of the advisory group meeting is to provide the advisory group members an opportunity to discuss the draft management plan (see Addendum 2).

Other Designations

John Pennekamp Coral Reef State Park is within an Area of Critical State Concern as defined in Section 380.05, Florida Statutes, and it is not presently under study for such designation. The park is a component of the Florida Greenways and Trails System, administered by the Department's Office of Greenways and Trails.

All waters within the park have been designated as Outstanding Florida Waters, pursuant to Chapter 62-302, Florida Administrative Code. Surface waters in this park are also classified as Class III waters by the Department. This park is within the Florida Keys National Marine Sanctuary.

RESOURCE MANAGEMENT COMPONENT

INTRODUCTION

The Florida Department of Environmental Protection (DEP), Division of Recreation and Parks (DRP) in accordance with Chapter 258, Florida Statutes, 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. Management measures expressed in this plan are consistent with the DEP's overall mission in ecosystem management. Cited references are contained in Addendum 3.

The DRP's philosophy of resource management is natural systems management. Primary emphasis is placed on restoring and maintaining, to the degree possible, the natural processes that shaped the structure, function and species composition of Florida's diverse natural communities as they occurred in the original domain. Single species management for imperiled species is appropriate in state parks when the maintenance, recovery or restoration of a species or population is complicated due to constraints associated with long-term restoration efforts, unnaturally high mortality or insufficient habitat. Single species management should be compatible with the maintenance and restoration of natural processes, and should not imperil other native species or seriously compromise park values.

The DRP's management goal for cultural resources is to preserve sites and objects that represent Florida's cultural periods, significant historic events or persons. This goal often entails 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 can be affected by conditions and events that occur beyond park boundaries. Ecosystem management is implemented through a resource management evaluation program that assesses resource conditions, evaluates management activities and refines management actions, and reviews local comprehensive plans and development permit applications for park/ecosystem impacts.

The entire park is divided into management zones that delineate areas on the ground that are used to reference management activities (see Management Zones Map). The shape and size of each zone may be based on natural community type, burn zone, and the location of existing roads and natural fire breaks. It is important to note that all burn zones are management zones; however, not all management zones include fire-dependent natural communities. Table 1 reflects the management zones with the acres of each zone.

Table 1: John Pennekamp Coral Reef State Park Management Zones			
Management Zone	**Acreage**	**Managed With Prescribed Fire**	**Contains Known Cultural Resources**
JP-01	7.17	N	N
JP-02	151.61	N	N
JP-03,04,05	77.37	N	Y
JP-06	14.75	N	Y
JP-07	147.12	N	N
JP-09	15.79	N	N
JP-10	605.37	N	N
JP-11	716.72	N	Y
JP-12	46.10	N	Y
JP-13	173.21	N	N
JP-14	31.17	N	N
JP-15	194.27	N	N
JP-16	45.44	N	N
JP-17	22.07	N	N
JP-18	67.24	N	N
JP-19	276.22	N	N
JP-20	310.25	N	N
JP-21	8.48	N	N
JP-22	26.13	N	N
JP-23	237.62	N	N
JP-24	668.06	N	Y
JP-S1	13,245.80	N	N
JP-S2	13,971.32	N	Y
JP-S3	15,131.68	N	Y
JP-S4	16,075.87	N	N
JP-S5	1,166.91	N	N
JP-S6	389.20	N	N

RESOURCE DESCRIPTION AND ASSESSMENT

Natural Resources

Topography

John Pennekamp Coral Reef State Park is part of the geographic region of high coral keys with maximum elevations reaching ten to twelve feet in the rockland hammock, then grading to sea level towards the shoreline. All of the offshore islands except Palo Alto Key, which supports rockland hammock, have lower elevations supporting predominately wetland habitats with minimally elevated coastal berm habitats. The edge of the continental shelf parallels the Keys approximately seven miles offshore.

JOHN PENNEKAMP CORAL REEF STATE PARK

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MANAGEMENT ZONES MAP

John Pennekamp Coral Reef State Park was established for the protection of the coral reefs offshore so the majority of the management area is submerged or intertidal. Depths vary in the submerged communities from a few inches to twenty-five feet depending upon the distance to shore and the community structure. Although located a few miles offshore, growth of coral on patch reefs reaches to just below the surface of the water. Depths in Hawk Channel, which parallels the shoreline, ranges from thirteen to fifteen feet.

Some of the topography of both the uplands and the submerged land has been altered by human activity. Dredging and filling of wetlands occurred with the development of the park in the late 1950s to include the main park facilities and marina basin. Over time with the addition of non-contiguous parcels, land acquired for the protection of both upland and submerged resources has included areas with topographic alteration including dredged borrow pits and basins which are approximately 32 feet in depth. Since most of the dredging in the Florida Keys occurred around the same time period, it is believed that the depth was a limitation of the equipment used at the time and not a factor of preferred depth for material.

Natural topographic changes in elevation develop when the limestone substrate is dissolved by rainfall and percolates into the porous limestone substrate. These depressions are known as solution holes and are a common component of the rockland hammock They can be a few inches in depth to very large, deep holes scattered throughout the hammock. Prior to the lowering of the Biscayne Aquifer, solution holes would have retained freshwater even during the dry season, providing an important resource to wildlife as well as maintaining the humidity level within the hammock. Most of the solution holes within Pennekamp do not retain freshwater due to the hydrological alterations, but a few have been observed with freshwater for short periods of time.

Geology

The upper layer geologic formation of the Florida Keys from Soldier Key to Bahia Honda Key is Key Largo limestone. Built by the coral polyps of ancient coral reef formations, these fossilized remains are similar to the present living coral reefs offshore. As sea levels have fluctuated over time, the land mass of South Florida has alternately been submerged and exposed above the level of the water. Sea level has been as much as one hundred feet higher than current levels and as much as three hundred feet lower than current levels. During the last interglacial ice age, approximately 120,000 years ago, sea level stabilized close to its present level, exposing the coral and allowing for the formation of the islands of the Florida Keys. When the area of the Keys is submerged, the limestone from ancient coral reefs provides the necessary substrate for new growth of coral formations and coral reefs. Subsequently, the Key Largo limestone is quite thick, as much as 145 feet in some areas of the upper Keys (Hoffmeister, 1974).

Soils

Information published in the U.S. Department of Agriculture's (USDA) Classification and Correlation of the Soils of Monroe County Keys Area Florida identifies seven soil

types at Pennekamp Park. They are Pennekamp gravelly muck, Matecumbe muck, Rock Outcrop-Tavernier complex, Islamorada muck, Keylargo muck, Udorthents-Urban complex, and Lignumivtae marl (United State Department of Agriculture, Natural Resources Conservation Service, 1995) (see Soils Map).

Pennekamp gravelly muck is found in the upland hammock areas typically at the highest elevations. It is characterized by a thin layer of organic debris and leaf layer over the limestone rock. Soil in this unit is well drained. Pennekamp gravelly muck is found in close association with Matecumbe muck ,which is formed at lower elevations that are subject to occasional flooding. In the low intertidal area, the soil unit is Rock Outcrop-Tavernier complex. In this soil unit, the mangrove tidal swamps are subject to daily flooding by tides causing the soil to be poorly drained. The exposed limestone rock has weathered into smooth caprock pitted with solution holes that fill with accumulated marl soil. In addition to the Rock Outcrop-Tavernier complex, Islamorada muck and Key Largo muck, Lignumvitae marl and Rock Outcrop-Cudjoe complex are associated with mangrove tidal swamps. However, in the Rock Outcrop-Cudjoe complex most of the map unit consists of exposed bedrock. Udorthents-Urban land complex includes constructed upland areas where land has been altered by dredging and filling for development (United State Department of Agriculture, Natural Resources Conservation Service, 1995). Addendum 3 contains detailed soil descriptions for the park.

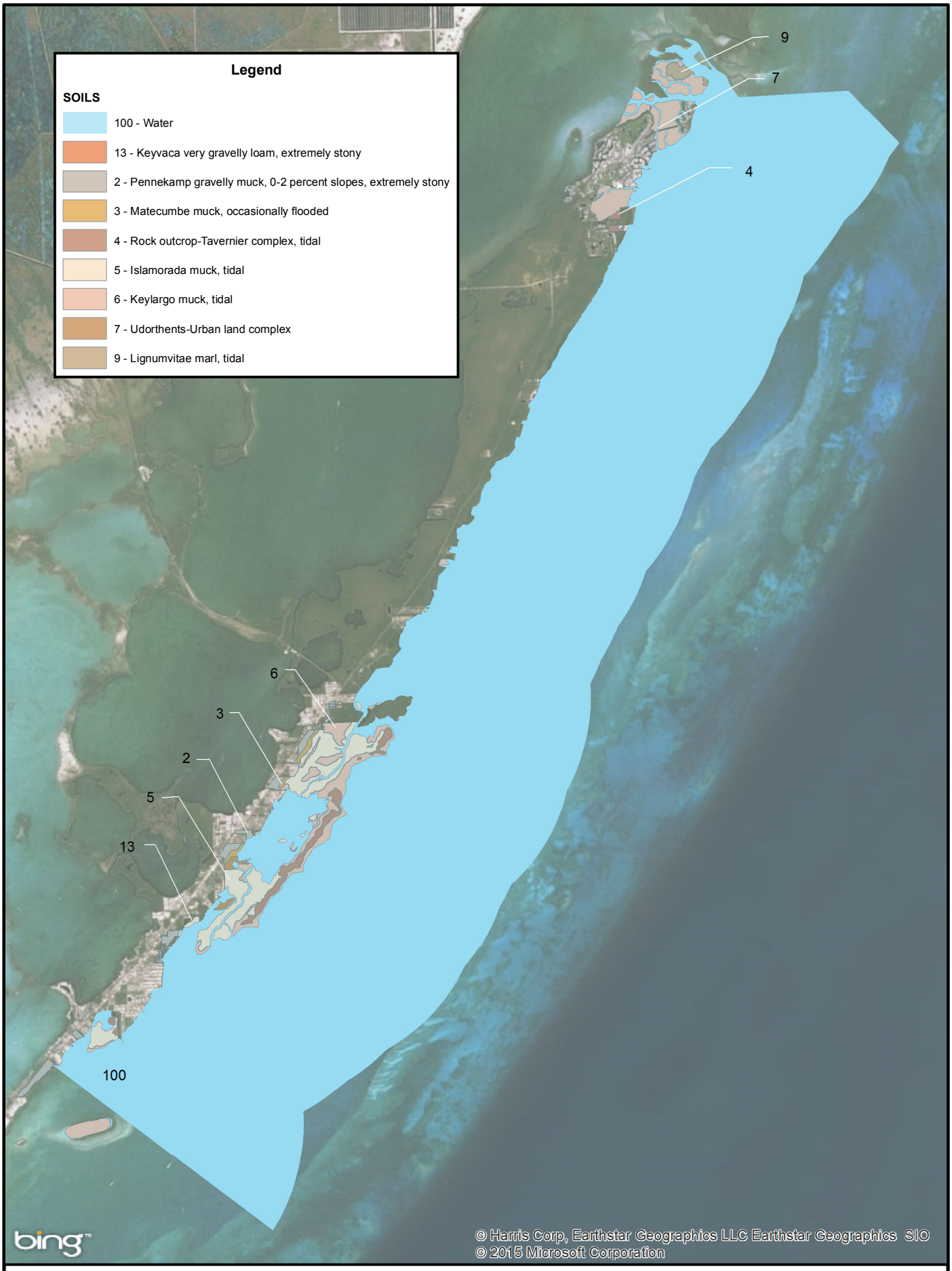
The submerged communities are subject to erosion from propeller scarring and boat grounding events that cut the seagrass rhizomes, and in some cases, significantly alters the topography of the seagrass flat. In addition to the physical damage to the seagrass, these injuries also cause suspended sediment in the water column that then affects the water quality of the nearshore and offshore waters, particularly the coral reef habitats in the park. No Motor Zone signs were installed in 1994 to mark areas of shallow seagrass flats to aid vessel operators in navigating these waters. Measures such as continued protection from physical damage to the submerged resources, sensitivity to upland resource development, and minimizing run-off will be taken to prevent soil erosion or other adverse impacts to the surrounding resources of the park and the Florida Keys National Marine Sanctuary.

Minerals

Key Largo limestone is the major mineral deposit at Pennekamp Park. Calcite is a minor mineral deposit in the park.

Hydrology

The primary natural source of freshwater in the Florida Keys is rain. Historically, early settlers collected rainwater in cisterns or used water from wells and solution holes that tapped the small, shallow freshwater lenses. These lenses form in the limestone above sea level during the rainy season. Until recently, nearshore freshwater upwelling, an extension of the Biscayne Aquifer, occurred in at least one location on northern Key Largo. Drainage of the Everglades and the subsequent canalization of southeast Florida (including canals in the Florida Keys) resulted in saltwater intrusion into the Biscayne Aquifer and changed the regional hydrology.



John Pennekamp Coral Reef State Park

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Florida Department of Environmental Protection
Division of Recreation and Parks
Date of aerial; 2011

SOILS MAP

Only on the larger islands such as Key Largo and Big Pine Key is rainwater retained for any length of time.

Natural Communities

This section of the management plan describes and assesses each of the natural communities found in the state park. It also describes of the desired future condition of each natural community and identifies the actions that will be required to bring the community to its desired future condition (DFC). Specific management objectives and actions for natural community management, exotic species management, imperiled species management and restoration are discussed in the Resource Management Program section of this component.

The system of classifying natural communities employed in this plan was developed by the Florida Natural Areas Inventory (FNAI). The premise of this system is that physical factors such as climate, geology, soil, hydrology and fire frequency generally determine the species composition of an area, and that areas that are similar with respect to those factors will tend to have natural communities with similar species compositions. Obvious differences in species composition can occur, however, 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. Some physical influences, such as fire frequency, may vary from FNAI's descriptions for certain natural communities in this plan.

When a natural community within a park reaches the desired future condition, it is considered to be in a "maintenance condition." Required actions for sustaining a community's maintenance condition may include, maintaining optimal fire return intervals for fire dependant communities, ongoing control of non-native plant and animal species, maintaining natural hydrological functions (including historic water flows and water quality), preserving a community's biodiversity and vegetative structure, protecting viable populations of plant and animal species (including those that are imperiled or endemic), and preserving intact ecotones linking natural communities across the landscape.

The park contains ten distinct natural communities as well as cleared and developed areas (see Natural Communities Map). A list of known plants and animals occurring in the park is contained in Addendum 5.

John Pennekamp Coral Reef State Park consists of the main park land-base where the public accesses nature trails, man-made beaches, a Visitor Center with multiple aquariums, and a park concession for canoe/kayak rentals, boating, snorkeling, diving, and glass bottom boat trips. However, there are non-contiguous parcels, offshore islands and 72 square miles of submerged resources that are managed as part of this state park. Natural communities, therefore, exist in multiple management zones and depending upon their proximity to urban landscapes (i.e., neighborhoods, stores and schools) will have a range of management considerations and concerns.

Coastal Berm

Desired future condition: Coastal berms are found on the seaward edge or landward edge of the mangroves or further inland depending on the height of the storm surge that formed them. Elevations range in height from one to ten feet. Structure and composition of the vegetation is variable depending on the height of the berm and the time since the last storm event. Coastal berm consists of a mixture of tropical herbs, shrubs and trees and is defined by its substrate of coarse, calcareous, storm-deposited sediment forming long narrow ridges that parallel the shore. The most stable berms may share some tree species with rockland hammocks, but generally have a greater proportion of shrubs and herbs. Tree species may include blolly (*Guapira bicolor*), gumbo limbo (*Bursera simaruba)*, and poisonwood (*Metopium toxiferum*). Characteristic tall shrub and short tree species include Spanish stopper (*Eugenia foetida*), hog plum (*Ximenia americana*), white indigo berry (*Randia aculeata*), seven year apple (*Genipa clusiifolia*), blackbead (*Pithecellobium keyense*), and saffron plum (*Sideroxylon salicifolium*). Short shrubs and herbs include spider lily (*Hymenocallis latifolia*), limber caper (*Cynophalla flexuosa*), lantana (*Lantana involucrata*), and rouge berry (*Rivina humilis*). More seaward berms, or those recently affected by storm deposition, may support a suite of plants similar to beaches, including sea purslane (*Sesuvium portulastrum*) cordgrass (*Spartina* spp.), and seashore dropseed (*Paspalum* spp.), or dense shrub thickets with buttonwood (*Conocarpus erectus*), black mangrove (*Avicennia germinans*) red mangrove (*Rhizophora mangle*), white mangrove (*Laguncularia racemosa*), joewood (*Jacquinia keyensis*), and sea ox-eye daisy (*Borrichia arborescens*).

Description and assessment: There is a narrow coastal berm on El Radabob Key (Management Zones JP-10 and JP-11). It is located landward of the mangrove shoreline and includes shrubby vegetation such as nickerbean (*Caesalpinia bonduc*), Spanish stopper, blolly, blackbead and spider lily. Canopy species including gumbo limbo, poisonwood and mahogany are also found in this management zone. Due to the increase in the extreme high tides, particularly of the fall high tides, this habitat has been subject to increasing levels of saltwater inundation, which will create shifts in species composition over time to more salt tolerant vegetation and a decrease in hardwood species.

The coastal berm on the northern end of El Radabob Key has been impacted by exotic vegetation specifically by Portia (*Thespesia populnea*), Brazilian pepper (*Schinus terebinthifolius*) and latherleaf (*Colubrina asiatica*).

Multiple exotic removal projects have been conducted along this section of the island including work contracted through the Florida Fish and Wildlife Conservation Commission Invasive Plant Management funding, exotic technicians, interns, park staff and District staff. The site can only be accessed by boat and transportation of equipment is difficult due to the shallow water and submerged resources of the nearshore waters along the shoreline.

Coastal berm is found on Dove Key (JP-01) in the interior of the island surrounded by mangrove swamp. Vegetative components on this berm include gumbo limbo,

Legend

Natural Communities

- CB - Coastal Berm - 13.10 ac.
- KCB - Keys Cactus Barren - 41.62 ac.
- RH - Rockland Hammock - 513.46 ac.
- KTRB - Keys Tidal Rock Barren - 246.27 ac.
- MS - Mangrove Swamp 3150.06 ac.
- MCPS - Marine Composite Substrate - 13.48 ac.
- MCNS - Marine Consolidated Substrate - 7117.54 ac.
- MCR - Marine Coral Reef1734.37 ac.
- MSGB - Marine Seagrass Bed - 50491.22 ac.
- MUS - Marine Unconsolidated Substrate - 417.55 ac.
- AG - Agriculture - 1.68 ac.
- CL - Clearing/Regeneration - 12.80 ac.
- DV - Developed - 46.63 ac.
- SA - Spoil Area - 13.01 ac.

JOHN PENNEKAMP CORAL REEF STATE PARK

N

0 0.5 1 2 Miles

Florida Department of Environmental Protection
Division of Recreation and Parks
Date of aerial; 2016

NATURAL COMMUNITIES MAP

inkwood (*Exothea paniculata*), false mint (*Dicliptera sexangularis*), and sea ox-eye daisy. Exotic species including coconut palm (*Cocos nucifera*), latherleaf (*Colubrina asiatica*) and Brazilian pepper (*Schinus terebinthifolius*) have infested this berm and several exotic removal projects have been conducted in order to eradicate all exotic species from the island. Dove Key is only accessible by boat but there is an access point on north side of the island which provides access to the interior.

A coastal berm is located in management zone JP-07 on the property that is within the boundaries of the Kawama Club development. This coastal berm is a narrow, linear berm of slightly higher elevation on the south edge of the management zone, grading into mangrove habitat on all sides. Vegetative components here include nickerbean, Spanish stopper, blolly, and blackbead.

General management measures: The coastal berm habitats on El Radabob, Dove Key and within the Kawama Club, are in good condition, but in order to achieve the desired future condition exotic removal projects will continue to be an ongoing resource management objective. Because the impact from debris, which is transported by storms and tides, is a perpetual issue in coastal ecosystems, removal is a difficult task due to logistics as well as the ongoing nature of this task. However, the park will conduct debris removal to the extent possible by staff, volunteers and other resources that the park identifies.

Keys Tidal Rock Barren

Desired future condition: Keys tidal rock barren is a flat rockland in the supratidal zone with much exposed and eroded limestone and a sparse cover of stunted halophytic herbs and shrubs, and it is inundated by salt water only during the spring high tides. Patches of low, salt-tolerant herbaceous species include sea ox-eye daisy, perennial glasswort, saltwort, Keys grass (*Monanthochloe littoralis*), saltgrass and seashore dropseed. Buttonwood is the dominant woody plant. It varies from stunted, sprawling, multi-stemmed shrubs to tree size. Other typical woody species are red mangrove, black mangrove, white mangrove and Christmas berry (*Lycium carolinianum*). At the transition to upland vegetation, buttonwood may be joined by a variety of shrubs and stunted trees of inland woody species including saffron plum, wild cotton (*Gossypium hirsutum*), blackbead, wild dilly (*Manilkara jaimiqui* ssp. *emarginata*), poisonwood and joewood.

Keys tidal rock barren occurs above the daily tidal range, but is subject to flooding by spring tides and storm events. Salt spray from coastal winds, as well as shallow soils, may limit height growth of woody plants. Aside from bare rock substrate, discontinuous patches of thin marl soils may be present. Depressions with deeper peat and mud soils support tidal swamp and tidal marsh communities, dominated respectively by mangroves or Gulf cordgrass (*Spartina spartinae*).

Description and assessment: Keys tidal rock barren is a rare community, occurring in scattered patches along a few shorelines in the Florida Keys. The substrate is exposed cap rock pitted with small solution holes, grading into a shoreline of jagged Key Largo limestone, or as an ecotonal community between the rockland hammock and the mangroves. In areas where the Keys tidal rock barren is close to the

shoreline, it will be inundated on a more regular basis from the twice-daily high tides. However, as a factor of sea level rise, more regular inundations have been observed in the Keys tidal rock barren habitats in the park.

Keys tidal rock barren in Pennekamp occurs on the northern end of El Radabob Key (JP-11) in the lower elevations on the western side of the coastal berm. It is also found at the south end of the park's management in zones JP-03_04_05 and in zone JP-06. The weathered caprock is pitted with numerous solution holes, which often hold water for extended periods of time. In zone JP-11 where the vegetation is sparse, this microhabitat provides important feeding grounds for wading birds. Where the vegetation is more concentrated, it consists of stunted black and white mangroves, buttonwood, saltwort (*Batis maritima*), Christmas berry, sea ox-eye daisy and glasswort. Epiphytic bromeliads (*Tillandsia* spp.) and butterfly orchids (*Encyclia tampensis*) utilize the buttonwood trees as substrate. In zones JP-03_04_05 and JP-06, the habitat is more open and consists mostly of herbaceous vegetation including saltwort, sea purslane and false mint. Typical animal species found in this habitat include great egret, white ibis, little blue heron, a variety of spiders, butterflies, raccoon (*Procyon lotor*), fiddler crab (*Uca pugilator*), and hermit crab (*Coenobita clypeatus*).

General management measures: Most of the Keys tidal rock barren at Pennekamp is in excellent condition, the greatest impact coming from debris that washes in by tides and storm events. In order to maintain this habitat in its desired future condition, continued surveys for exotic plant species infestations, unauthorized access and poaching will be an ongoing resource management objective. Because the impact from debris, which is transported by storms and tides, is a perpetual issue in coastal ecosystems, removal is a difficult task due to logistics as well as the ongoing nature of this task. However, the park will conduct debris removal to the extent possible by staff, volunteers and other resources that the park identifies.

Prior to the 2010 update of the Florida Natural Areas Inventory Guide to Natural Communities, Keys tidal rock barren and Keys Cactus rock barren were classified as one habitat, Coastal Rock Barren. However, due to differences in habitat types in the Florida Keys, this classification was further refined, and although many of the environmental conditions are the same, the difference is the amount of tidal inundation that the habitat experiences.

Keys Cactus Barren

Desired future condition: Keys cactus barren is an open, primarily herbaceous community with scattered shrubs on rocky areas of Key Largo limestone with little soil or leaf litter. The vegetation consists of a wide variety of herbaceous and succulent species that characteristically includes cacti, agave and several rare herbs. Such rare species include yellow hibiscus (*Cienfuegosia yucatanensis*), skyblue clustervine (*Jacquemontia pentanthos*), and Florida Keys indigo (*Indigofera mucronata* var. *keyensis*). These frequently occur with grasses and sedges, such as green sprangletop (*Leptochloa dubia*), coral panicum (*Panicum chapmanii*) and royal flatsedge (*Cyperus elegans*). Spiny species, particularly the rare three-spined pricklypear (*Opuntia abjecta*), are characteristic but their abundance is variable.

Other spiny species include false sisal (*Agave decipiens*), barbed-wire cactus (*Acanthocereus tetragonus*), and pricklypear cactus (*Opuntia stricta*). Scattered clumps of stunted trees may be present, including gumbo limbo, buttonwood, Spanish stopper and cat's claw (*Pithecellobium unguis-cati*). Keys cactus barren is a habitat that is confined to the Florida Keys.

Description and assessment: Keys cactus rock barren is a rare community, occurring in scattered patches along a few shorelines in the Florida Keys. The substrate is exposed cap rock pitted with small solution holes, grading into a shoreline of jagged Key Largo limestone or as an ecotonal community between rockland hammock and the mangrove swamp. Historically, the Keys cactus barren habitats within Pennekamp were rarely influenced by saltwater inundation, however with rising sea level, certain areas in the park have been impacted by tidal influences, particularly during the spring high tides in the fall.

At Pennekamp the Keys cactus rock barren occurs in management zone JP-18, JP-20 and JP-22 as the ecotonal community between two rockland hammock habitats. The habitat consists of stunted red, black and white mangroves, buttonwood, glasswort and many bromeliads. The Keys cactus barren located in zone JP-09 and JP-12 is the ecotonal community between the rockland hammock and mangrove swamp. This habitat is a narrow band of stunted trees including red, black and white mangroves and buttonwood. Access to zone JP-13 is limited due to the accessibility of the site so impacts from human influences is minimal or non-existent. The Keys cactus barren in JP-18 is behind the Key Largo Middle School and had been part of a natural trail prior to the redevelopment of the school. Animal species that utilize the Keys cactus rock barren include a variety of small animals including golden orb weaver (*Nephila clavipes*), silver argiope (*Argiope argentata*), zebra helconia (*Heliconius charitonius*), hermit crab, and birds.

General management measures: The Keys cactus barren in Pennekamp has achieved the desired future condition. In order to maintain this condition, the Keys cactus barren will continue to be monitored for exotic species infestations.

In the management plan approved on September 1, 2004, this habitat was described as coastal rock barren. The 2010- Florida Natural Areas Inventory Guide to Natural Communities updated habitat descriptions and further defined coastal rock barren as either Keys tidal rock barren, which is tidally influenced, or as Keys Cactus barren, which is an upland plant community that may only be influenced during extreme high tides or storm events.

Rockland Hammock

Desired future conditions: Rockland hammock is a rare tropical hardwood forest on upland sites and occurs on a thin layer of highly organic soil covering limestone. This habitat does not regularly flood, but it is often dependent upon a high water table to maintain reservoirs in solution features of the limestone and to keep humidity levels high. Organic acids dissolve the surface limestone creating eroded depressions in the rock called solution holes.

Rockland hammocks typically have larger more mature trees in the interior, while the margins are dense with growth of smaller shrubs, trees and vines. There are differences in species composition between rockland hammocks found on the mainland and in the Florida Keys. Even within the Florida Keys, there is variation and some species are found only in the upper Keys, while others are found only in the lower Keys. This is due to elevation, geologic and rainfall differences between the two regions. Typical canopy and understory species include, gumbo limbo, wild tamarind (*Lysiloma latisiliquum*), pigeon plum (*Coccoloba diversifolia*), mastic (*Sideroxylon foetidissimum*), strangler fig (*Ficus aurea*), poisonwood, several species of stoppers (*Eugenia* spp.), thatch palms (*Thrinax* spp.), torchwood (*Amyris elemifera*), marlberry (*Ardisia escallonioides*), satinleaf (*Chrysophyllum oliviforme*), and blackbead. Vines and herbaceous vegetation are less common and include greenbrier (*Smilax havanensis*) and bamboo (*Lasiacis divaricata*). Epiphytes, including orchids, ferns, and bromeliads can be found on larger trees.

Description and assessment: The rockland hammock at Pennekamp is found in the following management zones; JP-03_04_05, JP-06, JP-09, JP-12, JP-13, JP-15, JP-16, JP-17, JP-18, JP-20, JP-21, JP-22, and JP-24. The status of the rockland hammock throughout the park is dependent upon where it is located, some areas are in excellent condition while others are impacted by habitat fragmentation, encroachment, dumping, and invasion of exotic plant species. Typical canopy trees found in the hammock include gumbo limbo, strangler fig (*Ficus aurea*), poisonwood, mastic, coffee colubrina (*Colubrina arborescens*), Jamaica dogwood (*Piscidia piscipula*), and West Indian mahogany (*Swietenia mahagoni*). Understory species include lignum vitae (*Guajacum sanctum*), white stopper *(Eugenia axillaris*), Spanish stopper (*E. foetida*), soldierwood (*Colubrina elliptica*), torchwood, and crabwood (*Gymnanthes lucida*).

The imperiled Keys tree cactus (*Pilosocereus polyganus*) is found in a small hammock outcropping in zone JP-20. Until recent DNA work in 2013, this population was thought to be *P. bahamensis*. A long-term conservation partnership between Fairchild Tropical Botanic Garden, US Fish and Wildlife Service and The Florida Park Service (FPS) was established in order to protect the Keys tree cacti populations from extirpation in the Florida Keys. This small rockland hammock is situated in the middle of a mature red mangrove forest and is difficult to access. The edge and the interior of the hammock is dominated by lower elevation species including saffron plum (*Sideroxylon celastrinum*), blackbead, Spanish stopper, hog plum (*Ximenia americana*) and the imperiled dollar orchid (*Prosthechea boothiana*).

In May 2013 a local birding guide discovered a population of the endangered mahogany mistletoe (*Phoradendron rubrum*) in a subdivision adjacent to the park. Due to the long-term conservation efforts by FPS staff in protecting this species from extirpation in Dagny Johnson Key Largo Hammock Botanical State Park, this discovery was of great interest. Staff invesitigated the report and found there to be two trees with sixteen live mistletoe plants and seven dead plants. Further investigation showed that the parcel is one of several parcels managed as part of the Monroe County Conservation Land program. Staff then iniated surveys throughout the Monroe County parcels and the parcels managed by Pennekamp and

found two additional trees, one on the Monroe County right-of-way and one in Pennekamp management zone JP-18. Both host trees had two individual mistletoe plants with flower stalks and fruit. This discovery is a new species account for Pennekamp and a critically important component to the long-term conservation project of mahogany mistletoe in Key Largo.

Despite the fact that the rockland hammock in zone JP-03_04_05 is a disturbed area that is bisected by old roads, it still supports unusual species that are not found in any other area of the park. These include yellow nickerbean (*Caesalpinia major*), bird pepper (*Capsicum annuum* var. *glabriusculum*), wild hibiscus (*Hibiscus poeppigii*), the imperiled Florida Keys indigo (*Indigofera mucronata* var. *keyensis*), and segregata (*Foresteria segregata*).

The Wild Tamarind Nature Trail within the land base of Pennekamp Park (zone JP-15) provides public access to a loop trail through a rockland hammock. Wild lime (*Zanthoxylum flavum*), lancewood (*Ocotea coricea*), crabwood (*Gymnanthes lucida*), West Indian mahogany, poisonwood, gumbo limbo and wild tamarind are species found throughout this hammock. Several species not native to Pennekamp in the hammock adjacent to the nature trail. Non-native plants near the entrance, however, have been removed. In order to maintain the integrity and natural diversity of the park, these species will need to be included in the exotic plant removal plan, prioritizing target species and management zones sites.

Sections of the hammock in zone JP-17 are in fair condition where it has been impacted by multiple trails, unauthorized access and dumping. Several large solution holes on the back side of the homes on the north side of the parcel are degraded from a variety of debris dumped by adjacent homeowners. Crews conducting exotic removal have attempted to remove all of the trash, but larger items still remain. Interior of the hammock, however, is in good condition with minimal exotic infestation.

The rockland hammock in the park, even the disjunct parcels, provide important habitat for a variety of animals particularly migratory birds. The year-round residents found in this habitat include the imperiled white-crowned pigeon (*Patagioenas leucocephala*), Chuck-will's-widow (*Caprimulgus carolinensis*), *Liguus* tree snail, land crab (*Cardisoma guanhumi*), hermit crab, and a variety of butterflies including gulf fritillary (*Argraulis vanillae*), zebra heliconia, and great southern white (*Ascia monuste*).

General management measures: The majority of the rockland hammock habitats in Pennekamp are in good condition, although exotic plant and animal species removal is the primary resource management activity necessary to achieve the desired future condition. However, there are a few areas particularly in zones JP-03_04_05, JP-17, and JP-18 where boundary issues including encroachment, illegal dumping, and unauthorized access have degraded the quality of the habitat. Park staff prioritize management goals to include adequate signage along boundaries, education and outreach to park neighbors, and where possible, fencing to delineate park boundaries.

Marine Composite Substrate

John Pennekamp Coral Reef State Park was established for the protection of the submerged resources, particularly the coral reef ecosystem that was being decimated by rapid overharvesting of stony corals for curio collections. The submerged resources of the park consist of approximately 60,000 acres from the mean high water line to the three-mile state limit for a distance of twenty-four miles. The park boundary overlaps with the boundary of the Florida Keys National Marine Sanctuary (FKNMS), but an agreement with the FKNMS gives the park jurisdiction over the management of these waters. However, both park and district staff work closely with biologists and managers of the FKNMS thereby ensuring the full protection of the submerged communities both within the park boundary and in the Florida Keys National Marine Sanctuary.

The park has developed a submerged lands management plan for guiding management activities in the seagrass, mangrove, and coral reef habitats in the park. This plan is referenced in Addendum 3 of the Unit Management Plan and is available for review at the park office.

*Desired future condition***:** Marine composite substrate consists of a combination of natural communities including seagrass beds, consolidated substrate and unconsolidated substrate. Because composite substrate is a combination of community types, floral and faunal components from any of these communities may be found in the composite substrate habitat, so species diversity is often times greater than the surrounding habitats.

Description and assessment: The marine composite community forms a mosaic with associated submerged communities representing an ecotonal community where plant and animal species diversity is high. The marine composite substrate in Pennekamp persists at the northeast and southeast corners of Largo Sound, throughout South Sound and North Sound Creeks and at the southern boundary of the park. This habitat is in good condition and consists of a mixture of seagrass, macroalgae, and open, sandy substrate. Stony coral species, octocoral species, sponges, worms and anemones are more prevalent in Largo Sound where the habitat is not impacted to the same degree by strong currents that flow through the two creeks. These include rose coral (*Manicina areolata*), golfball coral (*Favia fragum*), finger coral (*Porites furcata*), Sargassum spp., shaving brush algae (*Penicillus* spp.), striate bubble (*Bulla striata*), and tulip snail (*Fasciolaria tulipa*). The marine composite substrate that persists at the south end of the park is adjacent to Rodriguez Key (zone JP-02) and is just a small portion of the larger ecosystem that falls outside of the park boundary. Species composition here is predominately a shoal of goniolithon (*Neogoniolithon* spp.), a red calcareous algae mixed with finger coral. This habitat supports a diverse array of marine organisms including juvenile fish, brittle star (*Ophiocoma echinata*), reef mantis (*Lysiosquilla glabriuscula*), shrimp and crab that utilize the fine branches of the goniolithon for protection. In recent years this shallow bank east of Rodriguez Key has become a popular spot for boaters who anchor in the seagrass and then wade in to the more shallow areas for recreation. Trampling of the submerged resources has degraded

the habitat so a different management approach is needed in order to protect the goniolithon shoal from further destruction. Pennekamp manages both Rodriguez Key and Dove Key (zone JP-01) but the submerged resources between the two islands falls within the jurisdication of the Florida Keys National Marine Sanctuary.

General management measures: The marine composite substrate in the park is subject to impacts from boat grounding events, increased recreational pressure and invasion by the exotic lionfish. Areas of high vessel traffic are closed to motorized vessels where the depth at mean high tide is four feet or less. These are delineated by No Motor Zone signs and buoys and extend from close to the southern boundary of the park to North Sound Creek. At the north end of the park, the Ocean Reef Club has installed No Motor Zone signs in the nearshore waters adjacent to their private community. In order to achieve the desired future condition of this habitat, the marine composite substrate needs to be protected from vessel impacts and the human impact of physical damage to the fragile goniolithon/*Porites* shoal. Installation of additional No Motor Zone signs may be necessary.

Marine Consolidated Substrate

Desired future condition: Marine consolidated substrate is characterized by Key Largo limestone substrate with minimal sediment accumulation. This habitat is also known as hardbottom and often time consists of a combination of macroalgae, octocoral and stony coral species. Because there is minimal sediment accumulation, seagrass does not thrive in this environment.

Description and assessment: The marine consolidated substrate in the park is scattered in the nearshore waters along the shoreline of Key Largo and El Radabob Key. This is an important community because it provides a foundation for the development of other marine communities. Seagrasses do not thrive here, instead, the marine consolidated substrate is dominated by macroalgae including; shaving brush algae, oatmeal algae (*Halimeda* spp.), fern algae (*Caulerpa* spp.), and mermaid's wine cup (*Acetabularia calyculus*); stony corals including finger coral, rose coral, lobed star coral (*Solenastrea hyades*), and starlet coral (*Siderastrea radians*); octocorals including sea whips (*Pterogorgia* spp.) and sea rods (*Plexaura* spp), Sargassum algae, sea stars, and a variety of fish common in the shallow waters of the Florida Keys. Because of the structure that the stony coral species provide along with natural solution holes in the substrate, the marine consolidated substrate provides suitable habitat for the invasive lionfish (*Pterois volitans*) that has increased in abundance and distribution throughout the Florida Keys as well as in the wider Caribbean basin. Park and District staff conduct surveys to locate and remove lionfish from park waters and park staff collaborate with the Reef Environmental Education Foundation (REEF) to eliminate this invasive species from Pennekamp waters.

General management measures: The marine consolidated substrate in Pennekamp is in good condition although it is subject to impacts from vessel groundings, water quality including run-off, increase in exotic marine species, and climatic changes resulting in coral bleaching events and increasing coral disease. In order to achieve the desired future condition, periodic surveys will be required to monitor for

potential impacts from park visitors, exotic marine species and the short-term and long-term impacts of coral bleaching events.

Coral Reef

Desired Future Condition: Coral reefs are characterized as aggregations of sessile, limestone-building coral occurring in warm subtidal waters, and are among the most diverse and productive environments in the world. Coral reefs are slow growing, provide shelter and food for a myriad of reef fishes and marine invertebrates, and are biologically and structurally sensitive ecosystems. Coral reefs consist of true stony corals, which are the primary hermatypic or reef building corals, along with an association of octocorals, macroalgae and fire coral ((*Millepora* spp.). Reef building corals include elkhorn coral (*Acropora palmata*), staghorn coral (*Acropora cervicornis*) brain coral (*Diplora* sp. and *Pseudodiploria* spp.), and star coral (*Siderastrea siderea*, *Montastraea* sp. and *Orbicella* spp.). Inshore patch reefs are typically dome-shaped with a topographic relief of 5 to 10 feet. Offshore barrier reefs, also known as spur and groove reefs, are much larger with coral formation orientated parallel to one another and separated by sections of open, sandy substrate. Barrier reefs are important structures that absorb wave energy and are the primary line of protection for shoreline.

Factors affecting the distribution of coral reefs include temperature, light penetration, turbidity, salinity, water currents, minimal nutrient levels, and availability of suitable substrates. Most corals are very sensitive to cold temperatures, being largely restricted to seas with an average temperature between 62° and 82°F. Additionally, the water must be quite clear since the symbiotic algae living within the corals are generally restricted to water depths of less than 50 meters (164 feet). Most coral reef will occur in marine waters with salinities between 30 and 37 ppt. Water currents transport essential nutrients and remove biological waste materials and suspended sediment.

Description and assessment: The coral reefs within Pennekamp are classified as mid-channel patch reefs and occur in scattered areas east of Hawk Channel. Size and vertical relief vary depending upon reef development, but the upper surface often times lies immediately beneath the surface of the water and may be exposed during low tides, particularly during spring tides. Turtle Rocks, located at the northern end of the park, is an exception in its configuration and should not be classified as a patch reef but as a shelf reef. Elkhorn coral, a large branching coral and one of the major reef builders on the outer reefs, does not develop in the inshore patch reefs. However, as a result of transect surveys conducted at Turtle Rocks in 2012 several colonies of elkhorn coral were discovered along with over 3,000 colonies of staghorn coral and several colonies of the hybrid fused staghorn coral (*Acropora prolifera*). Both elkhorn coral and staghorn coral abundance and distribution throughout the Florida Keys has declined due mainly to disease. Staghorn coral was once widespread throughout Pennekamp, however, the population was not only impacted by white plague disease, but more recently, by the cold water event in 2010 which caused the die-off of all known colonies. Therefore, the survival, health, and abundance of the population at Turtle rocks is

significant. Since the 2010 die-off, staghorn coral recruits have been observed at several patch reef sites.

The major reef building species in Pennekamp are the boulder corals and include; blushing star coral (*Stephanocoenia intersepta*), boulder star coral (*Montastraea* and *Orbicella* spp.), smooth star coral (*Solenastrea bournoni*), mustard hill coral (*Porites astreoides*), starlet coral (*Siderastrea siderea*), and brain coral (*Diploria* and *Pseudodiploria* spp. and *Colpophyllia natans*). These provide the limestone framework structure that is important for the organisms that rely on the coral reef for food and shelter. Smaller stony coral species include; finger coral, tube coral (*Oculina* spp.), lettuce coral (*Undaria agaricites*), knobby cactus coral (*Mycetophyllia aliciae*), and smooth flower coral (*Eusmilia fastigiata*). Other components of the coral reef include octocorals, sponges macroalage, crustaceans, worms, mollusks, echinoderms and 140 of the approximately 500 species of fish found in the waters surrounding the Florida Keys. These include; corky sea finger (*Briareum asbestinum*), warty sea rod (*Eunicea calyculata*), common sea fan (*Gorgonia ventalina*), sea feather (*Pseudopterogorgia bipinnata*), tube sponge (*Callyspongia vaginalis*), vase sponge (*Ircinia campana*), red boring sponge (*Cliona lampa*), fire sponge (*Tedania ignis*), queen conch (*Strombus gigas*), Caribbean reef squid (*Sepioteuthis sepioidea*), milk conch (*Strombus costatus*), pen shell (*Pinna carnea*), Christmas tree worm (*Spirobranchus giganteus*), common blue crab (*Callinectes sapidus*), decorator crab (*Microphrys bicornuta*), spiny lobster (*Panulirus argus*), banded coral shrimp (*Stenopus hispidus*), thorny starfish (*Echinaster sentus*), Florida sea cucumber (*Holothuria floridana*), cushion sea star (*Oreaster reticulata*), West Indian sea egg (*Tripneustes ventricosus*), long-spined urchin (*Diadema antillarum*), spotted eagle ray (*Aetobatus narinari*), tiger shark (*Galeocerdo cuvier*), bonnethead shark (*Sphyrna tiburo),* sergeant major (*Abudefduf saxatilis*), scrawled filefish (*Aluterus scriptus*), queen triggerfish (*Balistes vetula*), blue runner (*Caranx crysos*), porcupinefish (*Diodon hystrix*), Nassau grouper (*Epinephelus striatus*), queen angelfish (*Holacanthus ciliaris*), and black grouper (*Mycteroperca bonaci*).

Although coral reefs are scattered throughout the park, two large areas have a high aggregation of patch reefs; Mosquito Banks located at the southern end of Pennekamp offshore of Key Largo, and Basin Hill Shoals located inshore of Carysfort Reef towards the northern end of the park offshore of Dagny Johnson Key Largo Hammock Botanical State Park. In addition to the shelf reef at Turtle Rocks, other reef assemblages include Cannon Patch, Three Sisters, and Hidgons Reef.

In 1990 in response to impacts to the coral reefs in Pennekamp the District biology staff developed a coral reef carrying capacity study at Mosquito Banks (zone JP-S4) and Basin Hill Shoals (zone JP-S2). The purpose of this research project was to study selected reefs in the park for long-term impacts by both human use and natural events, which would help determine if temporary reef closures would be warranted. This was accomplished by setting up three parameters for reef access; installation of mooring buoys which delineated the presence of the reef as well as providing a safe anchorage for vessels, installation of Research Only buoys which closed the reefs to all access with the exception of the work conducted as part of

this project, and reefs that were left unmarked, which meant use of or damage to the reefs would be a result of the navigational skills of the boat operators. Mooring buoys were installed at two sites, Research Only buoys were installed at two sites, and the remaining four sites were left unmarked. This enabled staff to compare use and impacts according to how visible the reef was to the general public.

In order to identify the reef sites for this study, aerial photographs were taken at Mosquito Banks and Basin Hill Shoals. The reefs were compared by analyzing the aerials and by visual inspection for consistency in size and structure of reef, species composition and diversity of stony corals. Five sites were selected at Mosquito Banks and three sites were selected at Basin Hill Shoals. Stony corals were identified, mapped, photographed and measured at the Research Only sites. The bearings of each coral head were also taken in relation to reference stakes that were installed on the reefs. This provided important reference point information so that staff could easily re-visit coral heads to make specific comparisons due to impact, disease or damage over time, and enabled consistent photo point documentation.

Surveys were conducted bi-monthly beginning in 1992. Data collection consisted of presence/absence of disease; bleaching; human influenced damage including boat grounding or propeller damage and debris; natural damage including fish or worm predation; and damage from storm events. Data was recorded by all surveyors and entered into a Lotus database. Months when reef surveys were not conducted staff monitored vessel activity during peak weekend hours. This enabled staff to extrapolate the activity and amount of use that each site experienced which was then compared with the data collected from the surveys. Annual reports were compiled until the project was put on hold in 1998.

The Florida Keys, like the rest of Florida, have been subject to an increase in tropical storm activity since Hurricane Andrew in August 1992. Storm events have become more frequent in both intensity and frequency, particularly since 1998 with the most activity in 2004 and 2005. Changes in reef structure are becoming more prevalent worldwide due to decreasing water quality, rising sea surface temperatures, changes in chemical composition, and increasing occurrences of coral bleaching and disease. Although staff participate in The Nature Conservancy's Reef Resilience Project to monitor for bleaching events during the peak of the summer, this project only captures a small subset of data from randomly selected reefs. Therefore, in order to determine the status of the reefs within Pennekamp, and to compare the current conditions with the data collected from the 1990s study, the carrying capacity project was re-established in 2009 utilizing the same parameters and protocols for comparison of changes over time. This will not only assist in resource management decisions, but will also be a tool in understanding how the reefs are responding to influences on a local, regional and global scale.

Due to the 11-year gap in data, baseline surveys were conducted to establish current reef condition. Surveys were conducted in the spring of 2009 by placing belt transects randomly throughout each reef documenting all stony corals one meter to one side of the transect. The goal of these surveys was to establish stony and

octocoral densities; species occurrence; condition; percent live coral coverage; number of isolates; presence/absence of disease; presence/absence of the long-spined urchin; presence/absence of the orange boring sponge; presence/absence of the zooanthid Palythoa (*Palythoa caribaeorum*) an aggressive spatial competitor; coral bleaching; damage due to fish or worm predation or boat grounding events; and overgrowth on stony corals by macroalgae or sponges. By conducting the surveys using this method, we were able to capture a significant subset of the total species composition, distribution, and abundance at each reef site (Duquesnel, J.A. 2009).

Regular bi-monthly surveys were initiated post the baseline surveys in July 2009 and were conducted until 2012. Coral bleaching data was entered into the Mote Marine Laboratory Bleach Watch database.

In January 2010, there was a six-day period where sea surface temperatures maintained a lower than average rate due to an extended cold front. Mid-channel patch reefs were adversely impacted as many coral species were unable to withstand the extended cold temperatures. Instead of the progression of colonies being affected by bleaching, many coral colonies sloughed off their tissue and died. This event was unlike summer bleaching events where coral colonies may show paling, partial bleaching or full bleaching, some of which are resilient enough to recover. Many species of coral are able to withstand coral bleaching, however, bleaching can lead to the onset of disease or mortality if the sea conditions do not return to the narrow parameters that coral can tolerate. The purpose of the TNC Reef Resilience Project (FRRP) is to monitor these events long-term and to determine which species of stony coral are more susceptible and less resilient to bleaching events. Coral bleaching is a natural occurrence; however, the frequency and severity of summer bleaching has increased in recent years along with an increase in the presence of coral disease. The FRRP includes multiple agencies to monitor the Florida Reef Tract for such events based upon geographic region and location of reef sites within the nearshore and offshore waters. Park and District staff have been involved with this program since it was initiated in 2005.

A paper published in 2011 (Diego Lirman, et. al, 2011*)* discusses the effects of the January 2010 cold weather event linked with the long-term study of the FRRP. The data shows that the inshore patch reefs have been experiencing lower levels of coral bleaching than the offshore reefs during the summer bleaching months. Therefore, scientists were hopeful that these inshore reefs would provide adequate germplasm to both the inshore and offshore reefs thereby increasing the chance for successful recruitment and long-term coral survival. With such a high rate of mortality from the 2010 cold weather event, there is increased concern over successful spawning and recruitment and the long-term impacts from a potential decrease in germplasm available to the reefs off the Florida Keys.

The January 2010 cold weather event led to severe stony and octocoral die-off in John Pennekamp Coral Reef State Park, particularly Mosquito Banks. Belt transect surveys conducted after the die-off estimated a loss of between 75%-80% live stony coral coverage at the five research sites at Mosquito Banks. In addition to

loss of live coral coverage species diversity decreased at Mosquito Banks with starlet coral (*Siderastrea siderea*) becoming the predominant stony coral. Other changes documented at these five sites post January 2010 was an increase in the population of the brown alga species *Padina sanctae-crucis* which recruited onto the recently dead coral colonies; an increase in abundance of orange boring sponge, and a die-off of octocoral colonies although juvenile *Gorgonian* recruits have been observed since the July 2011 surveys.

Basin Hill Shoals, which is located approximately nine miles north of Mosquito Banks and offshore of Dagny Johnson Key Largo Hammock Botanical State Park did not exhibit the same rate of coral mortality or loss of species diversity.

To better quantify the changes that had occurred as a result of the 2010 cold weather event, updated baseline surveys were conducted in July 2011. Survey protocols were consistent with those utilized during the baseline surveys conducted in 2009. It is important to note that the data shows an increase in abundance in starlet coral at Mosquito Banks not because of an actual increase in the number of individuals, but due to the loss of coral tissue on large coral heads leading to an increase in the number of isolates.

The marked increase in the number of isolates of starlet coral recorded at Mosquito Banks produced an artificial loss of 27% of live coral coverage. However, if this species is removed from the data there is an 81% loss of live coral coverage which is more consistent with the belt transect observations of coral mortality at the five research sites. Species diversity between 2009 and 2011 decreased by 53%.

Surveys at Basin Hill Shoals illustrated an increase in the percent of live coral coverage, and a loss of species diversity of only 6% between 2009 and 2011 (Duquesnel, J.A. 2011).

No colonies of the imperiled staghorn coral that were persisting at the eight research sites survived the 2010 cold weather event. However, colonies were observed during the Florida Reef Resilient surveys conducted in August 2011 at Turtle Rocks in zone JP-S1. Staghorn coral was also observed during the September 2011 surveys at the research site at Basin Hill Shoals.

In 2018, a severe coral disease outbreak affected the corals of the park. Disease surveys are being conducted to monitor for spread of impact or improvement of conditions. Additional research on the disease outbreak is pending.

General management measures: The coral reefs in Pennekamp are in poor to good condition depending upon their location in the park. This is due to numerous stressors which are locally, regionally, or globally influenced. Therefore, it is difficult to project the best management measures necessary in order to bring the coral reefs within the park to their desired future condition. Several management practices are already in place including the presence of mooring buoys at the more popular reefs in order to minimize or eliminate damage from boat anchors. “Danger Shallow Reef” signs, mooring buoys, and other navigational aids are maintained by

the park. The coral carrying capacity surveys are no longer conducted bi-monthly, but it is recommended that they be conducted bi-annually or annually in order to provide additional data to the data that has been collected over the 20-year period of this project. Index reef sites have been identified in the park and random reefs have been selected for a coral monitoring program that will focus on annual surveys monitoring for diversity, structure, rugosity, bleaching, disease and presence/absence of long spined urchin *(Diadema antillarum*). Participation in the Florida Reef Resilience Project is ongoing. Education and interpretation on coral reef protection is being developed. Coral reef restoration is conducted where possible post coral grounding events. Park staff have collaborated with researchers to outplant staghorn coral on specific reef sites.

A secondary use that has been identified by the park is the establishment of a coral nursery either as an in-situ or ex-situ collection. This coral nursery would be used for future restoration of the coral reef, which has been impacted by physical damage, increased coral bleaching, and increased disease. Although this is a suitable secondary use for the park's resources, several non-profit organizations have successfully established coral nurseries in the Florida Keys. Stock from these nurseries are being outplanted both within park waters and within the surrounding waters of the Florida Keys National Marine Sanctuary. As a result, a coral nursery established as part of Pennekamp is not being considered at this time, but may be a resource management tool that the park will utilize in the future if staff determines that it is a necessary resource management tool for coral restoration.

State Statute rule 68B-24.0065 enacted by the Florida Fish and Wildlife Commission (FWC) established Special Provisions for John Pennekamp Coral Reef State Park. These provisions include the closure of lobster harvesting anywhere in Pennekamp during the two-day sport season, and the closure of lobster harvesting on coral formation protection zones. Park staff have reevaluated the GPS boundaries set forth in the State Statute, and will work with FWC on revising the Statute to better delineate the coral reef habitats. Staff conduct marine debris removal particularly on reef structures, to minimize or eliminate the potential for impact to corals.

Park and District staff conduct lionfish removal workdays, and park staff have collaborated with the Reef Environmental Education Foundation to remove lionfish within park waters. These efforts will reduce the potential catastrophic impact to the coral reef ecosystem from this non-native invasive species.

In addition to the FWC law enforcement, the park has collaborated with the U.S. Coast Guard to provide additional presence on the water. This additional presence will provide an educational opportunity for park visitors by assisting boaters with navigational skills in order to prevent additional damage to coral.

On a larger scale, the Florida Keys are moving from a septic tank system for waste disposal to a centralized sewage treatment system. This will have a positive impact on the water quality of both the nearshore and offshore waters of the park.

Seagrass Bed

Desired future condition: Seagrass beds are typically characterized as expansive stands of vascular plants and are one of the most productive communities in the world. Seagrass beds occur in clear, coastal waters where wave energy is moderate. The three most common species of seagrass in Florida are turtle grass (*Thalassia testudinum*), manatee grass (*Syringodium filiforme*), and shoal grass (*Halodule wrightii*). Johnson's grass (*Halophila* spp.) may be intermingled with the other seagrasses, but species of this genus are considerably less common in the Florida Keys.

Seagrass beds require unconsolidated substrate in order to establish their underground biomass root structure. They are typically found in waters ranging from 20° to 30°C (68° to 86°F), and require clear water for photosynthesis. Seagrass beds do not thrive where nutrient levels are high because of increased turbidity and competition of undesirable algae species.

Seagrass beds provide important habitat for a host of commercially and recreationally important species including the Florida spiny lobster, queen conch, stone crab (*Menippe mercenaria*) and shrimp. Information from the Florida Fish and Wildlife Conservation Commission's Annual Landings Report for 2006 estimated that the harvest of the six major recreational and commercially important species was $25.8 million in the Florida Keys. All of these species rely on the marine grass bed for part or all of their life cycle. Larger predators such as the loggerhead turtle (*Caretta caretta*), green turtle (*Chelonia mydas*), hawksbill turtle (*Eretmochelys imbricata*), West Indian manatee (*Trichechus manatus*), and bottlenose dolphin (*Tursiops truncatus*) utilize the seagrass beds.

Most species migrate between the coral reef, seagrass beds and mangrove communities on a diurnal, seasonal or life cycle pattern. Seagrass stabilize sediment, cycle nutrients, and the seagrass blades trap suspended sediment in the water allowing clear water to be transported to the offshore coral reefs during tidal movement.

Description and assessment: The three species of seagrass found in the park are turtle grass, shoal grass, and manatee grass. Turtle grass is the climax species while shoal grass and manatee grass are the pioneer species and first to colonize into open and/or disturbed sites. Shoal grass has a greater tolerance for salinity and temperature fluctuations and is therefore typically found in areas where extreme conditions occur nearshore and in areas of minimal water depth. The morphology of its root structure enables shoal grass to effectively colonize open or disturbed areas stabilizing the sediment for the heavier rooted turtle grass. Manatee grass can be found in association with the other two species but is far less common in the park.

Macroalgae are found in association with the seagrass community although they are not as abundant in a climax seagrass bed that is predominantly a monoculture of turtle grass. These include shaving brush algae, oatmeal algae, Fan algae (*Udotea* spp and *Avrainvillea* spp.), mermaid's wine cup, fern algae and *Batophora oerstedii*.

Several non-reef building species of coral can be found in this habitat including finger coral, rose coral, ivory tube coral, golfball coral, and lobed star coral. These species are present in the offshore coral reef habitat, but they are also able to persist in the seagrass beds because they are tolerant of higher salinity, higher water temperature, and a greater amount of suspended sediment in the water column than most coral species. Other animals found in the seagrass include echinoderms, crustaceans, fish, worms, sponges, and epiphytic species that attach themselves to the turtle grass blades.

The seagrass beds make up approximately 84 percent; 50,506 acres of the approximately 60,000 acres of submerged land within the park. Aerial photographs were taken in 1994, 1997 and 2005 and along with current technology, can be utilized to analyze the trend of damage within the park, and to establish a list of seagrass restoration priorities. A Seagrass Restoration Plan (Duquesnel, J.A. 2011), a component of the Submerged Land Managed Plan is already in place and defines the goals, methods and objectives for seagrass restoration. This plan is based upon the seagrass restoration work that has been conducted at Lignumvitae Key Submerged Land Managed Area since 2005.

No Motor Zone signs and buoys delineate the areas that are four feet or less in depth at mean high tide; Airport Flats (zone JP-S4), South Sound Creek (JP-S4), Largo Sound (JP-S5), and North South Creek (JP-S3). Despite these and other aids to navigation including channel markers, vessel groundings regularly occur, causing damage to the seagrass root and rhizome structures, and in extreme cases, causing topographic damage to the seagrass bed. Injury features develop in the form of propeller scars, vessel impressions, blowholes, and berms. It has been documented that it can take a damaged seagrass flat 10-60 years to recover to its climax community (Engeman, et. al. 2008). If topographic damage is greater than twenty-centimeters in depth, the natural recovery will not occur because the seagrass rhizomes are unable to grow with that great a vertical relief. Over time erosion caused by tidal movement and currents will increase the size of the original injury footprint and there will be continued loss of habitat.

An area of seagrass bed at the south end of the park by Rock Harbor is an unauthorized anchorage for live aboard vessels. In the early to mid-2000s this anchorage was investigated by law enforcement officers and District biological staff for impacts to the submerged resources, but was not pursued by law enforcement despite the documented damage to the park's resources. Damage to the seagrass is a result of multiple factors including improper anchoring methods, discharge of sewage into park waters, and extended shading of the plant community. This site needs to be re-evaluated to determine the best management practices in order to protect the resources of the park.

General management measures: Although protection of the resource to prevent damage is a top priority, seagrass restoration is also crucial to repair existing damage and to achieve the desired future condition of the seagrass habitat in the park. Seagrass beds found in the deeper waters in the park or in the mangrove creeks are in excellent condition. However, those found adjacent to navigational

channels and in the shallow flats are subject to impacts from vessel groundings and are in fair to poor condition. Establishing seagrass restoration at Pennekamp is a high priority in the park and will be implemented as part of the Submerged Management Plan.

In addition to restoration measures, the park will continue to maintain aids to navigation markers and No Motor Zone signs. It will also be important to determine whether additional No Motor Zone signs are necessary by analyzing aerial photographs as well as current technology to evaluate sites of concentrated damage. All submerged resources in the park provide critical habitat for a variety of flora and fauna. To protect these resources, any impacts, whether direct or indirect, need to be carefully managed. These include physical impacts from boats and boat propellers, as well as indirect impacts from shading via structures such as docks.

Mangrove Swamp

Desired future condition: Mangrove swamp is typically a dense forest occurring along relatively flat, low wave energy, marine and estuarine shorelines. The dominant overstory includes red mangrove, black mangrove, white mangrove, and buttonwood. These four species can occur either in mixed stands or often in differentiated, monospecific zones based on varying degrees of tidal influence, levels of salinity, and types of substrate. Red mangroves typically dominate the deepest water, followed by black mangrove in the intermediate zone, and white mangroves and buttonwood in the highest, least tidally influenced zone. Mangroves typically occur in dense stands (with little to no understory) but may be sparse, particularly in the upper tidal reaches where salt marsh species predominate. When present, shrub species can include seaside oxeye (*Borrichia arborescens, B. frutescens*), gray nicker (*Caesalpinia bonduc*), coinvine (*Dalbergia ecastaphyllum*), vines including rubbervine (*Rhabdadenia biflora*), and herbaceous species such as saltwort (*Batis maritima*), shoregrass, perennial glasswort (*Sarcocornia perennis*), and giant leather fern (*Acrostichum danaeifolium*). Soils are generally anaerobic and are saturated with brackish water at all times, becoming inundated at high tides. Mangrove swamps occur on a wide variety of soils, ranging from sands and mud to solid limestone rock. Soils in South Florida are primarily calcareous marl muds or calcareous sands and along Central Florida coastlines, siliceous sands. In older mangrove swamps containing red mangroves, a layer of peat can build up over the soil from decaying plant material primarily red and black mangrove roots.

Description and assessment: The majority of the mangrove swamp at Pennekamp is in excellent condition with some damage occurring along the edges of North Sound and South Sound Creeks. In these navigational channels boat grounding events have resulted in the destruction of mangroves, and in some cases leaving large, long-lived scars. Several mangrove restoration projects have been conducted by the park to restore these areas and to prevent erosion where the mangrove roots are no longer helping to support the substrate.

Mangrove swamp occurs in numerous management zones – JP-01, JP-02, JP-06, JP-07, JP-09, JP-10, JP-11, JP-12, JP-13, JP-14, JP-15, JP-16, JP-17, JP-18, JP-19, JP-20, JP- 22, JP-23, and JP-24. It is the shoreline habitat along North Sound and

South Sound Creek along the undeveloped shoreline of Key Largo, and surrounding Dove Key, Rodriguez Key, El Radabob Key, Egret Island, Rattlesnake Key, Palo Alto Key, and numerous other mangrove islands. Typically, red mangroves are the dominant cover as they are most adapted to growing with their roots in the water. Black and white mangrove are typically found inland of the shoreline along with mangrove associates including saltwort and glasswort. Only in areas where the mangrove swamp is infrequently inundated by storm surges or tidal events will you find a greater diversity of species including spider lily, nickerbean, buttonwood, orchids and bromeliads. This is the area, however, that is most prone to invasion of exotic species, particularly Brazilian pepper, Australian pine, beach naupaka, latherleaf, and Portia. Several exotic removal projects have been conducted on El Radabob Key, Dove Key, and in the transitional mangrove areas. Follow-up treatment is a priority for park staff.

Mangroves play an important role in the marine and estuarine ecosystems of the Park. They are the primary producers establishing food cycles. Mangroves also provide food and shelter to important commercial and recreational marine species. Over 220 fish species have been recorded utilizing mangrove ecosystems at some point during their lifecycle. A wide variety of birds use mangroves for nesting, roosting, and protection from predators and the elements. Mangroves also serve to baffle storm and wave energy and possess an extensive root system that helps to stabilize the shoreline. Mangrove ecosystems act as sinks (net accumulators) for a variety of elements, including nitrogen, phosphorous, trace elements, and heavy metals. These elements are filtered from the water by the concerted actions of mangrove prop roots, prop root algae, the associated sediments, fallen mangrove litter, the intricate root system, and a variety of sessile invertebrates (such as oysters), as well as microorganisms attached to all of these surfaces. Trimming mangroves decreases their ability to perform these important functions.
Other species found here include white-crowned pigeon, black whiskered vireo (*Vireo altiloquus*), snowy egret (*Egretta thula*), brown pelican (*Pelecanus occidentalis*), white ibis (*Eudocimus albus*), and roseate spoonbill (*Platalea ajaja*).

Because the coral reefs offshore protect the islands from high-energy wave action, mangrove swamp was the dominant shoreline habitat prior to development of the Florida Keys. In addition to damage from boat grounding events, these areas are also subject to debris washed in by tides and storm surges.

General management measures: In order to achieve or maintain the desired future condition, the mangrove swamp in Pennekamp needs to be protected from boat grounding events; be regularly monitored and treated for exotic plant species infestation; and remove marine debris that is washed ashore by tides or storm events. Because the impact from debris is a perpetual issue in coastal ecosystems removal is a difficult task due to logistics as well as the ongoing nature of this task. However, the park will conduct debris removal to the extent possible by staff, volunteers and other resources that the park identifies. Mangrove restoration in the form of replanting red mangrove propagules has been conducted in areas that have been identified where significant damage has occurred. Additional restoration is a management tool that will aid the mangrove swamp to maintain the structure and

integrity of the ecosystem. Educational signage assists park visitors in understanding the value of and the need for protecting this ecosystem.

Mangroves grow in a harsh environment under metabolically stressful conditions. The soil is low in oxygen and highly saline. Tidal fluctuations expose the root system. Mangroves must also maintain a salt balance between the salinity of the water and soil and what is needed for internal functions. Trimming further stresses the tree and renders a potentially fatal impact.

Mangroves are designated as essential fish habitat (EEF) and habitat areas of particular concern (HAPC) by the South Atlantic Fishery Management Council (SAFMC). HAPCs are rare, particularly susceptible to human-induced degradation, ecologically important, and most often found in an environmentally stressed area. The negative impacts of mangrove trimming to the globally significant submerged resources of the Florida Keys necessitates a concerted effort between environmental regulators and conservation lands managers in order to ensure a healthy ecosystem, and in turn, a healthy local economy.

Marine Unconsolidated Substrate

Desired future conditions: Marine unconsolidated substrates are characterized as expansive, relatively open areas of subtidal, intertidal, and supratidal zones that lack dense populations of sessile plant species. Unconsolidated substrates are unsolidified material and include coral, algae, marl, mud, mud/sand, sand or shell. This community may support a large population of infaunal organisms as well as a variety of transient planktonic and pelagic organisms. While these areas may seem relatively barren, the densities of infaunal organisms in subtidal zones can be quite numerous, making this habitat an important feeding ground for many bottom feeding fish. Unconsolidated substrates are important because they form the foundation for the development of other marine communities.

Description and assessment: The unconsolidated substrate in Pennekamp occurs in the larger navigational channels, along the edges of seagrass beds, in Hawk Channel, and as a naturally occurring halo interspersed between seagrass beds and individual patch reefs. Although this habitat type appears barren, it supports a diverse array of infaunal organisms including echinoderms, worms, mollusks, shrimp and crabs. Because of the presence of these organisms, the unconsolidated substrate is an important feeding ground for bottom-dwelling fish, invertebrates and, in nearshore areas, wading birds.

In the northwest corner of Largo Sound (zone JP-S5) between the Marvin D. Adams Waterway, Taylor Creek and North Sound Creek is an area of fluctuating vegetative seagrass cover. This area was first observed in the mid-1990s as large patches of healthy seagrass began peeling away from the substrate. District biological staff conducted regular monitoring to determine the cause of this phenomenon and to monitor the progress of the seagrass loss. The entire benthic substrate of Largo Sound was surveyed and it was found that the substrate in this section of the sound is approximately one meter in thickness. Throughout the rest of Largo Sound, the substrate is approximately 5 centimeters or less. It was theorized that the

convergence of detrital material from the three waterways caused organic material accumulation resulting in a thick but very fine layer of substrate. Because the root structure of turtle grass is dense, it was unable to remain supported within the substrate resulting in the peeling of large mats of healthy seagrass. The turtle grass blades here are thicker than normal, which is an indication of higher than normal phosphorous. This area was resurveyed in November 2008 as a follow-up on the study. The sediment remains thick and although some recruitment has occurred, it consists mostly of macroalgae species.

Areas of unconsolidated substrate are found on the shallow grass flats due to the loss of seagrass from boat grounding events and seagrass die-off. These areas of unnaturally bare substrate are detrimental to the health of the seagrass community because of the loss of the faunal organisms that support a host of fish, invertebrates, crustaceans and mollusks, and which provides important ecological functions to the nearshore and offshore waters of the Florida Keys.

General management measures: In most areas within the park, the unconsolidated substrate is in good condition. However, where vessel groundings have impacted seagrass beds leading to bare substrate, the habitat needs to be restored. In order to achieve the desired future condition of the unconsolidated substrate, navigation markers and the No Motor Zone signs will continue to be maintained to protect the shallow submerged resources. Where unconsolidated substrate is the result of boat grounding damage, seagrass restoration needs to be undertaken.

Clearing

Desired future condition: The cleared areas within the park will be managed to minimize the effect of the developed areas on adjacent natural areas. Priority invasive plant species (FLEPPC Category I and II species) will be removed from all cleared areas.

Description and assessment: Not all of the land that is part of Pennekamp is contiguous, and there are several management zones that are within or adjacent to subdivisions. These “edge” areas create a challenge to management as they are often subject to unauthorized access, dumping and exotic species infestations. In addition to these edges, cleared areas in the park include portons of the land base, the Grove and the Shaw tract (zones JP-15 and JP-16).

The Grove was once used by the Shaw family, who were the former owners of this parcel of land, as an orchard for tropical fruits including mangos, Key limes, and avocados. Although these are not native to the Florida Keys, they are not invasive species and do not recruit outside of the landscape. The Grove is of cultural significance and is maintained as a cultural landscape.

The Shaw tract includes the park manager’s residence and a large fill area adjacent to the dredged boat basin. This land was once infested by exotic species particularly Australian pine, but numerous exotic removal projects were conducted and native species have recruited into the site. Exotic follow-up treatment continues by park staff.

Egret Island (zone JP-14) has been restored and both upland and wetland vegetation are recruiting into the site.

General management measures: In order for the cleared areas to be in their desired future condition exotic removal projects must remain a priority. The exception are the fruit trees that are part of the cultural landscape in the Grove.

In addition, regular inspections of all of the properties within the park will continue to monitor for unauthorized access, dumping, and exotic species infestations. Park Boundary signs will be maintained to identify the parcels as part of the park. Fencing should be considered where possible.

Spoil Area

Desired future condition: The spoil area is a location in the park where dredged or spoil material is deposited and which may re-colonize with native and non-native vegetation. Spoil areas will be managed to remove priority invasive plant species (FLEPPC Category I and II species). Other management measures include limited restoration efforts designed to minimize the effect of the spoil areas on adjacent natural areas. Cost-effectiveness, return on investment and consideration of other higher priority restoration projects within the park will determine the extent of restoration measures in these areas.

Description and assessment: The spoil areas in the park include the islands in Largo Sound (zone JP-S5), along the edge of South Sound Creek (zone JP-S4), in North Sound Creek (zone JP-S3), and Dynamite Island (zone JP-S2). These spoil islands are a remnant of dredging activities, and although they are small, they provide resting areas for birds where vegetation has not recruited. However, successful bird nesting becomes difficult due to access by park visitors mostly via canoe or kayak. Exotic plant infestation and debris are management issues on these islands. Dynamite Island is a small island that is a remnant of Dynamite Docks, which was a spoil island and fill area used to offload dynamite in the 1930s and 1940s, where it was then transported to the mainland. Dynamite Docks was created from dredged material from the adjacent submerged communities and connected to an altered shoreline in what is now Dagny Johnson Key Largo Hammock Botanical State Park. A road led from Dynamite Docks through a wetland and into the rockland hammock where it connected with old C-905. Restoration of Dynamite Docks was conducted in the mid-1990s and included removing the spoil road, restoring the wetland, and grading the shoreline to the historic elevation. The island was retained as an artificial site for shorebird nesting, specifically least terns. Despite several years of attempts by birds and the installation of signs and wooden decoys, successful fledglings were impeded by unauthorized access to the island during nesting season. Due to the remote location of Dynamite Island, enforcement of unauthorized access is difficult. Restoration is needed to remove the island and place the sediment in the hole where it was removed. This would complete the restoration of the site including restoration of the submerged resources.

General management measures: In order for the spoil areas to be in their desired future condition exotic removal, unauthorized access, dumping and debris washed in by storm events and tidal fluctuations will need to be addressed. Regular inspections of these spoil islands to monitor for management needs will be ongoing as staff conduct other resource management work in the park. Installation of park boundary signs will assist in protecting these sites in the park. The restoration of Dynamite Island will remove this spoil island and restore the seagrass habitat in the adjacent waters.

Developed

Desired future condition: The developed areas within the park will be managed to minimize the effect of the developed areas on adjacent natural areas. Priority invasive plant species (FLEPPC Category I and II species) will be removed from all developed areas.

Description and assessment: The developed areas in the park include seven residences, the main park entrance and facilities (zone JP-15) including the Ranger Station, Administration building, park shop buildings, Visitor Center, nature trails, man-made beaches, parking lots, park boathouse, marina, concession buildings and campgrounds. The facilities for the Dagny Johnson Key Largo Hammock Nursery are situated behind the Administration Building and include a shade house, work tables, and an average of 3,000 native plants that are grown by volunteers for restoration, education and outreach, and landscaping projects. The Visitor Center contains a 30,000-gallon aquarium; five smaller aquariums several of which contain live coral rescued from boat grounding events; miscellaneous collections (to be described in the Cultural Resource Section); terrestrial displays; and an 88-seat auditorium. In addition to regular education videos available to the public for viewing, the auditorium is used for educational presentations and classes, and is the venue for the Dagny Johnson Key Largo Hammock Botanical State Park annual Delicate Balance of Nature Lecture Series held from January through March.

Developed areas also include dredged borrow pits that are found within management zones JP-21 and JP-22, although not all of the borrow pit in zone JP-21 falls within the boundary of the park. The boat basin in zone JP-15 is associated with the Shaw tract. Restoration of these sites is addressed in Natural Communities Management section of this plan.

The Cannon Beach located near the Visitor Center is a swimming area within Largo Sound that allows for safe access from boat traffic. Three cannons from the HMS Winchester, which ran aground at Carysfort Reef in 1695, are displayed on the beach. In the early 1980's cannons from a 1715 Spanish fleet shipwreck were retrieved and placed in five to eight feet of water in order to protect these historic resources from looting or theft, and to provide the public with an easy and safe opportunity to observe the remnants of a shipwreck. In addition to the cannons, an anchor from the 1733 Spanish fleet shipwreck and some ballast stones were relocated to the submerged waters off Cannon Beach. Visitors to the park can safely snorkel over the replicated wreck site and the artifacts are protected from deterioration and looting.

Located at the entrance of North Sound Creek from the Florida Straits is a concrete barge. This structure provides habitat for many marine organisms including lobster, fish and the non-native invasive lionfish. Lionfish continue to be removed as part of the park's eradication program.

General management measures: In order to achieve the desired future condition of the developed areas in the park, exotic removal projects will be an ongoing priority for the park. The exception will be the fruit trees in the Grove that are part of the cultural landscape. Efforts to restore borrow pits within the park by accepting source-separated clean fill is a compatible restoration technique that will be considered on a case-by-case basis.

Imperiled Species

Imperiled species are those that are (1) tracked by FNAI as critically imperiled (G1, S1) or imperiled (G2, S2); or (2) listed by the U.S. Fish and Wildlife Service (USFWS), Florida Fish and Wildlife Conservation Commission (FWC) or the Florida Department of Agriculture and Consumer Services (FDACS) as endangered, threatened or of special concern.

Known naturally occurring imperiled plant species were mapped in 1998/1999 using a Trimble GPS unit. These were recorded either as individual occurrences, or as polygons occurring within a natural community. This information will be updated when significant alterations to the habitat occur such as tropical storm or hurricane events. Locustberry (*Byrsomina lucida*) and semaphore cactus (*Consolea corallicola*) are cultivated species because they only occur as part of the residential landscape. Manchineel (*Hippomane mancinella*) is a cultivated species because it has been planted in the park. Maidenbush is a species that is historically native only to the lower Keys. There are no conservation goals for these species within the park, and because they occur outside of their historic range, they should be considered within the removal priority for the park. This will ensure plant species integrity and diversity at Pennekamp.

The population of Keys tree cactus found in zone JP-20 was believed to be *Pilosocereus bahamensis*, but DNA research conducted in 2013 identified the population to be *P. polyganus*. The population occurs on a small outcropping located in the middle of a mature red mangrove forest. This population and all of the populations in the Florida Keys are part of a Keys wide conservation project in collaboration with Fairchild Tropical Botanic Garden, US Fish and Wildlife Service and the Florida Park Service. Red stopper (*Eugenia rhombea*), redberry stopper (*Eugenia confusa*), Florida Keys indigo (*Indigofera mucronata* var. *keyensis*) and pearlberry (*Vallesia antillana*) are signficiant species in the park because they are uncommon throughout their historic range in the Florida Keys.

The recent discovery of mahogany mistletoe in Pennekamp is an important component to the long-term conservation project conducted by FPS staff in Dagny Johnson Key Largo Hammock Botanical State Park. This population is included in

the monthly monitoring schedule, for further details on this project, see the Unit Management Plan for Dagny Johnson Key Largo Hammock Botanical State Park.

In 2014, the National Oceanographic and Atmospheric Administration (NOAA) listed several Caribbean coral species as threatened under the Endangered Species Act. These coral species, elkhorn (*Acropora palmata*), staghorn (*A. cervicornis*), fused staghorn (*Acorpora prolifera*), lobed star coral (*Orbicella annularis*), mountainous star coral (*O. faveolata*), boulder star coral (*O. franksi*), and large flower coral (*Musa angulosa*) will be monitored as part of the coral monitoring projects, and as part of The Nature Conservancy's Florida Reef Resilience Project.
The Stock Island tree snail (*Orthalicus reses reses*) occurs in the park because of what was supposed to be a temporary relocation project. However, the researcher neglected to conduct the follow-up work on these individuals, most importantly which was to remove them from their temporary location between the Ranger Station and the Administration building, and to relocate them to an appropriate site within their historic range in the lower Keys.

The population of American crocodile (*Crocodylus acutus*) has expanded throughout the Florida Keys. Individuals can be observed along several shorelines in the park.

The current population of the Key Largo woodrat (*Neotoma floridana smalli*) is restricted to rockland hammock in north Key Largo in Crocodile Lake National Wildlife Refuge and Dagny Johnson Key Largo Hammock Botanical State Park. Staff from Florida Fish and Wildlife Conservation Commission, U.S. Fish and Wildlife Service, Florida Park Service, Lowry Zoo, Walt Disney's Animal Kingdom, and numerous researchers from a variety of academic institutions have been involved in the long-term study and protection of the Key Largo woodrat and the Key Largo cotton mouse (*Peromyscus gossypinus*) due to their limited habitat range and fluctuating/declining population numbers. A captive breeding program was established with individuals housed both at Lowry Zoo and the Animal Kingdom facility at Disney World. Releasing the woodrats into north Key Largo has met with limited success in part due to non-native, free roaming pets, and feral predators including domestic cats (*Felis domesticus*) and at least one Burmese python (*Python molurus bivittatus)* that have been documented as predating on woodrats. In 2011 fifteen individuals from the Disney facility were temporarily relocated where non-native predators were absent to determine their ability to survive without these threats. Scientists hoped that this would provide valuable information about the captive breeding program. Although woodrats were not historically found as far south as Lignumvitae Key, researchers had considered this island as a temporary option. Both the Key Largo woodrat and the Key Largo cotton mouse were translocated to Lignumvitae Key in the 1970s to prevent the extinction of the species with the proposed development of north Key Largo. Trappings dating back to the early 1990s confirmed that the woodrat and the cotton mouse were extirpated from Lignumvitae Key. Staff recommended Palo Alto Key (zone JP-24) as a more suitable alternative due to the proximity of Palo Alto to the current population in north Key Largo. Palo Alto is within the boundaries of Pennekamp but located just north of the Ocean Reef Club at the north end of north Key Largo. There is documentation that the Key Largo woodrat was historically found south of

its current population distribution in Key Largo. Since this range falls within the boundaries of Pennekamp, this proposal would be considered a reintroduction to the park, falling within the guidelines for species distribution in the Operations Manuel. The advantage of Palo Alto is its proximity to the current population, the lack of non-native or feral predators, significant rockland hammock habitat (65 acres) which allows for territorial ranges to be established, and its isolation from human disturbance. The animals were released in late 2011. Monitoring was conducted to document survival, weight gain, reproductive maturity, and reproduction. Several individuals were fitted with radio collars and all were injected with PIT tags. Unfortunately, natural predation, believed to have been by either a great horned owl or a hawk, was documented. By February 2012 two males and one female were persisting, but by the time these individuals were to be relocated back to the main population in the Crocodile Lakes National Wildlife Refuge, only one male remained. Contact with this individual was lost when the radio collar failed so the fate of this woodrat is unknown.

Provided that current cleared or developed areas in the park are not under any constraints by restoration permits and/or restoration funding sources, these areas may be considered for the enhancement or establishment of suitable shorebird nesting habitat.

Table 2 contains a list of all known imperiled species within the park and identifies their status as defined by various entities. It also identifies the types of management actions that are currently being taken by DRP staff or others, and identifies the current level of monitoring effort. The codes used under the column headings for management actions and monitoring level are defined following the table. Explanations for federal and state status as well as FNAI global and state rank are provided in Addendum

Table 2: Imperiled Species Inventory

Common & *Scientific* Name	**Imperiled Species Status**				**Management Actions**	**Monitoring Level**
	FWC	**USFWS**	**FDACS**	**FNAI**		
PLANTS						
Locustberry *Byrsonima lucida*			LT	G4G5, S3		
Cinnamon bark *Canella winterana*			LE	G5?2	2, 10, 13	Tier 3
Semaphore cactus *Consolea corallicola*		C	LE	G1,S1		
Rhacoma *Crossepetalum rhacoma*			LT	G5,S3	2, 10, 13	Tier 3
Milkbark			LE	G4,S2	2, 10,	Tier

Table 2: Imperiled Species Inventory						
Common & *Scientific* Name	**Imperiled Species Status**				**Management Actions**	**Monitoring Level**
	FWC	**USFWS**	**FDACS**	**FNAI**		
Drypetes diversifolia					13	3
Redberry stopper *Eugenia confusa*			LE	G4G5, S2S3	2, 10, 13	Tier 3
Red stopper *Eugenia rhombea*			LE	G5,S1	2, 10, 13	Tier 3
Wild cotton *Gossypium hirsutum*			LE	G4G5, S3	2, 10, 13	Tier 3
Lignum vitae *Guajacum sanctum*			LE	G2,S1	2, 10, 13	Tier 3
Prickly apple cactus *Harrisia simpsonii*			LE	G2,S2	2, 10, 13	Tier 3
Manchineel *Hippomane mancinella*			LE	G5,S2		
Florida Keys indigo *Indigofera mucronata* var. *keyensis*			LE	G5?T1Q,S1	2, 10, 13	Tier 3
Sky-blue morning glory *Jacquemontia pentanthos*			LE	G4G5, S2	2, 10, 13	Tier 3
Joewood *Jacquinia keyensis*			LT	G4,S3	2, 10,13	Tier 3
Wild dilly *Manilkara jaimiqui* ssp. *emarginata*			LT	G4,S3	2, 10,13	Tier 3
Passionflower *Passiflora multiflora*			LE	G4,S1	2, 10,13	Tier 3
Mahogany mistletoe *Phoradendron rubrum*			LE	G4,S1	2,10	Tier 4
Tree cactus *Pilosocereus polyganus*			LE	G3?,S1	2, 10,13	Tier 4
Swartz's snoutbean *Rhynchosia swartzii*			LE	G3,S1	2, 10,13	Tier 3
Maidenbush *Savia bahamensis*			LE	G4,S2		
Florida boxwood *Schaefferia frutescens*			LE	G5,S2	2, 10,13	Tier 3
West Indian mahogany *Swietenia mahagoni*			LT	G3G4, S3	2, 10,13	Tier 3
Key thatch palm			LE	G4G5,	2,	Tier

Table 2: Imperiled Species Inventory						
Common & *Scientific* Name	**Imperiled Species Status**				**Management Actions**	**Monitoring Level**
	FWC	**USFWS**	**FDACS**	**FNAI**		
Leucothrinax morrisii				S3	10,13	3
Florida thatch palm *Thrinax radiata*			LE	G4G5, S2	2, 10,13	Tier 3
Banded wild pine *Tillandsia flexuosa*			LT	G5,S3	2, 10,13	Tier 3
West Indian trema *Trema lamarckianum*			LE	G5,S2	2, 10,13	Tier 3
Pearlberry *Vallesia antillana*			LE	G4,S1	2, 10,13	Tier 3
INVERTEBRATES						
Staghorn coral *Acropora cervicornis*	FT	LT		G2,S1	10, 13,14	Tier 3
Elkhorn coral *Acropora palmata*	FT	LT		G1G2, S1	10, 13,14	Tier 3
Fused staghorn coral *Acropora prolifera*				G2,S2	10, 13,14	Tier 3
Large flower coral *Mussa angulosa*				G3G4, S2	10, 13,14	Tier 3
Lobed or Boulder star coral *Orbicella annularis*		LT		G2,S1 S2	10, 13,14	Tier 3
Mountainous star coral *Orbicilla faveolata*		LT		G2,S1 ,S2	10, 13,14	Tier 3
Boulder star coral *Orbicella franksi*		LT		G2,S1 ,S2	10, 13,14	Tier 3
Stock Island tree snail *Orthalicus reses reses*	FT	LT		G2T1, S1		
REPTILES						
Loggerhead turtle *Carretta carretta*	FT	LT		G3,S3	10, 13	Tier 1
Atlantic green turtle *Chelonia mydas*	FE	LE		G3,S2	10, 13	Tier 1
American crocodile *Crocodylus acutus*	FT	LT		G2,S2	10, 13	Tier 1
Atlantic leatherback turtle *Dermochelys coriacea*	FE	LE		G2,S2	10, 13	Tier 1
Eastern indigo snake *Drymarchon corais cooperi*	FT	LT		G3,S3	10, 13	Tier 1

Table 2: Imperiled Species Inventory						
Common & *Scientific* Name	**Imperiled Species Status**				**Management Actions**	**Monitoring Level**
	FWC	**USFWS**	**FDACS**	**FNAI**		
Hawksbill turtle *Eretmochelys imbricata*	FE	LE		G3,S1	10, 13	Tier 1
Atlantic ridley *Lepidochelys kempii*	FE	LE		G1,S1	10, 13	Tier 1
Florida Keys mole skink *Plestiodon egregius egregius*	SSC			G5T2, S2	10, 13	Tier 1
Rim rock crowned snake *Tantilla oolitica*	ST			G1G2, S1S2	10, 13	Tier 1
BIRDS						
Limpkin *Aramus guarauna*	SSC			G5,S3	10, 13	Tier 1
Great white heron *Ardea herodias occidentalis*				G5T2, S2	10, 13	Tier 2
Short-tailed hawk *Buteo brachyurus*				G4G5, S1	10, 13	Tier 1
Piping plover *Charadrius melodus*	FT	LT		G3,S2	10, 13	Tier 2
Little blue heron *Egretta caerulea*	SSC			G5,S4	10, 13	Tier 2
Reddish egret *Egretta rufescens*	SSC			G4,S2	10, 13	Tier 2
Snowy egret *Egretta thula*	SSC			G5,S3	10, 13	Tier 2
Tricolored heron *Egretta tricolor*	SSC			G5,S4	10, 13	Tier 2
Swallow-tailed kite *Elanoides forficatus*				G5,S2	10, 13	Tier 1
White ibis *Eudocimus albus*	SSC			G5,S4	10, 13	Tier 2
Merlin *Falco columbarius*				G5,S2	10, 13	Tier 1
Peregrine falcon *Falco peregrinus*				G4,S2	10, 13	Tier 1
Magnificent frigatebird *Fregata magnificens*				G5,S1	10, 13	Tier 1
Wood stork	FE	LE		G4,S2	10,	Tier

Table 2: Imperiled Species Inventory						
Common & *Scientific* Name	**Imperiled Species Status**				**Management Actions**	**Monitoring Level**
	FWC	**USFWS**	**FDACS**	**FNAI**		
Mycteria americana					13	1
Sooty tern *Onychoprion fuscata*				G5,S1	10, 13	Tier 2
Osprey *Pandion haliaetus*	SSC			G5,S3 S4	10, 13	Tier 1
White-crowned pigeon *Patagioenas leucocephala*	ST			G3,S3	10, 13	Tier 1
Brown pelican *Pelecanus occidentalis*	SSC			G4,S3	10, 13	Tier 1
Roseate spoonbill *Platalea ajaja*	SSC			G5,S2	10, 13	Tier 1
American avocet *Recurvirostra americana*				G5,S2	10, 13	Tier 1
Black skimmer *Rynchops niger*	SSC			G5,S3	10, 13	Tier 1
Least tern *Sternulla antillarum*	ST			G4,S3	10, 13	Tier 2
Caspian tern *Sterna caspia*				G5,S2	10, 13	Tier 2
Roseate tern *Sterna dougallii*	FT	LT		G4,S1	10, 13	Tier 2
Sandwich tern *Thalasseus sandvicensis*				G5,S2	10, 13	Tier 2
MAMMALS						
Key Largo woodrat *Neotoma floridana smalli*	FE	LE		G5T1, S1	3	Tier 4
Florida manatee *Trichechus manatus latirostris*	FE	LE		G2,S2	10, 13	Tier 1

Management Actions:

1. .....Prescribed Fire
2. .....Exotic Plant Removal
3. .....Population Translocation/Augmentation/Restocking
4. .....Hydrological Maintenance/Restoration
5. .....Nest Boxes/Artificial Cavities
6. .....Hardwood Removal
7. .....Mechanical Treatment
8. .....Predator Control
9. .....Erosion Control

10. .....Protection from visitor impacts (establish buffers)/law enforcement
11. .....Decoys (shorebirds)
12. .....Vegetation planting
13. .....Outreach & Education
14. .....Other

Monitoring Level:

Tier 1. Non-Targeted Observation/Documentation: includes documentation of species presence through casual/passive observation during routine park activities (i.e. not conducting species-specific searches). Documentation may be in the form of *Wildlife Observation Forms*, or other district specific methods used to communicate observations.

Tier 2. Targeted Presence/Absence: includes monitoring methods/activities that are specifically intended to document presence/absence of a particular species or suite of species.

Tier 3. Population Estimate/Index: an approximation of the true population size or population index based on a widely accepted method of sampling.

Tier 4. Population Census: A complete count of an entire population with demographic analysis, including mortality, reproduction, emigration, and immigration.

Tier 5. Other: may include habitat assessments for a particular species or suite of species or any other specific methods used as indicators to gather information about a particular species.

Detailed management goals, objectives and actions for imperiled species in this park are discussed in the Resource Management Program section of this component and the Implementation Component of this plan.

Exotic and Nuisance Species

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

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

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

Detailed management goals, objectives and actions for management of invasive exotic plants and exotic and nuisance animals are discussed in the Resource Management Program section of this component.

Numerous exotic plant removal projects have been conducted in Pennekamp through funding from the FWC Invasive Plant Management program, by the Keys

Resource Management Team projects, and in-house by park and District staff. Periodic surveys to monitor for and retreat infestations are ongoing. Since the approval of the 2004 Management Plan, 251.74 acres have been treated in John Pennekamp Coral Reef State Park.

Park and District staff remove lionfish from the submerged resources either in conjunction with coral surveys, buoy maintenance, or as part of species specific surveys. Park staff also collaborates with REEF coordinating Lionfish derbies within Pennekamp waters.

The population of green iguanas throughout the Florida Keys has significantly increased in the last five years. The concern with this population explosion is the potential impacts on the native plant recruitment if iguanas eat flowers, thus preventing fruits from forming. This is especially critical for the imperiled species within the park. Feral and domestic cats are also prevalent in the Florida Keys and adversely impact songbirds and nesting birds. Black rats are abundant throughout the Keys and are found in the park. A flock of peacocks (*Pavo cristatus*) escaped from the adjacent neighborhood and were often seen roaming at the Pennekamp landbase. These individuals were removed and relocated to a farm on the mainland. Curly-tailed lizards are increasing in their abundance in the Florida Keys but have only been observed in the park on a few occasions and were successfully removed. When exotic animals are observed in the park, they are removed according to the protocols established in the Operations Manual. Since the approval of the 2004 Pennekamp Unit Management Plan 450 exotic animals have been removed from the park's uplands and submerged resources.

Table 3 contains a list of the Florida Exotic Pest Plant Council (FLEPPC) Category I and II invasive, exotic plant species found within the park (FLEPPC, 2015). The table also identifies relative distribution for each species and the management zones in which they are known to occur. An explanation of the codes is provided following the table.

Table 3: Inventory of FLEPPC Category I and II Exotic Plant and Animal Species

Common & Scientific Name	FLEPPC Category	Distribution	Management Zone (s)
PLANTS			
Red sandalwood *Adenanthera pavonina*	II	2	JP-17
Sisal hemp *Agave sisalana*	II	2	JP-15
Coral vine *Antigonon leptopus*	II	2	JP-15, JP-17
Asparagus fern *Asparagus aethiopicus*	I	2	JP-15
Green shrimp plant *Blechum pyramidatum*	II	2	JP-15
Basket plant	II	2	JP-15

Table 3: Inventory of FLEPPC Category I and II Exotic Plant and Animal Species			
Common & Scientific Name	**FLEPPC Category**	**Distribution**	**Management Zone (s)**
Callisia fragrans			
Mastwood *Calophyllum antillanum*	I	1	JP-15
Australian pine *Casuarina equestifolia*	I	3	JP-03, JP-04. JP-05, JP-07, JP-10, JP-11, JP-14
Coconut palm *Cocos nucifera*	II	2	JP-15, JP-17
Latherleaf *Colubrina asiatica*	I	3	JP-01, JP-04, JP-05, JP-07, JP-11, JP-24
Egyptian grass *Dactyloctenium aegyptium*	II	3	JP-15, JP-15, JP-17
Pothos *Epipremnum pinnatum cv Aureum*	II	2	JP-15
Surinam cherry *Eugenia uniflora*	I	1	JP-15, JP-17
Ground orchid *Eulophia graminea*	II	2	JP-15
Laurel fig *Ficus microcarpa*	I	2	JP-15
Jasminum *Jasminum fluminense*	I	2	JP-17
Life plant *Kalanchoe pinnata*	II	2	JP-03
Lantana *Lantana camara*	I	2	JP-22
Lead tree *Leucaena leucocephala*	II	3, 6	JP-03, JP-04, JP-05, JP-09, JP-15, JP-16, JP-17, JP-18, JP-19, JP-20, JP-22
Sapodilla *Manilkara zapota*	I	3	JP-04, JP-05, JP-06, JP-09, JP,11, JP-12, JP-15, JP-16, JP-17, JP-21, JP-24

Table 3: Inventory of FLEPPC Category I and II Exotic Plant and Animal Species			
Common & Scientific Name	**FLEPPC Category**	**Distribution**	**Management Zone (s)**
Natal grass *Melinis repens*	I	2	JP-15
Burma reed *Neyraudia reynaudiana*	I	2	JP-21
Guinea grass *Panicum maximum*	II	3	JP-03, JP-17, JP-21
Guava *Psidium guajava*	I	2	JP-17
Brake fern *Pteris vittata*	II	2	JP-15
Solitaire palm *Ptychosperma elegans*	II	2	JP-16
Bowstring hemp *Sansevieria hyacinthoides*	II	3	JP-09, JP-15, JP-16, JP-17, JP-18, JP-20, JP-21
Beach naupaka *Scaevola taccada*	I	3	JP-07
Umbrella tree *Schefflera actinophylla*	I	2	JP-15
Brazilian pepper *Schinus terebinthifolius*	I	3	JP-03, JP-04, JP-05, JP-06, JP-07, JP-09, JP-10, JP-11, JP-12, JP-15, JP-16, JP-17, JP-18, JP-21, JP-22
Wedelia *Sphagneticola trilobata*	II	3	JP-15
Mahoe *Taliparti tiliaceum*	II	2	JP-05, JP-07
Tropical almond *Terminalia catappa*	II	2	JP-07, JP-17
Portia *Thespesia populnea*	I	3	JP-05-, JP-06, JP-07
Oyster plan *Tradescantia spathacea*	II	2	JP-06, JP-09, JP-15, JP-16, JP-17, JP-21, JP-22
Simpleleaf chastetree *Vitex trifolia*	II	2	JP-17

Table 3: Inventory of FLEPPC Category I and II Exotic Plant and Animal Species			
Common & Scientific Name	**FLEPPC Category**	**Distribution**	**Management Zone (s)**
ANIMALS			
Knight anole *Anolis equestis*			JP-15
Brown anole *Anolis sagrei*			All upland
Greenhouse frog *Eleutherodactylus p. planirostris*			All upland
Domestic cat *Felis catus*			All upland
Tokay gecko *Gecko gecko*			JP-15
Indo-Pacific gecko *Hemidactylus garnotii*			JP-15
Mediterranean gecko *Hemidactylus turcicus*			JP-15
Green iguana *Iguana iguana*			All upland
Northern curly-tailed lizard *Leiocephalus carinatus armouri*			JP-15
Cuban tree frog *Osteopilus septentrionalis*			All upland
Madagascar day gecko *Phelsuma madagascariensis*			JP-16
House sparrow *Passar domesticus*			JP-15
Lionfish *Pterois volitans*			All submerged
Norway rat *Rattus norvegicus*			All upland
Black rat *Rattus rattus*			All upland
Fire ant *Solenopsis invicta*			All upland
Cuban garden snail *Zachrysia provisoria*			All upland

Distribution Categories (FNAI):

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

Special Natural Features

The extensive mid-channel patch reef system is the special natural feature at John Pennekamp Coral Reef State Park. Pennekamp was established specifically for the protection of the coral reef and became the first underwater state park. There are thirty-two stony coral species and fourteen octocoral species documented in Pennekamp. The coral reef supports a diverse assemblage of species including fish, mollusks, echinoderms, and crustaceans who rely on the reef for shelter and food.

The extensive seagrass bed is the second most prominent natural feature at this site. Although the seagrass beds have been impacted by boat grounding events, they play an important ecological role by trapping suspended sediment, producing oxygen, stabilizing sediment and providing food and shelter for numerous species, many of which are commercially and recreationally important to the economy of the Florida Keys. The health of this ecosystem is linked to the health of the mangrove ecosystem along the shoreline, and the coral reef ecosystem offshore.

Pennekamp park manages both upland and submerged resources providing a continuity of ecosystem protection including several rare habitats and numerous imperiled species.

Cultural Resources

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

landscape refer to all resources that will become 50 years old during the term of this plan.

Condition Assessment

Evaluating the condition of historic structures and landscapes is accomplished using a three-part evaluation scale, expressed as good, fair and poor. These terms describe the present condition, rather than comparing what exists to the ideal condition. Good describes a condition of structural stability and physical wholeness, where no obvious deterioration other than normal occurs. Fair describes a condition in which there is a discernible decline in condition between inspections, and the wholeness or physical integrity is and continues to be threatened by factors other than normal wear. A fair assessment is usually cause for concern. Poor describes an unstable condition where there is palpable, accelerating decline, and physical integrity is being compromised quickly. A resource in poor condition suffers obvious declines in physical integrity from year to year. A poor condition suggests immediate action is needed to reestablish physical stability.

Level of Significance

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

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

The following is a summary of the FMSF inventory. In addition, this inventory contains the evaluation of significance.

Pre-Historic and Historic Archaeological Sites

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

Description: Originally, the Florida Master Site File listed eight sites in John Pennekamp Coral Reef State Park, although not all of them were within the boundaries of the park. However, in 2013 a predictive model was completed for the upland portions only of John Pennekamp Coral Reef State Park excluding the submerged resources of the park. A digital elevation model (DEM) was incorporated from aerial LiDAR data in order to determine the potential for additional cultural resources. Ground-truthing surveys were then conducted using GPS and camera equipment in order to determine prospective cultural resources.

The analysis of LiDAR and ground-truthing documented four additional cultural sites for Pennekamp, one site that was relocated, and two sites that are not within the boundary of the park. 8MO128 is in Dagny Johnson Key Largo Hammock Botanical State Park.

An archaeological sensitivity model was developed for John Pennekamp Coral Reef State Park. This model included factors that took in a variety of environmental and cultural variables that account for the presence of sites through time and space and account for the variability of site types known to occur within the park as demonstrated through previous surveys or recordation of sites within the park vicinity. Matrix variables present in the park included coastal features, topography, soils, NRHP and mound and midden site locations, and negative factors relating to soil drainage. Legacy information from previous work in the Keys, including Goggin, Eyster, and Carr, are valuable resources in the discussion of archaeological predictive factors in this area. The sensitivity model found that of the 4,044.98 upland acres within John Pennekamp Coral Reef State Park, 524.03 acres or 12.96% were considered to be high sensitive areas for cultural resources. Zero acres were considered to be medium sensitive areas for cultural resources, and 3,520.95 acres or 87.04% were considered to be low sensitive areas for cultural resources (Collins, et.al 2013).

8MO00127 is located in both Dagny Johnson Key Largo Hammock Botanical State Park and John Pennekamp Coral Reef State Park. This site is known as Dynamite Rock and is located on a coastal berm north of the old Dynamite Dock. It is a shell midden dating to the Glades I and II period and is occupied by a historic house site on the highest part of the berm. The date of the house is unknown, but believed to be from the mid 1800's to the early 1900's. Three walls of a cistern of "tabby" construction are all that remains of the house structure. Shell refuse and artifacts are present near the only population of the imperiled manchineel in Dagny Johnson Key Largo Hammock Botanical State Park.

8MO02065, known as the Oceanside site, consists of two separate components; a shallow prehistoric midden of the Glades II-III period, and a historic house site with extensive artifactual refuse. The midden had been previously cleared, leaving "mounds" of midden around tree bases that had not been affected by the bulldozing. These clumps of midden soil contained shell refuse, faunal bones, and pottery sherds. The remains of the midden are within an area of approximately 120ft. by approximately 20ft. The site is located 75 feet west of the Atlantic Ocean and is located in Keys tidal rock barren habitat.

8MO02057, known as the Rose Marie site, is an altered solution hole nine-feet in diameter and approximately 2.5 feet in depth. It has been capped with concrete to allow for the retention of freshwater. This site is considered 20th century and a component of early pioneer settlement. Approximately 100-feet southwest of the solution hole are a series of rock piles thought to be from agricultural clearing. Thirty-feet northwest of the solution hole is a rectangular pile of rocks approximately 15ft x 10 ft. There are also unmortared rock walls with 200-feet to the south. It is believed that this solution hole was turned into a cistern for watering penned animals.

8MO02058, known as the Rock Harbor or Gun Range site, is believed to be late 1800 – early 1900s and was recorded in the Carr survey of the Key Largo area. There is a collection of artifacts at this site including bottle fragments, ceramic sherds, and a metal stencil with the name “Darling”. There is evidence of an historic home and cistern near this site, and upon further investigation during the predictive modeling surveys, it was discovered that the spatial location was incorrect. New GPS data points and photos were taken to update the FMSF.

8MO1970, known as the Garden Cove site, is a shallow midden, historic house site and cistern considered to be both pre-historic and historic. The midden consists of scattered shell fragments to a depth of 25cm. The cistern is believed to be early 20th century and is in good condition. This site does not occur within the boundaries of the park.

8MO02056, known as the Norman site, is located in both Dagny Johnson Key Largo Hammock Botanical State Park and John Pennekamp Coral Reef State Park. This site is considered to be prehistoric, but of unknown period. It consists of a scattering of *Strombus* shell refuse. A carved pumice effigy was found at the site during the archeological survey.

8MO0144, known as Cannon Patch (Florida Archaeological Survey. Underwater Site-25) is located in shallow water off Key Largo and consists of a portion of a shipwreck believed to be of English or Spanish origin. This 18th century site consists of two iron cannons eleven feet long, a conglomerate of 150-200 cannonballs, iron artifacts, a grinding wheel, and timber fragments. The cannons are encrusted with both stony and octocoral species as well as other encrusting marine organisms.

8MO208, is considered a mixed district because it encompasses all of the submerged resources in the park. In 1972 John Pennekamp Coral Reef State Park was designated as a National Historic District.

8MO2337, is a newly recorded cultural resource documented during the Archaeological Predictive Model survey. This site consists of an historic cistern that is well preserved and contains standing water. It is of similar dimension and construction as 8MO2058, approximately 10ft x 12ft and with walls approximately 4ft in height. The site is overgrown with vegetation, which can cause surface

cracking and degradation from root penetration. GPS data and photos were taken at this site.

8MO2338, is a newly recorded cultural resource documented during the Archaeological Predictive Model survey. This site is a cistern structure that is larger than site MO2337, and appears to be older with most of the plaster-mortared surface eroded. There is an area containing historic refuse and a sherd of heavily crazed ironstone ceramic. GPS data and photos were taken at this site.

8MO2052, known as the Litman site, is located on the northeast edge of Sunrise Key. Originally it was a large midden approximately 100 feet in length that followed along the shoreline. Unfortunately, this site was bulldozed by the development of the Ocean Reef Club. However minimal fragments persist including conch shell refuse, pottery, and eroded sand tempered plain. Several large pieces of Spanish olive jars were found as well as one shard of non-local Indian pottery.

8MO1338, is located in the submerged resources of the park just northeast of Rodriguez Key. This site is an underwater anchorage midden.

Condition Assessment: It is difficult to determine the condition of Site 8MO0144 at Cannon Patch reef because coral and other marine organisms have grown over the structures.

Sites 8MO00127, 8MO02065, 8MO2056, and 8MO2058 consist of shell, bone and refuse fragments. These sites are in good condition and are in areas that are difficult to access so unauthorized access is unlikely. However, they are in close proximity to the shoreline so are subject to tropical storm events which have the potential to not only disturb the sites, but also to alter the sites depending upon the strength of the storm. Extreme high tides particularly in the spring and fall can have an impact on these sites, which will only be exacerbated as these conditions strengthen.

Site 8MO2057 is in good condition and is also located in an area of the park that is difficult to access so unauthorized access is unlikely.

Site 8MO2337 is in good condition, although it is getting overgrown by vegetation.

Site 8MO2338 is in good condition although the recent surveys documented plaster-mortar surface erosion. This site also has an accumulation of debris adjacent to the structure.

Site 8MO2052 is in poor condition due to impacts from development. What had once been a large midden has been reduced to refuse scatter covering an area approximately 100ft x 50ft.

Site 8MO1338 is an underwater midden that was not evaluated during the 2013 predictive modeling surveys. Its condition is unknown.

Threats to these cultural sites include overgrowth by native vegetation, the possibility of infestation by exotic species, and debris washed in by tidal events. In the case of the submerged sites, threats to their condition are impacts due to water quality, vessel groundings, and storm events.

General management measures: To achieve the desired future condition of these cultural resources, the sites need to be protected from unauthorized access, destruction, vandalism, looting, native vegetative overgrowth, and exotic species infestations. It is critical that all exotic removal projects be conducted in such a way as to eliminate any impact to the cultural resources. Where feasible, stabilization may be necessary.

Site MO0144 is difficult to distinguish due to the coral that is encrusting the shipwreck. The protection of this cultural site relies on the protection of the coral reef.

For sites that are in the submerged resources of the park, protection of the submerged resource from boat grounding events is the most effective management tool to protect the cultural resource.

Historic Structures

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

Description: 8MO2339, is a newly recorded cultural resource documented during the Archaeological Predictive Model survey. This site is an historic building feature that consists of wood, concrete, and historic refuse. It contains material indicative of occupation in the mist-20th Century.

Condition Assessment: Site 8MO2339 is in fair condition with refuse and only the remains of the building in place.

General management measures: In order to achieve the desired future condition of this site, it will need to be protected from unauthorized access, destruction, vandalism, looting, native vegetative overgrowth, and exotic species infestations. It is critical that all exotic removal projects be conducted in such a way as to eliminate any impact to the cultural resources. Where feasible, stabilization may be necessary.

Collections

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

Description: The Visitor Center houses many collections on display for public interpretation not all of which were found within the park's boundaries. Most of these collections were donated. Many of the marine organisms were found by park staff and donated for display. There are currently four, locked cabinets where the collections are displayed and include; miscellaneous artifacts from the San Pedro shipwreck, a signaling cannon, musket balls, spike from the Seminole Wars, 19th and 20th Century copper pin, tarpon mount, sea turtles, crocodile, skulls and bones of various animals, various shells, sponges, echinoderms, crustaceans, and stony and octocoral species.

The Visitor Center is a climate-controlled environment. The most serious threat to these collections is damage to the building by tropical storm or hurricane events. Three cannons from the HMS Winchester are on display at Cannon Beach and a cannon from the San Jose wreck is on display in the open area west of the Visitor Center.

Condition assessment: The collections in the Visitor Center are in good condition. The biggest threat to both the collections in the Visitor Center is damage to the building itself. The building has had problems with roof damage and water leaks, but neither events led to damage to the collections. Damage or destruction from a tropical storm or hurricane event would potentially impact the collections maintained in the building.

Despite the fact that they have been subject to environmental conditions, the cannons on display at Cannon beach are in good condition. They will need to be monitored to ensure that exposure does not end up taking a toll on the structures. Tropical storm and hurricane events may have an impact on the cannons, and the only way to minimize the impact would be to secure them in place prior to an approaching storm.

General management measures: An inventory of the collection in the Visitor Center has been documented and each item is numbered. They are housed in a climate controlled building.

Detailed management goals, objectives and actions for the management of cultural resources in this park are discussed in the Cultural Resource Management Program section of this component. Table 4 contains the name, reference number, culture or period, and brief description of all the cultural sites within the park that are listed in the Florida Master Site File. The table also summarizes each site's level of significance, existing condition, and recommended management treatment. An explanation of the codes is provided following the table.

Table 4: Cultural Sites Listed in the Florida Master Site File					
Site Name & FMSF #	**Culture/Period**	**Description**	**Significance**	**Condition**	**Treatment**
8MO00127	Glades I & II	Midden	NE	G	P
Norman 8MO02056	Prehistoric	Midden	NE	G	P
Rose Marie 8MO02057	20th Century	Cistern	NE	G	P
Gun Range Cistern 8MO02058	Late 1800-early 1900	Refuse and Cistern	NE	G	P
Garden cove 8MO01970	Early 20th Century	Cistern – Not in park boundary	NE	G	P
Ocean side 8MO02065	Glades II & III	Midden	NE	G	P
Cannon Patch 8MO00144	18th Century	Shipwreck	NE	G	P
John Pennekamp Coral Reef State Park 8MO208	Mixed District	Submerged resources of park	NRL	G	P
Pennekamp State Park Cistern 1 8MO2337		Cistern	NE	G	P
Pennekamp State Park Cistern2 8MO2338		Cistern	NE	G	P
Pennekamp Historic Building 8MO2339		Building remains	NE	F	P
Litman 8MO02052	Prehistoric	Midden(s)	NE	P	P
Rodrigues Key/Rock		Anchorage midden-underwater	NE		

Table 4: Cultural Sites Listed in the Florida Master Site File					
Site Name & FMSF #	**Culture/Period**	**Description**	**Significance**	**Condition**	**Treatment**
Harbor Anchorage 8MO1338					

Significance

NRL National Register Listed
NR National Register Eligible
LS Locally Significant
NE Not Evaluated
NS Not Significant

Condition

G Good
F Fair
P Poor

Recommended Treatment

RS Restoration
RH Rehabilitation
ST Stabilization
P Preservation
R Removal

RESOURCE MANAGEMENT PROGRAM

Management Goals, Objectives and Actions

Measurable objectives and actions have been identified for each of the DRP's management goals for John Pennekamp Coral Reef State Park. Please refer to the Implementation Schedule and Cost Estimates in the Implementation Component of this plan for a consolidated spreadsheet of the recommended actions, measures of progress, target year for completion and estimated costs to fulfill the management goals and objectives of this park.

While the DRP utilizes the ten-year management plan to serve as the basic statement of policy and future direction for each park, a number of annual work plans provide more specific guidance for DRP staff to accomplish many of the resource management goals and objectives of the park. Where such detailed planning is appropriate to the character and scale of the park's natural resources, annual work plans are developed for prescribed fire management, exotic plant management and imperiled species management. Annual or longer- term work plans are developed for natural community restoration and hydrological restoration.

The work plans provide the DRP with crucial flexibility in its efforts to generate and implement adaptive resource management practices in the state park system.

The work plans are reviewed and updated annually. Through this process, the DRP's resource management strategies are systematically evaluated to determine their effectiveness. The process and the information collected is used to refine techniques, methodologies and strategies, and ensures that each park's prescribed management actions are monitored and reported as required by Chapters 253.034 and 259.037, Florida Statutes.

The goals, objectives and actions identified in this management plan will serve as the basis for developing annual work plans for the park. The ten-year management plan is based on conditions that exist at the time the plan is developed, and the annual work plans provide the flexibility needed to adapt to future conditions as they change during the ten-year management planning cycle. As the park's annual work plans are implemented through the ten-year cycle, it may become necessary to adjust the management plan's priority schedules and cost estimates to reflect these changing conditions.

Natural Resource Management

Hydrological Management

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

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

Objective: Conduct an assessment of the park's hydrological restoration needs.

Action 1 Restore natural topography by filling in sites where material was dredged for construction.

Action 2 Restore natural topography by removing fill material that was a by-product of dredging for construction.

The sites within Pennekamp that have either been dredged or have fill material need to be restored in order to restore the natural hydrology within those areas are the boat basin at the Shaw tract (JP-15), the entrance channel to Ocean Forest Estates (JP-S2), the entrance channel to Carysfort (JP-S2), end segment of Fisherman's Lane (JP-S4), and the Kawama Club channel (JP-S4).

Only a portion of the borrow pit in zone JP-21 falls within the boundaries of the park, so conducting restoration at this site will be difficult, particularly since the adjacent land has been converted to an affordable housing development.

Two large dredge pits at the end of Fisherman's Lane should be filled to match the surrounding habitat depth and replanted with seagrass.

Restoration of the Kawama Club channel will require removal of the fill spit and raising the dredged channel depths to a level that will support marine plants while still being navigable by boats. Seagrass planting units and/or bird stakes should be utilized reestablishment of seagrass community species.

Objective: Restore natural hydrological conditions and functions to approximately five acres of nearshore submerged resources including marine composite substrate and seagrass bed natural communities.

Action 1 Fill approximately 5 acres of channels.
Action 2 Remove 0.5 acres of fill material to restore seagrass habitat.

The artificial spit at the Kawama Club (JP-07) is approximately 0.5 linear acres and is fill material overtop of submerged land within Pennekamp park. Removal of this spit would increase hydrological flow, allow for the restoration of the submerged resources, and would restore the submerged resources to the management of the park.

The marina and entrance channel at the Shaw tract needs to be filled in to a depth that would not only enable better tidal flushing, but would also encourage the development of a healthy seagrass community. This site is approximately .31 acres in linear size, and believed to be approximately 32-35 feet in depth. Filling the marina to a depth of 6-8 feet would allow for shallow water vessel access at the same time as meeting the goals of developing a functional seagrass ecosystem.

The entrance channel at the former Ocean Forest Estates falls within the boundaries of Pennekamp with the remaining portion of this parcel in Dagny Johnson Key Largo Hammock Botanical State Park. The entrance channel is 2.5 acres in linear size and approximately 6 feet in depth. Filling this channel would restore hydrological flow of the nearshore communities, allow for better flushing, decrease turbidity and improve the adjacent habitats.

The entrance channel at the former Carysfort Yacht Club is a similar to Ocean Forest Estates, is 1.7 acres in linear acres and approximately 6 feet in depth. Carysfort has undergone major wetland restoration projects including filling the marina and restoring the natural mangrove and wetland shoreline. Filling this channel would not only restore hydrological flow of the nearshore communities, allow for better flushing, decrease turbidity and improve the adjacent habitats, but it would complete the ongoing wetland restoration projects at this site.

The old quarry in Management zone JP-22 adjacent to Garden Cove subdivision needs to be filled in to restore the hammock in this section of the park.

Natural Communities Management

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

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

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

There are no fire-dependent natural communities at John Pennekamp Coral Reef State Park.

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

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

Following are the natural community/habitat restoration and maintenance actions recommended to create the desired future conditions in John Pennekamp Coral Reef State Park.

Objective: Conduct habitat/natural community restoration activities on 30.4 acres of seagrass, coral reef, mangrove, and rockland hammock communities.

Action 1 Implement restoration plan.

Natural community restoration will be necessary in several habitat types in Pennekamp. Restoration of seagrass beds that have been damaged by vessel groundings needs to be conducted in order to restore valuable submerged habitat, prevent further degradation and improve water quality.

Coral reefs are subject to a number of stressors including water quality, an increase in sea surface temperatures which leads to an increase in coral bleaching and disease, and physical impacts. Coral restoration will not only assist in stabilizing coral structures, but it will also assist in increasing abundance and diversity of stony corals, particularly of the imperiled staghorn coral.

Rockland hammock restoration will be necessary in areas where the hammock has been destroyed, fragmented, impacted by exotic species infestations, or partially developed. Restoring rockland hammock will provide for a contiguous habitat that will positively affect the hammock species. However, care must be taken to minimize or eliminate destruction where natural recruitment has occurred.

A total of 30.4 acres have been identified for restoration in the park including seagrass, mangrove, and rockland hammock restoration, with seagrass constituting the highest percentage of habitat in need of restoration.

Objective: On average, restore approximately 2.06 acres per year of damaged seagrass beds in John Pennekamp Coral Reef State Park and conduct necessary follow-up management activities.

Action 1 Analyze and prioritize potential restoration sites.
Action 2 Conduct restoration activities.

A seagrass restoration plan, modeled after the ongoing seagrass restoration work at Lignumvitae Key Submerged Land Managed Area, is complete. The next step is for staff to analyze aerial photographs and develop a list of restoration priorities. It will be critical to select sites in areas where natural recovery is not occurring to maximize funding sources and restoration efforts. Successful seagrass restoration protocols have been established and can be implemented in Pennekamp once sites have been identified and funding has been secured. Site-specific techniques need to include topographic restoration, bird stake installation and planting unit installation.

Objective: Conduct habitat restoration on coral reef sites within the park.

Action 1 Develop coral restoration plan.
Action 2 Analyze potential for an in-situ coral nursery.

Coral reef restoration has been sporadic with the majority of the restoration conducted by park staff post vessel grounding events. This work consisted of cementing damaged coral on-site with fragments impacted by the vessel grounding.

A more intensive coral reef restoration program needs to be established in the park beginning with the development of a coral restoration plan. Components of the plan need to include the establishment of an in-situ coral nursery that would enable staff to salvage coral fragments and store them in a secure location where the fragments would have the opportunity to recover, but would remain within the ocean environment. An in-situ population would need to be secure enough to prevent damage to the coral colonies, but would also need to be mobile in the event of a major storm event. As part of a coral restoration plan it will be necessary to collaborate with other agencies including the Florida Keys National Marine Sanctuary, The Nature Conservancy, and NGOs that are already conducting coral restoration work.

Objective: Conduct rockland habitat restoration where feasible.

Action 1 Identify potential restoration sites.
Action 2 Conduct borrow pit restoration where feasible.

Rockland hammock restoration needs to be identified on the non-contiguous parcels in Pennekamp. There is a borrow pit in zone JP-22 adjacent to Garden Cove subdivision that needs to be filled in and the hammock restored. Only a portion of the borrow pit in zone JP-21 falls within the boundaries of the park so restoration of this site will not be possible unless it is in conjunction with the adjacent property owner. The feasibility of the benefit of hammock restoration needs to be determined on a case-by-case basis depending upon the amount of natural recruitment that has taken place on previously disturbed lands.

Natural Communities Improvement: Improvements are similar to restoration but on a smaller, less intense scale. This typically includes small-scale vegetative management activities or minor habitat manipulation. There are no natural community improvement needs at John Pennekamp Coral Reef State Park.

Imperiled Species Management

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

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

In the preparation of this management plan, DRP staff consulted with staff of the FWC's Imperiled Species Management Section or that agency's Regional Biologist and other appropriate federal, state and local agencies for assistance in developing imperiled animal species management objectives and actions. Likewise, for imperiled plant species, DRP staff consulted with FDACS. Data collected by the

FWC, USFWS, FDACS and FNAI as part of their ongoing research and monitoring programs will be reviewed by park staff periodically to inform management of decisions that may have an impact on imperiled species at the park.

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

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

Objective: Monitor and document five imperiled coral species in the park.

Action 1	Develop monitoring protocols for five selected imperiled animal species including coral species that have been listed as imperiled.
Action 2	Implement monitoring protocols for five imperiled animal species including those listed in Action 1.
Action 3	Conduct annual coral surveys documenting species diversity, structure, rugosity, and coral bleaching.
Action 4	Continue to participate in the Nature Conservancy's Florida Reef Resilience Project.

Imperiled coral species including elkhorn coral, staghorn coral, fused staghorn coral, boulder star coral and large flower coral will be monitored along with all stony and octocoral species as part of the ongoing coral reef research project.
Complete the patch reef survey for populations of staghorn coral, elkhorn coral, and fused staghorn coral to obtain baseline information on population status, trends, and condition. Include these sites in follow-up surveys during bleaching events to monitor for the effects of coral bleaching and coral disease on this imperiled species.

Objective: Conduct population dynamics study of the imperiled Schaus' swallowtail butterfly.

Action 1	Implement monitoring protocols for monitoring the federally endangered Schaus Swallowtail butterfly in the park.

Continue to collaborate with the Florida Fish and Wildlife Conservation Commission, University of Florida, U.S. Fish and Wildlife Service and the North American

Butterfly in an effort to survey for presence/absence and abundance of the Schaus Swallowtail butterfly in John Pennekamp Coral Reef State Park.

Objective: Monitor and document all imperiled plant species in the park.

Action 1 Continue to support conservation of imperiled species in the park.
Action 2 Continue to collaborate with Fairchild Tropical Botanic Garden and the U.S. Fish and Wildlife Service on the long-term conservation of Keys tree cactus.

Known populations of imperiled species were mapped in 1998 and 1999. Updated mapping is currently underway.

Exotic Species Management

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

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

Objective: Annually treat 57.75 acres of exotic plant species in the park.

Action 1 Annually develop/update exotic plant management work plan.
Action 2 Implement annual work plan by treating 57.75 acres in park, annually, and continuing maintenance and follow-up treatments, as needed.

The park will continue to apply for funding for exotic removal in the park. Follow-up removal will continue by park staff, district staff and Resource Management Team projects. The goal will be to treat exotic species that have either re-sprouted or have recruited into the site following previous exotic removal treatments.

Objective: Implement control measures on four exotic animal species in the park.

Action 1 Continue to capture and remove green iguanas, black rats, and feral cats within the park.
Action 2 Continue to capture and remove lionfish from nearshore and offshore habitats within the park.

When black rats, green iguanas, and feral or free roaming cats are observed in the park, they will be removed according to the guidelines outlined in the DRP's Operations Manual. Management will investigate the feasibility of contracting the USDA to conduct this removal. Lionfish removal will continue in both the nearshore and offshore habitats within the park.

Cultural Resource Management

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

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

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

Objective: Assess and evaluate one of twelve recorded cultural resources in the park.

Action 1	Complete one assessment/evaluation of an archaeological site.
Action 2	Complete one Historic Structures Reports (HSR's) for historic buildings and cultural landscape. Prioritize stabilization, restoration, and rehabilitation projects.

Most of the cultural sites within the park are in areas that are isolated and are not impacted by human influence, development, or construction activities. However, unauthorized access and vandalism is a concern so site inspections will be necessary to monitor these cultural resources. Known sites are in various stages of degradation due to age and environmental conditions. Stabilization may be necessary to prevent further degradation and to repair any damage that is a result of unauthorized access to the site.

The Grove is maintained as a cultural landscape with historic fruit trees cultivated as they were when the Shaw family owned the property. A Historic Structures Report will be completed on an annual basis to provide an update and analysis on the condition of this landscape.

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

Action 1	Ensure all known sites are recorded or updated in the Florida Master Site File.
Action 2	Conduct Level 1 archaeological survey for one priority area identified by predictive model or other previous study.
Action 3	Develop and adopt a Scope of Collections Statement.

Due to the changes of sea level over time, many cultural sites are believed to be in the submerged resources of the park. There may also be remains of shipwrecks in the nearshore and offshore waters of the park. Therefore, it will be necessary that damage assessments conducted after any physical disturbances to coral reefs, seagrass beds, composite substrate or unconsolidated substrate, or prior to restoration of seagrass, include the potential for unearthing archaeological or cultural resources. If a site is found the State Archaeologist will be notified and the site will remain undisturbed until such time that it can be inspected by an expert.

A predictive model study of John Pennekamp Coral Reef State Park was completed in 2013 and three new sites were documented and added to the FMSF. In addition, a sensitivity model was completed which indicated areas within the park that were documented as having a high and low probability for archaeological resources. In order to determine the presence or absence of archaeological resources in these high and low predicted areas, a Level 1 archaeological survey will need to be conducted.

A scope of collections statement will need to be drafted for the collections in the Visitor Center at Pennekamp.

Objective: Bring one of twelve recorded cultural resources into good condition.

Action 1	Design and implement regular monitoring programs for eleven cultural sites.
Action 2	Create and implement a cyclical maintenance program for each cultural resource.

Most of the cultural sites within the park are in remote areas and not threatened by unauthorized access. However, a regular monitoring program will ensure that these sites are not being degraded by other than natural environmental conditions. The archaeological predictive modeling survey identified additional cultural resources in the park. These will be evaluated and measures will be taken to ensure that they are not impacted. Once the monitoring is complete, the park will take the necessary measures to either bring one site into good condition or to take the necessary measures to ensure that the site remains in good condition. The shipwreck at Cannon Patch (MO00144) will be protected in conjunction with the protection of the coral reef which includes preventing physical impacts from vessels, anchors, or people.

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 DRP's statutory responsibilities and an analysis of the park's resource needs and values. The long-term management goal for forest communities in the state park system is to maintain or re-establish old-growth characteristics to the degree practicable, with the exception of those communities specifically managed as early successional.

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

Coastal/Beach Management

The DRP manages over 100 miles of sandy beach, which represents one-eighth of Florida's total sandy beach shoreline. Approximately one-quarter of Florida's state parks are beach-oriented parks and account for more than 60 percent of statewide park visitation. The management and maintenance of beaches and their associated systems and processes is complicated by the presence of inlets and various structures (jetties, groins, breakwaters) all along the coast. As a result, beach restoration and nourishment have become increasingly necessary and costly procedures for protecting valuable infrastructure. All of these practices affect beaches for long distances on either side of a particular project. DRP staff needs to be aware of and participate in the planning, design and implementation of these projects to ensure that park resources and recreational use are adequately considered and protected.

John Pennekamp Coral Reef State Park includes 72 square miles of submerged resources. There are no naturally occurring beaches in the park only two small manmade beaches on Largo Sound. These are approximately 100 feet in length and do not provide suitable nesting sites for sea turtles. Because of the protection of El Radabob Key, Largo Sound is an inshore body of water with minimal or no wave action on the beaches. Erosion is typically only notable after storm events.

The submerged resources at the southern end of the park are closed to motorized vessels where the depth is four feet or less. It will be necessary to identify the need of expanding the closed zones particularly where the submerged resources of Pennekamp abut against the boundary of Dagny Johnson Key Largo Hammock Botanical State Park. Park staff will need to analyze aerial photographs in order to determine if such measures should be implemented.

All of the submerged resources in the park provide critical habitat for a variety of flora and fauna. In order to protect these resources, any impacts, whether direct or indirect, need to be carefully managed. These include physical impacts from boats and boat propellers, as well as indirect impacts from shading via structures such as docks.

Arthropod Control Plan

Mosquito spraying is conducted in the main visitor area of the park, in the campground and in the shop area. Because many of the parcels that are part of Pennekamp are adjacent to neighborhoods, they are subject to mosquito spraying. Aerial spraying occurs throughout the Florida Keys so incidental drift does occur on state lands and over state waters particularly Largo Sound. Larvicide application has been approved in limited areas within Pennekamp. The goal of this application method is to reduce the need for aerial or truck spraying throughout the Florida Keys. An Arthropod Control Plan has been developed for Pennekamp Park.

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

Sea Level Rise

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

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 located in the Implementation Component of this management plan.

Land Management Review

Section 259.036, Florida Statutes, established land management review teams to determine whether conservation, preservation and recreation lands titled in the name of the Board of Trustees are being managed for the purposes for which they

were acquired and in accordance with their approved land management plans. The considered recommendations of the land management review team and updated this plan accordingly.

John Pennekamp Coral Reef State Park was subject to a land management review on November 15, 2010. The review team made the following determinations:

- The land is being managed for the purpose for which it was acquired.
- The actual management practices, including public access, complied 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 Florida Department of Environmental Protection (DEP), Division of Recreation and Parks (DRP). These responsibilities are to preserve representative examples of original natural Florida and its cultural resources, and to provide outdoor recreation opportunities for Florida's citizens and visitors.

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. Additional input is received through public workshops, and through environmental and recreational-user groups. With this approach, the DRP 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 expressed 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 park interaction with other facilities. John Pennekamp Coral Reef State Park is located within Monroe County, adjacent to Key Largo in the Florida Keys.

The population of Monroe County is relatively diverse in terms of demographic characteristics. According to the U.S. Census Data (Census 2013), approximately 32% of residents in the county identify as black, Hispanic or Latino, or another minority group. Over one-third (39%) of residents can be described as youth or seniors (Census 2013). 71% of the population is of working age (16 to 65) (Census 2013). Monroe County ranked third statewide in per capita personal income at $57,829 (above the statewide average of $41,497) (U.S. Bureau of Economic Analysis 2014).

The park is located in the Southeast Vacation Region, which includes Broward, Miami-Dade, Monroe, and Palm Beach counties (Visit Florida 2013). According

to the 2013 Florida Visitor Survey, approximately 17.3% of domestic visitors to Florida visited this region. Around 87% of visitors to the region traveled to the Southeast for leisure purposes. The top activities for domestic visitors were beach/waterfront and culinary/dining experiences. Summer was the most popular travel season, but visitation was generally spread throughout the year. Most visitors traveled by air (60%), reporting an average of 4.4 nights and spending an average of $186 per person per day (Visit Florida 2013).

The table below identifies significant resource-based recreation opportunities within 15 miles of John Pennekamp Coral Reef State Park.

Table 5. Resource-Based Recreational Opportunities Near John Pennekamp Coral Reef State Park

Name	Biking	Hiking	Swim / Beach Access	Boating / Paddling	Fishing	Wildlife Viewing	Overnight Stay	Hunting
Biscayne National Park (USDOI)		✓	✓	✓	✓	✓	✓	
Black Point Park & Marina (Miami-Dade County)	✓	✓		✓	✓			
Dagny Johnson Key Largo Hammock Botanical State Park (FDEP)	✓	✓				✓	✓	
Everglades National Park (USDOI)	✓	✓		✓	✓	✓	✓	
Florida Keys Overseas Heritage Trail (FDEP)	✓	✓			✓	✓		
Frog Pond Wildlife Management Area (SFWMD)						✓		✓
Harry Harris Park (Monroe County)			✓	✓	✓			
Homestead Bayfront Park (Miami-Dade County)			✓	✓	✓			
Southern Glades Wildlife and Environmental Area (SFWMD)	✓	✓		✓	✓	✓		✓
Windley Key Fossil Reef Geological State Park (FDEP)		✓				✓		

Existing Use of Adjacent Lands

John Pennekamp Coral Reef State Park is located on Key Largo, which is the northernmost key of the Florida Keys and has an estimated population of around 10,780 (Census 2014). The park has almost 3,000 acres of upland habitat located mostly in the southern portion of the park, while the majority of the park, almost 60,000 acres, is submerged lands in the Atlantic Ocean. The park is surrounded by the Florida Keys National Marine Sanctuary and works closely with the National Oceanic and Atmospheric Administration (NOAA) to coordinate management efforts of submerged resources. Like most of the inhabited keys, the major thoroughfares of U.S. Highway 1 and CR 905 connect the park to the surrounding communities and run the length of the western park boundary from the northeast to the southwest with Barnes Sound, Card Sound, and Florida Bay to the west and the Atlantic Ocean to the east.

North of the park, the private gated community of Ocean Reef Club consists of large, single family and condominium residences located along artificial canals with numerous amenities including a private airport and golf club. Beginning at the intersection of CR 905 and U.S. Highway 1 at MM 106 and to the south is the more densely developed section of Key Largo with water oriented residential and commercial developments in a conventional suburban layout characteristic of the Florida Keys. Several single-family residential and low-density commercial developments with artificial canals are interspersed among the upland areas of the park east of U.S. Highway 1.

Planned Use of Adjacent Lands

Monroe County is a relatively small county in terms of population in Florida with around 74,000 residents (BEBR). With the inherent environmental limitations on growth present in the Florida Keys, multiple environmental and social conflicts arise when increasing demand for development places a heavy burden on limited land. The vulnerability of the Florida Keys to tropical storm events has encouraged officials to address evacuation efforts throughout Monroe County. By managing growth in Monroe County and thereby preventing too much pressure on the Overseas Highway as the main means of evacuation, officials hope to ensure safe evacuation times for County residents and visitors when threatened by a tropical storm event. County officials have adopted a series of land use regulations that aim to focus growth in areas that are in a better position to support more development. In addition, these regulations deter future growth from occurring in sensitive natural areas that protect numerous listed plant and animal species. This approach also supports efforts to maintain and enhance water quality throughout the Florida Keys National Marine Sanctuary (Monroe County 2000).

Future land use designations to the northeast include Recreation (R), Mixed Use Commercial (MC), Residential Conservation (RC), Residential Medium (RM), Residential High (RH), and Residential Low (RL). Mixed Use Commercial (MC), Institutional (INS), Education (E), Industrial (I), Recreation (R), Residential Low (RL), Residential Medium (RM), and Residential High (RH) designations are in

place for the community of Key Largo. Residential Conservation (RC), Residential Low (RL), Conservation (C), and Public Facilities (PF) future land use designations exist within the park.

As part of unincorporated Monroe County, the park, along with surrounding undeveloped parcels have been assigned either a Tier I or Tier III-A designation, which is meant to discourage future development through a competitive point allocation system as part of the rate of growth ordinance (ROGO) which aims to manage growth throughout Monroe County.

Migration to, and tourism in, the Florida Keys is expected to increase in popularity, and the impacts of residential and resort development, including loss of wildlife habitat, water quality impacts, noise, and traffic congestion along U.S. Highway 1 will continue to affect the state park. Division staff should be involved in the development of the Monroe County comprehensive plan, future land use map, and land development ordinances. Staff should also stay well informed about development plans in the surrounding community. Staff will request to be included by the local planning agency in the review of development proposals that may affect the natural, cultural, or recreational resources of the state park.

Greenways and Trails

Florida Greenways and Trails System (FGTS)

The Florida Greenways and Trails System (FGTS) is made up of existing, planned, and conceptual non-motorized trails and ecological greenways that form a connected, integrated statewide network. The FGTS serves as a green infrastructure plan for Florida, tying together the greenways and trails plans and planning activities of communities, agencies, and non-profit organizations throughout Florida. Trails include paddling, hiking, biking, multi-use, and equestrian trails. The Office of Greenways and Trails maintains a priority trails map and gap analysis for the FGTS to focus attention and resources on closing key gaps in the system.

In some cases, existing or planned priority trails run through or are adjacent to state parks, or they may be in close proximity and can be connected by a spur trail. State parks can often serve as trailheads, points-of-interest, and offer amenities such as camping, showers, and laundry, providing valuable services for trail users while increasing state park visitation. The park is a designated component of the Florida Greenways and Trails System, administered by the Department's Office of Greenways and Trails.

Florida Keys Overseas Heritage Trail (FKOHT)

The Florida Keys Overseas Heritage Trail (FKOHT) is a multi-use trail that extends from MM 106.5 in Key Largo to MM 0 in Key West parallel to U.S. Highway 1. The majority of the trail is located in FDOT right-of-way while the trail is routed across the Florida Keys Historic Bridges, originally constructed by

Henry Flagler as part of the East Coast Railroad in the early 1900s, when possible.

The FKOHT is the southernmost segment of the East Coast Greenway, with the northern terminus located in Calais, Maine and the southern terminus in Key West, Florida. The FKOHT passes by numerous exceptional and unique natural communities including rockland hammock, mangroves, Keys tidal rock barren, and lagoons. The FKOHT is managed by the DRP in partnership with the FDOT and Monroe County, in addition to each community through which the trail passes.

The FKOHT is a critical component of local transportation infrastructure, and is still in development. Additions, expansions, trail widening projects, and bridge rehabilitation efforts are currently underway. Where there is a gap in the trail, the trail then merges with the U.S. Highway 1 shoulder.

In addition, the park is also located along the Florida Circumnavigational Saltwater Paddling Trail that traverses the entire Florida coastline from Perdido Key State Park in Escambia County on the Gulf coast to Fort Clinch State Park in Fernandina Beach on the Atlantic coast.

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.

Recreational Resource Elements

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

Land Area

The upland area of the park consists of tracts of land on Key Largo and offshore islands to north and east of Key Largo. Elevations range from sea level to 10 - 12 feet. Upland areas in the park provide excellent opportunities for nature study, hiking, camping, picnicking, and bicycling along the adjacent FKOHT.

Water Area

Submerged resources make up the vast majority of the park. The marine habitats off the coast of Key Largo are made up of numerous shoals, shallows, and coral outcroppings excellent for diving and snorkeling. Operating out of the land base, charter boats allow public access to the reefs. Canoeing is excellent along the quiet and remote mangrove coastline and waterways.

Shoreline

As a coastal park, John Pennekamp Coral Reef State Park has an extensive shoreline centered around Largo Sound; however, mangrove swamps can prevent public access to the majority of the shoreline. Swimming and beach use are popular activities at the artificial sandy beaches at the land base in Largo Sound.

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.

Significant 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 several recorded prehistoric sites at the park along with significant archaeological and historical features. A number of shipwrecks of archaeological importance are documented. Underwater archaeologists estimate that there could be more wrecks than are currently known in the park. To help 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, significant natural features, structures, facilities, roads and trails existing in the unit are delineated on the base map (see Base Map). Specific uses made of the unit are briefly described in the following sections.

Past Uses

The park has seen a wide variety of human activity prior to its acquisition as a state park. The territory of the Calusa people at times reached the Florida Keys and were politically influential when not in direct control. Several shell middens indicate extensive pre-Columbian influences from indigenous groups.

In the modern era, remnants of several historic homesteads can be found across the island. These homesteads supported significant agricultural interests in the region. Tropical fruits, such as pineapple, were grown to be sent to northern markets.

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 in the 1950s.

Future Land Use and Zoning

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

As part of unincorporated Monroe County, the park, along with surrounding undeveloped parcels have been assigned either a Tier I or Tier III-A designation, which is meant to discourage future development through the competitive point allocation system as part of the rate of growth ordinance (ROGO) which aims to manage growth throughout Monroe County.

Existing zoning designations that exist within the park include Improved Subdivision (IS), which accommodates subdivisions that were in existence prior to the adoption of current land development regulations; Sparsely Settled (SS), which allows for very low density development with rural character; Native Area (NA), a designation that prevents development in preserved natural areas; Suburban Residential (SR), a low density single-family residential area; and Offshore Island (OS), which is intended to limit the intensity of development of islands not connected to U.S. Highway 1.

Future land uses identified for lands within the park include Conservation (C), which provides for publicly or privately owned lands held primarily for the

preservation of natural and historic resources and compatible passive recreational uses; Residential Conservation (RC), a designation that encourages the preservation of open space and natural resources while providing for very low-density residential development; Residential Low (RL), and Residential Medium (RM), which accommodates low and medium density subdivisions respectively.

Current Recreational Use and Visitor Programs

The majority of recreational activities available at John Pennekamp Coral Reef State Park center on the park's aquatic resources. 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. John Pennekamp Coral Reef State Park lies adjacent to the route of the Florida Keys Overseas Heritage Trail and the Florida Circumnavigational Saltwater Paddling Trail.

John Pennekamp Coral Reef State Park recorded 628,005 visitors in FY 2016/2017. By DRP estimates, the FY 2016/2017 visitors contributed $57,662,917 million in direct economic impact, the equivalent of adding 947 jobs to the local economy (FDEP 2017).

Other Uses

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

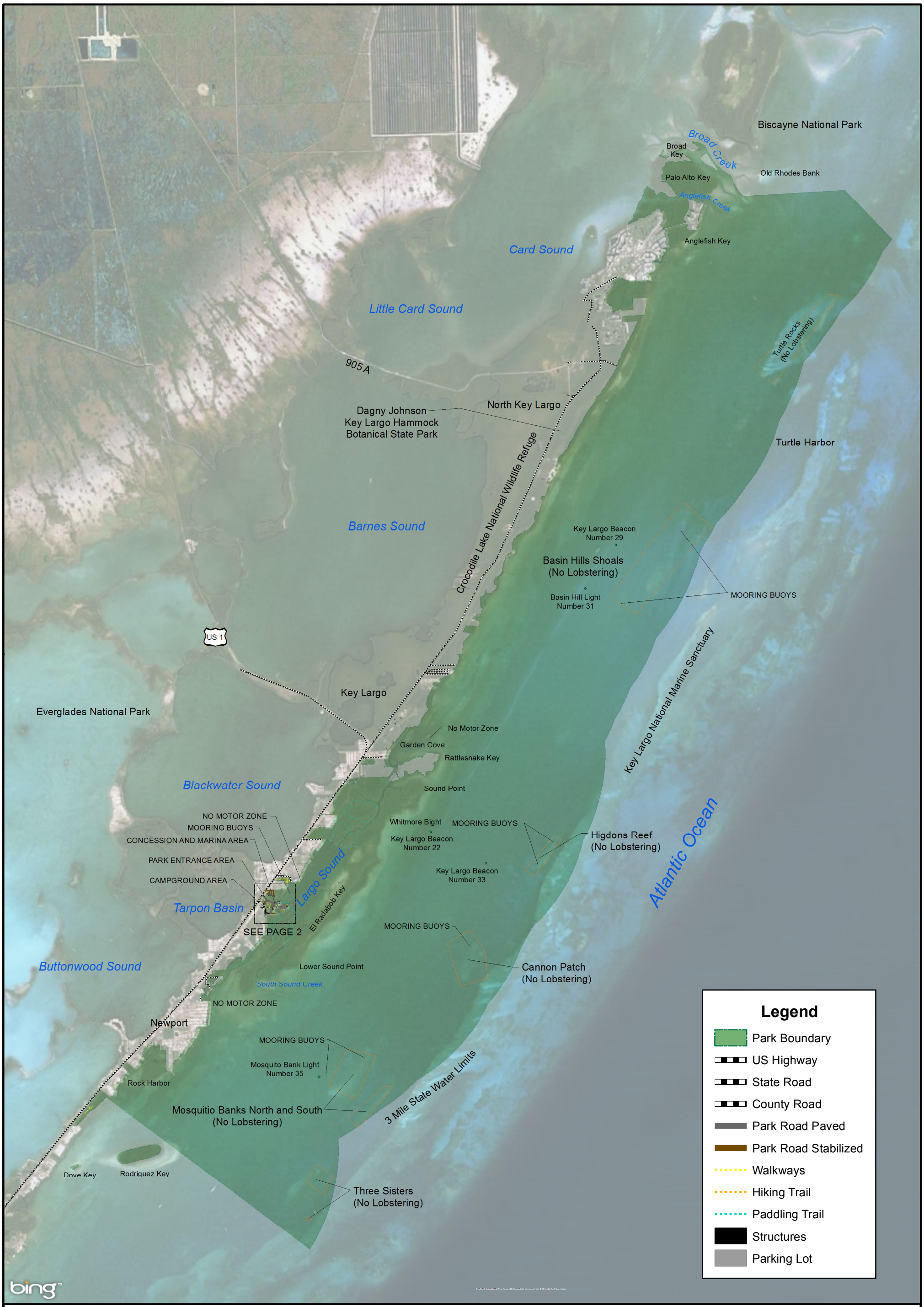
Protected Zones

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 resulting in intensive resource use, such as parking lots, camping areas, shops or maintenance areas, are not permitted in protected zones. Facilities with minimal resource impacts, such as trails, interpretive signs and boardwalks are generally allowed. All decisions involving the use of protected zones are made on a case-by-case basis after careful site planning and analysis.

At John Pennekamp Coral Reef State Park, all wetlands and floodplain as well as coastal berm, coastal rock barren, rockland hammock, marine coral reef, and known imperiled species habitat have been designated as protected zones. The park's current protected zone is delineated on the Conceptual Land Use Plan.

Existing Facilities

While the park is almost 64,000 square acres, almost all facilities at the park are located at the land base near MM 102.5. Since the park was acquired in the 1950s, many of the facilities are rather aged and in need of both aesthetic and



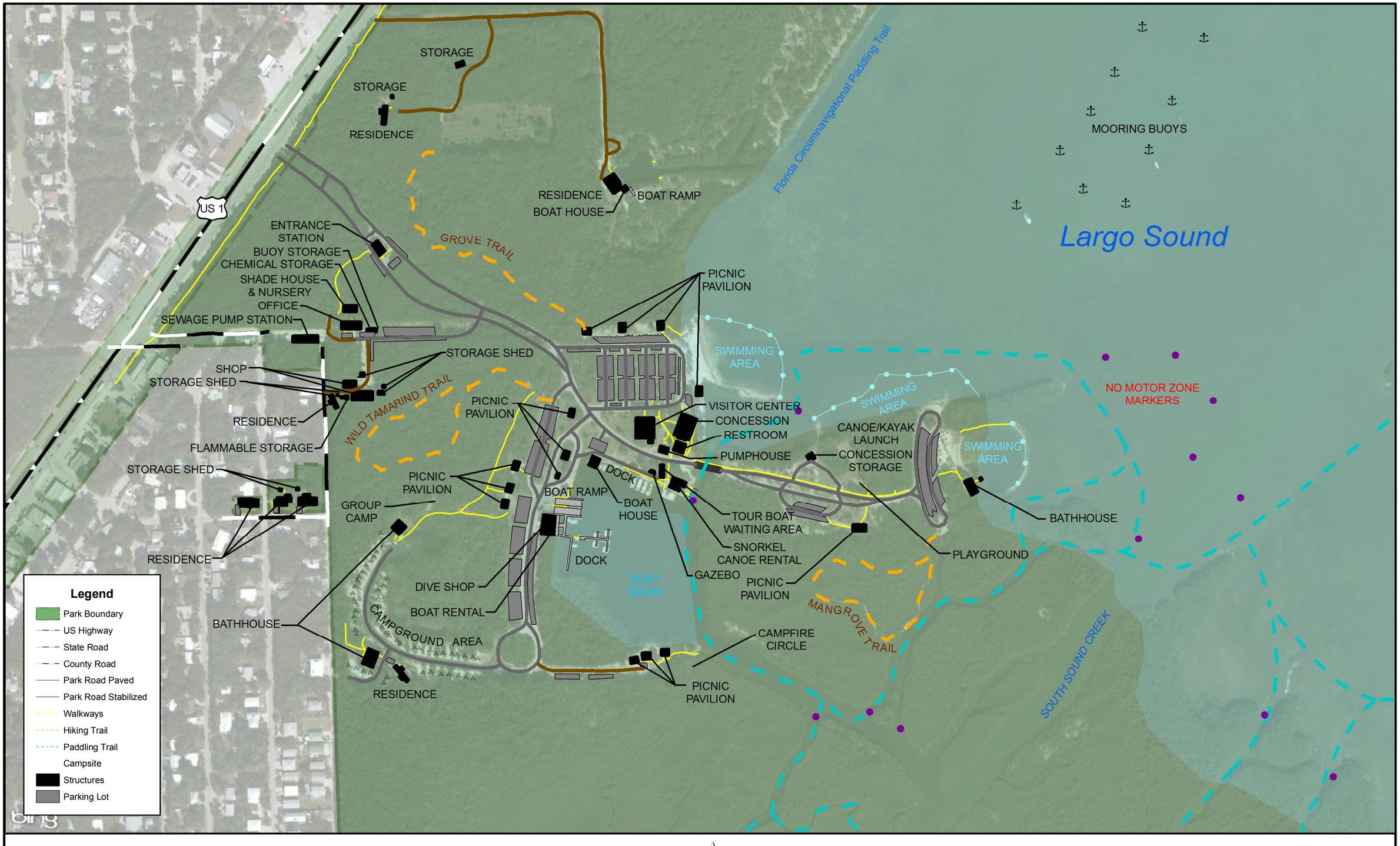
JOHN PENNEKAMP CORAL
REEF STATE PARK

N

0 0.5 1 2 Miles

Florida Department of Environmental Protection
Division of Recreation and Parks
Date of aerial; 2011

BASE MAP PAGE 1



JOHN PENNEKAMP
CORAL REEF STATE PARK

N

0 250 500 1,000 Feet

Florida Department of Environmental Protection
Division of Recreation and Parks
Date of aerial: 2011

BASE MAP PAGE 2

functional updating. Support facilities, including park offices, shops, storage, and staff residences are concentrated along the western edge of the land base in the Administration Area, Shop Area, Residence Area, Entrance Area, and Grove Residence Area. Recreation facilities, including picnic facilities, campgrounds, the visitor center and concession, and swimming areas are located to the east within the Main Day Use Area, Family Camping Area, Primitive Group Camping Area, Far Point Day Use Area, Far Beach Day Use Area, and around the Boat Basin.

Several nature trails are also located at the land base. These include the .3 mile long Mangrove Trail, the .35 mile long Wild Tamarind Trail, and the Grove Trail, which is .2 miles long. In Largo Sound, mooring buoys allow for boat camping (see Base Map).

Recreation Facilities

Boating Access Area
Boat Ramp (2 Lanes)
Floating Dock (11 Slips)
Dive/Boat Rental Shop
Fixed Dock (8 Slips)
Marina (8 Moorings)
Parking Areas (74 Spaces)

Family Camping Area
Campground (47 Sites)
Primitive Group Campground
Campfire Circle
Bathhouse (2)

Far Beach Day Use Area
Bathhouse
Parking Areas (81 Spaces)
Canoe/Kayak Launch
Large Picnic Pavilion
Playground

Far Point Day Use Area
Medium Picnic Pavilion (3)
Campfire Circle

Main Day Use Area
Medium Picnic Pavilion (11)
Visitor Center
Concession
Gazebo
Canoe/Kayak Launch
Tour Boat Waiting Shelter
Bathhouse
Parking Areas (196 Spaces)

Primitive Group Camping Area
Campfire Circle
Grill
Picnic Tables

Parkwide
Largo Sound Moorings
Mangrove Trail (.3 Miles)
Wild Tamarind Trail (.35 Miles)
Grove Trail (.2 Miles)
Paddle Trails (2.5 Miles)

Support Facilities

Administrative Area
Buoy Storage
Chemical Storage
Nursery
Shade House
Office
Sewage Pump Station

Grove Residence Area
Storage (2)
Staff Residence

Main Day Use Area
Pumphouse

Boating Access Area
Boathouse (2 Slips)

Entrance Area
Ranger Station

Family Camping Area
Staff Residence

Far Beach Day Use Area
Concession Storage

Residence Area
Staff Residence (3)
Storage (2)

Shaw Residence Area
Staff Residence
Boathouse
Boat Ramp

Shop Area
Storage (5)
Shop
Flammable Storage
Staff Residence

Conceptual Land Use Plan

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

During the development of the conceptual land use plan, the DRP assessed the potential impact of proposed uses or development on the park resources and applied that analysis to determine the future physical plan of the park as well as the scale and character of proposed development. Potential resource impacts are also identified and assessed as part of the site planning process once funding is available for facility development. At that stage, design elements (such as existing topography and vegetation, sewage disposal and stormwater management) and design constraints (such as imperiled species or cultural site locations) are investigated in greater detail. Municipal sewer connections, advanced wastewater treatment or best available technology systems are applied for on-site sewage disposal. Creation of impervious surfaces is minimized to the greatest extent feasible to limit the need for stormwater management systems and all facilities are designed and constructed using best management practices to limit and avoid resource impacts. Federal, state and local permit and regulatory requirements are addressed during facility development. This includes the design of all new park facilities consistent with the universal access requirements of the Americans with Disabilities Act (ADA). After new facilities are constructed, park staff monitors conditions to ensure that impacts remain within acceptable levels.

In 1991, the Department of Natural Resources, Office of Land Use Planning and Biological Services published the Key Largo Land Use Feasibility Study. The

LEGEND

- Protected Zone
- Park Boundary
- Hiking Trail
- Boardwalk Improvements

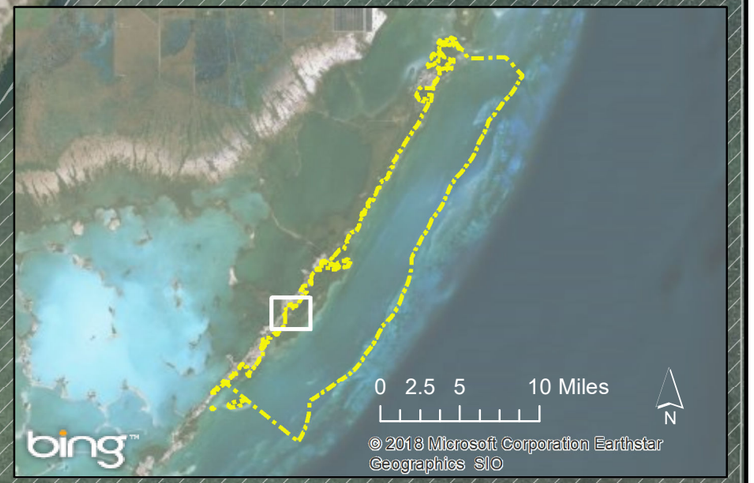
Grove Day Use Area
Add Medium Picnic Shelter

Shaw Residence Area
Add Boathouse

Main Day Use Area
Redesign Parking
Remove Boathouse
Redesign Docks
Redesign Concession Area
Improve Pedestrian Circulation and Safety

Residence Area
Add Staff Residences (2)

Family Camping Area
Bathhouse Improvements



JOHN PENNEKAMP
CORAL REEF STATE PARK

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Florida Department of Environmental Protection
Division of Recreation & Parks
Date of aerial 2010

DRAFT CONCEPTUAL
LAND USE PLAN

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.

Potential Uses

Public Access and Recreational Opportunities

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

The existing recreational activities and programs of this state park are appropriate to the natural and cultural resources contained in the park and should be continued. Improved activities and programs are also recommended and discussed below.

Objective: Maintain the park's current recreational carrying capacity of 3580 users per day.

The park will continue to provide opportunities for hiking, boating, camping, paddling, fishing, picnicking, swimming and nature observation at the park's land base and support snorkeling, scuba, and glass-bottom catamaran excursions into the nearshore reefs within the park's submerged resources. Interpretive exhibits and programs will continue to be offered at the park. The park's ability to accommodate current visitation levels will be enhanced.

Objective: Expand the park's recreational carrying capacity by 32 users per day.

Within the park land base, minor improvements are proposed that will expand the parks recreational carrying capacity. The addition of a medium picnic shelter in the Grove Day Use Area at the terminus of the Grove Trail will support the interpretation of the historical significance of the grove by providing a central area where interpretive efforts may be focused.

Objective: Continue to provide the current repertoire of three interpretive and educational programs on a regular basis.

Current interpretive and educational programs offered at the park include several ranger-led activities such as campfire talks, walks, and kayak tours. From January to April, evening campfire programs are provided for visiting campers and guests. These programs, presented by park staff, vary by presenter and focus on the ecology and the history of the park. Ranger-led walks during the weekend highlight a variety of topics including mangrove ecology, hardwood hammock ecology, and the history of the park. Kayak tours led by park staff will allow guests to appreciate mangrove ecology up close and learn about the important role they play in the larger ecosystem. The park also initiated a column in the local newspaper called *Nature's Corner*. Contributors include Pennekamp staff, staff from other parks, and nursery volunteers from Dagny Johnson Key Largo Hammock Botanical State Park.

Proposed Facilities

Capital Facilities and Infrastructure

Goal: Develop and maintain the capital facilities and infrastructure necessary to implement the recommendations of the management plan.

As recommended in the Key Largo Land Use Feasibility Study, the development of the land base will be mostly limited to improving and redesigning existing facilities to better handle the significant number of park visitors that visit annually. Development outside of the land base will be restricted to light imprint uses that minimize disturbance of the important natural communities throughout the remaining upland areas. The existing facilities of this state park are appropriate to the natural and cultural resources contained in the park and should be maintained. New construction, as discussed further below, is recommended to improve the quality and safety of the recreational opportunities, to improve the protection of park resources, and to streamline the efficiency of park operations. The following is a summary of improved or renovated and new facilities needed to implement the conceptual land use plan for John Pennekamp Coral Reef State Park:

Objective: Maintain all public and support facilities in the park.

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

Objective: Improve six existing facilities and .36 miles of trail.

Major repair projects for park facilities may be accomplished within the ten-year term of this management plan, if funding is made available. These include the modification of existing park facilities to bring them into compliance with the Americans with Disabilities Act (a top priority for all facilities maintained by DRP). The following discussion of other recommended improvements and repairs are organized by use area within the park.

Grove Day Use Area
The addition of a medium picnic shelter in the Grove Day Use Area, at the terminus of the Grove Trail, will support the interpretation of the historical significance of the grove by providing a central area where interpretive efforts may be focused.

Family Camping Area
Improvements to the existing bathhouse within the main campground are proposed that will address occasional nuisance flooding and ADA accessibility.

Main Day Use Area
The large majority of park visitors pass through the land base and, at times, can give rise to concerns related to traffic congestion, crowded public facilities, and inadequate space for management activities. However, with appropriate design interventions, a reorganization of the main day use area will provide the necessary support system to serve the large number of visitors. With a

realignment of the main park drive, parking areas, and improvements made to the existing visitor center and concessionaire, the Main Day Use Area can accommodate a larger number of park visitors more efficiently.

Improvements to the design and layout of the Main Day Use Area will provide additional parking while prioritizing the flow of pedestrian traffic between the redesigned concessionaire/visitor center and the docks for boarding of boats travelling to the nearshore reefs. Realigning the main park drive will provide a larger and more pedestrian oriented staging area for park visitors while reducing potential points of conflict with motorists travelling to the Far Beach Day Use Area. The park support boathouse is proposed to be relocated to the Shaw Residence Area in an effort to reduce congestion within the boat basin and provide additional space to recreational boat traffic. The existing dock configurations will be reevaluated in order to identify the potential for a more efficient arrangement of the floating dock.

Parkwide
The boardwalk along the Mangrove Trail, near the Far Beach Day Use Area, is in need of repair in order to support continued use by park visitors.

Residence Area
Three existing staff residences are located in the single-family subdivision adjacent to the land base. DRP staff will pursue necessary permitting in order to add two additional staff residences in the Residence Area.

Shaw Residence Area
A new boathouse is proposed for the boat basin in the Shaw Residence Area. Currently, park staff utilize the boathouse in the Main Day Use Area boat basin. This arrangement can, at times, add to existing congestion within the Main Day Use Area boat basin. The new boathouse in the Shaw Residence Area is proposed to replace the existing boathouse for park staff not only as a means of reducing congestion between recreational and park support boat traffic but also as a way to separate park support operations and the concessionaire boat boarding area.

Facilities Development

Preliminary cost estimates for these recommended facilities and improvements are provided in the Ten-Year Implementation Schedule and Cost Estimates (Table 7) located in the Implementation Component of this plan. These cost estimates are based on the most cost-effective construction standards available at this time. The preliminary estimates are provided to assist DRP in budgeting future park improvements, and may be revised as more information is collected through the planning and design processes. New facilities and improvements to existing facilities recommended by the plan include:

Grove Day Use Area
Add Medium Picnic Pavilion

Parkwide
Mangrove Trail Boardwalk Improvements

Main Day Use Area
Redesign Concession Area
Redesign Parking
Remove Boathouse
Redesign Docks
Improve Pedestrian Circulation and Safety

Residence Area
Add Staff Residences (2)

Shaw Residence Area
Add Boathouse

Family Camping Area
Improve Bathhouse

Recreational 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 6).

Table 6. Recreational Carrying Capacity

	Existing Capacity*		Proposed Additional Capacity		Estimated Recreational Capacity	
Activity / Facility	One Time	Daily	One Time	Daily	One Time	Daily
Boating						
Boat Launch	4	288			4	288
Camping						
Standard	376	376			376	376
Primitive (Group)	24	24			24	24
Boat Camping	66	66			66	66
Fishing	31	62			31	62
Paddling	50	100			50	100
Picnicking	504	1008	16	32	520	1040
Swimming	180	360			180	360
Trails						
Nature Trails	34	136			34	136
Visitor Center	290	1160			290	1160
TOTAL	**1559**	**3580**	**16**	**32**	**1575**	**3612**

*Existing capacity revised from approved plan according to DRP guidelines.

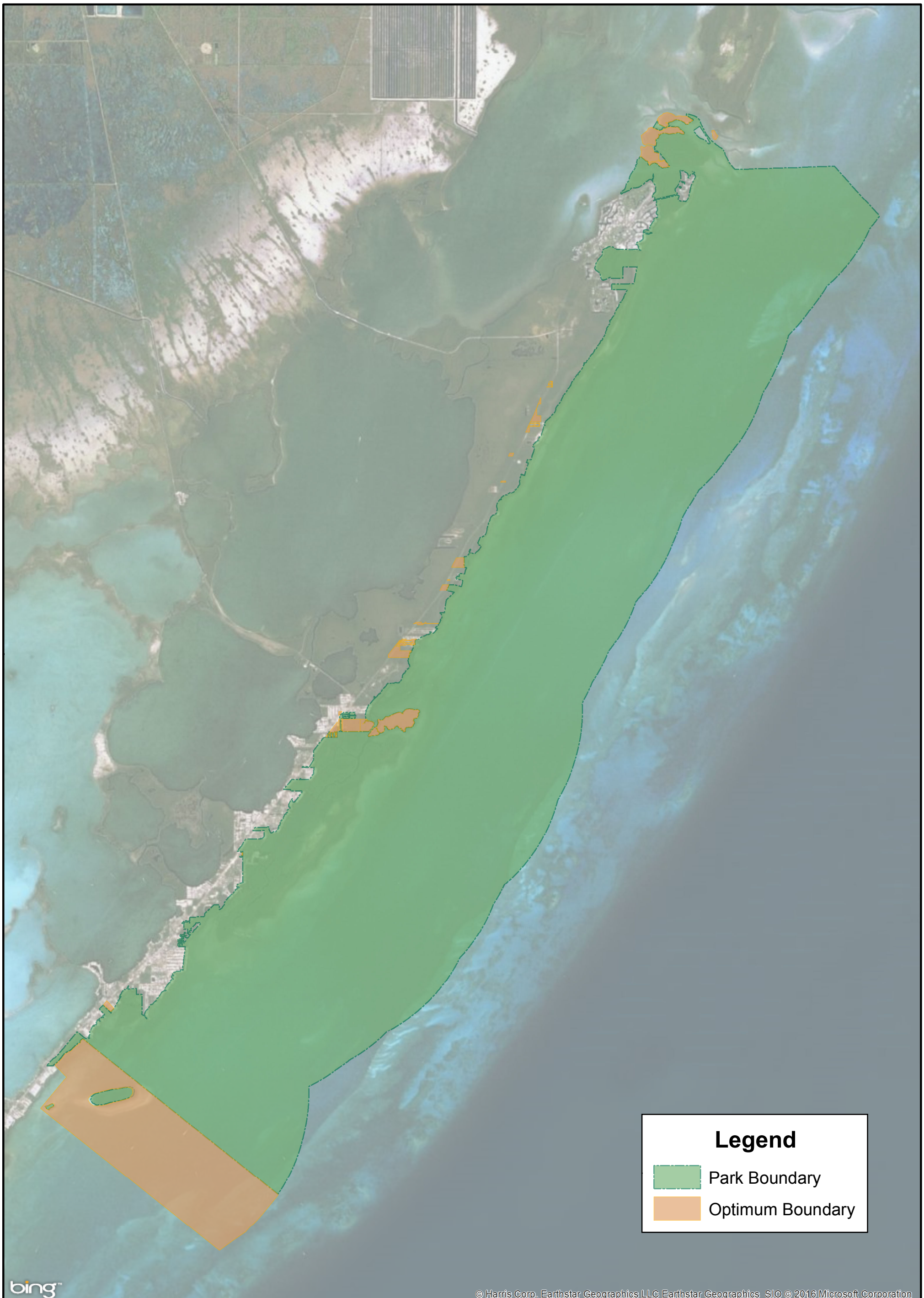
Optimum Boundary

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

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

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.

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 boundary. At this time, no lands are considered surplus to the needs of the park.



JOHN PENNEKAMP CORAL
REEF STATE PARK

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Florida Department of Environmental Protection
Division of Recreation and Parks
Date of aerial; 2011

OPTIMUM BOUNDARY MAP

IMPLEMENTATION COMPONENT

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

MANAGEMENT PROGRESS

Since the approval of the last management plan for John Pennekamp Coral Reef State Park in 2004, significant work has been accomplished and progress made towards meeting the DRP's management objectives for the park. These accomplishments fall within three of the five general categories that encompass the mission of the park and the DRP.

Acquisition

- 70 new parcels have been added to the park since the approval of the previous management plan in 2004, totaling 78.73 acres

Park Administration and Operations

- New park signs were installed at the main entrance and in front of the Visitor Center.
- Improvements to the landscaping at the park entrance have been completed.
- The Park procedures manual has been completed.

Resource Management

Natural Resources

- Restoration of Egret Island was completed with funding provided by the Keys Environmental Restoration Trust Fund.

Cultural Resources

- The Shaw Grove was replanted with Key Lime, avocado, and mango trees. A nature trail from the picnic tables in the main park area was added to access the Grove.

Recreation and Visitor Services

- ADA accessibility improvements made at the park include the following:
  - Installed concrete walkways around facilities and sidewalks to the Far Beach Day Use Area;
  - Installed a mobi-mat at the Far Beach Day Use Area;
  - Improved Tour boat access;
  - Improved accessibility at the Dive Shop rental docks;
  - Two camping sites were made ADA accessible;
  - The sound system in the amphitheater was upgraded with remotes for the hearing impaired;
  - Visitor Center signs were improved to include braille;
  - Thirteen small pavilions were replaced and the ADA access was improved at each;
  - Electric gates were installed at the park entrance and in the camping area, providing better security and ADA accessibility;
  - All restrooms were improved to enhance ADA accessibility including ramps, railings, shower stalls, and accessories;
  - Additional ADA park spaces were installed in the park.
- Improvements made to the campground include the following:
  - Campground roads were paved;
  - Installed new electric posts;
  - Plumbing was upgraded at each site;
  - Sewage hook-ups were added to each site;
  - The main lift station was rebuilt and upgraded;
  - The old restroom was refurbished and landscaped.
- Upgrades made to the Visitor Center include the following:
  - New full-length windows for the big aquarium were installed;
  - All fiberglass coral replicas were repainted;
  - The roof was replaced.
- An interpretive kiosk was installed in the Shaw Grove.
- A new picnic pavilion was installed in the Main Day Use Area.
- Nine interpretive brochures were created with park and resource information.
- Large print documents were created.
- A Volunteer handbook was created.

Park Facilities

- A new metal roof was installed on the Ranger Station.
- The wooden bridge that leads to the Far Beach Day Use Area was reinforced and resurfaced.
- The two boat ramps were rebuilt with paver-type stones.
- Dock decking has been replaced with recycled lumber.

MANAGEMENT PLAN IMPLEMENTATION

This management plan is written for a timeframe of ten years, as required by Section 253.034 Florida Statutes. The Ten-Year Implementation Schedule and Cost Estimates (Table 7) summarizes the management goals, objectives and actions that are recommended for implementation over this period, and beyond. Measures are

identified for assessing progress toward completing each objective and action. A time frame for completing each objective and action is provided. Preliminary cost estimates for each action are provided and the estimated total costs to complete each objective are computed. Finally, all costs are consolidated under the following five standard land management categories: Resource Management, Administration and Support, Capital Improvements, Recreation Visitor Services and Law Enforcement.

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

Statewide priorities for all aspects of land management are evaluated each year as part of the process for developing the DRP's annual legislative budget requests. When preparing these annual requests, the DRP considers the needs and priorities of the entire state park system and the projected availability of funding from all sources during the upcoming fiscal year. In addition to annual legislative appropriations, the DRP pursues supplemental sources of funds and staff resources wherever possible, including grants, volunteers and partnerships with other entities. The DRP's ability to accomplish the specific actions identified in the plan will be determined largely by the availability of funds and staff for these purposes, which may vary from year to year. Consequently, the target schedules and estimated costs identified in Table 7 may need to be adjusted during the ten-year management planning cycle.

Table 7
John Pennekamp Coral Reef State Park
Ten-Year Implementation Schedule and Cost Estimates
Sheet 1 of 6

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

Goal I: Provide administrative support for all park functions.		**Measure**	**Planning Period**	**Estimated Manpower and Expense Cost* (10-years)**
Objective	**Continue day-to-day administrative support at current levels.**	Administrative support ongoing	C	**$1,230,000**
Objective	**Expand administrative support as new lands are acquired, new facilities are developed, or as other needs arise.**	Administrative support expanded	C	**$11,000**
Goal II: Protect water quality and quantity in the park, restore hydrology to the extent feasible, and maintain the restored condition.		**Measure**	**Planning Period**	**Estimated Manpower and Expense Cost* (10-years)**
Objective	**Conduct an assessment of the park's hydrological restoration needs.**	Assessment conducted	LT	**$4,500,000**
Action 1	Restore natural topography by filling in sites where material was dredged for construction.	#Acres restored	LT	$3,000,000
Action 2	Restore natural topography by removing fill material that was a by-product of dredging for construction.	#Acres restored	LT	$1,500,000
Objective	**Restore natural hydrological conditions and functions to approximately five acres of nearshore submerged resources including marine composite substrate and seagrass bed natural communities**	#Acres restored	LT	**$400,000**
Action 1	Fill approximately 5 acres of channels.	#Acres filled	LT	$250,000
Action 2	Remove 0.5 acres of fill material to restore seagrass habitat.	#Acres restored	LT	$150,000

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

Table 7
John Pennekamp Coral Reef State Park
Ten-Year Implementation Schedule and Cost Estimates

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

Goal III: Restore and maintain the natural communities/habitats of the park.		Measure	Planning Period	Estimated Manpower and Expense Cost* (10-years)
Objective	**Conduct habitat/natural community restoration activities on 30.4 acres of seagrass, coral reef, mangrove, and rockland hammock communities.**	Restoration plan needs to be developed	ST, LT	**$5,003,000**
Action 1	Implement restoration plan.	#Acres restored	ST, LT	$5,003,000
Objective	**On average, restore approximately 2.06 acres per year of damaged seagrass beds and conduct necessary follow-up management activities**	#Acres restored	ST, LT	**$50,000**
Action 1	Analyze and prioritize potential restoration sites.	# Sites analyzed	ST	$1,000
Action 2	Conduct Restoration Activities	# Acres restored	LT	$49,000
Objective	**Conduct habitat restoration on coral reef sites within the park.**	# Habitats restored	ST,LT	**$25,000**
Action 1	Develop coral restoration plan.	Plan developed	ST	$23,000
Action 2	Analyze potential for an in-situ coral nursery.	Potential analyzed	ST,LT	$2,000
Objective	**Conduct rockland habitat restoration where feasible.**	# Acres restored	ST,LT	**$4,925,000**
Action 1	Identify potential restoration sites.	# Sites identified	ST,LT	$0
Action 2	Conduct borrow pit restoration where feasible.	# Acres restored	ST,LT	$4,925,000

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

Table 7
John Pennekamp Coral Reef State Park
Ten-Year Implementation Schedule and Cost Estimates
Sheet 3 of 6

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

Goal IV: Maintain, improve, or restore imperiled species populations and habitats in the park.		Measure	Planning Period	Estimated Manpower and Expense Cost* (10-years)
Objective	**Update baseline imperiled species occurrence inventory lists for plants and animals.**	In progress	C	**$1,500**
Objective	**Monitor and document five imperiled coral species in the park.**	# Species monitored	ST, LT	**$28,000**
Action 1	Develop monitoring protocols for five selected imperiled animal species including coral species that have been listed as imperiled.	# Protocols being developed	ST	$2,000
Action 2	Implement monitoring protocols for five imperiled animal species including those listed in Action 1.	# Protocols being developed	ST, LT	$5,000
Action 3	Conduct annual coral surveys documenting species diversity, structure, rugosity, and coral bleaching.	# Surveys completed	ST, LT	$20,000
Action 4	Continue to participate in the Nature Conservancy's Florida Reef Resilience Project.	Ongoing	C	$1,000
Objective	**Conduct population dynamics study of the imperiled Schaus' swallowtail butterfly.**	Ongoing	C	**$2,500**
Action 1	Implement monitoring protocols for monitoring the federally endangered Schaus Swallotail butterfly in the park.	# Protocols Implemented	C	$2,500
Objective	**Monitor and document all imperiled plant species in the park.**	Ongoing	ST, LT	**$1,500**
Action 1	Continue to support conservation of imperiled species in the park.	Ongoing	ST, LT	$1,000
Action 2	Continue to collaborate with Fairchild Tropical Botanic Garden and U.S. Fish and Wildlife Service on the long-term conservation of Keys tree cactus.	Ongoing	C	$500

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

Table 7
John Pennekamp Coral Reef State Park
Ten-Year Implementation Schedule and Cost Estimates

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

Goal V: Remove exotic and invasive plants and animals from the park and conduct needed maintenance control.		**Measure**	**Planning Period**	**Estimated Manpower and Expense Cost* (10-years)**
Objective	**Annually treat 57.75 acres of exotic plant species in the park.**	# Acres treated	C	**$10,250**
Action 1	Annually develop/update exotic plant management work plan.	Plan developed/updated	ST	$250
Action 2	Implement annual work plan by treating 57.75 acres in park, annually, and continuing maintenance and follow-up treatments, as needed.	Plan implemented	ST, LT	$10,000
Objective	**Implement control measures on four exotic and nuisance animal species in the park.**	# control measures implemented	ST, LT	**$750**
Action 1	Continue to capture and remove green iguanas, black rats, and feral cats within the park.	# of animals removed	C	$500
Action 2	Continue to capture and remove lionfish from nearshore and offshore habitats within the park.	# of animals removed	C	$250
Goal VI: Protect, preserve, and maintain the cultural resources of the park.		**Measure**	**Planning Period**	**Estimated Manpower and Expense Cost* (10-years)**
Objective	**Assess and evaluate one of twelve recorded cultural resources in the park.**	Documentation complete	LT	**$500**
Action 1	Complete one assessment/evaluation of an archaeological site.	Assessments complete	ST, LT	$250
Action 2	Complete one Historic Structures Report (HSR) for historic buildings and cultural landscapes. Prioritize stabilization, restoration, and rehabilitation projects.	Reports and priority lists completed	LT	$250
Objective	**Compile reliable documentation for all recorded historic and archaeological sites.**	Documentation complete	LT	**$2,700**
Action 1	Ensure all known sites are recorded or updated in the Florida Master Site File.	# Sites recorded or updated	ST	$200
Action 2	Conduct Level 1 archaeological survey for one priority area identified by predictive model or other previous study.	Survey completed	LT	$1,000
Action 3	Develop and adopt a Scope of Collections Statement.	Statement completed	ST	$1,500
Objective	**Bring one of twelve recorded cultural resources into good condition.**	# Sites in good condition	LT	**$3,000**
Action 1	Design and implement regular monitoring programs for eleven cultural sites.	# Sites monitored	LT	$1,500
Action 2	Create and implement a cyclical maintenance program for each cultural resource.	# Programs implemented	LT	$1,500

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

Table 7
John Pennekamp Coral Reef State Park
Ten-Year Implementation Schedule and Cost Estimates
Sheet 5 of 6

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

Goal VII: Provide public access and recreational opportunities in the park.		Measure	Planning Period	Estimated Manpower and Expense Cost* (10-years)
Objective	Maintain the park's current recreational carrying capacity of 3,580 users per day.	# Recreation/visitor	C	$3,450,000
Objective	Expand the park's recreational carrying capacity by 32 users per day.	# Recreation/visitor	ST, LT	$31,000
Objective	Continue to provide the current repertoire of three interpretive, educational, and recreational programs on a regular basis.	# Interpretive/education programs	C	$15,000
Goal VIII: Develop and maintain the capital facilities and infrastructure necessary to meet the goals and objectives of this management plan.		**Measure**	**Planning Period**	**Estimated Manpower and Expense Cost* (10-years)**
Objective	Maintain all public and support facilities in the park.	Facilities maintained	C	$3,825,000
Objective	Continue to ensure facilities are accessible in accordance with the American with Disabilities Act of 1990.	#of Facilities made accessible	LT	$3,000,000
Objective	Improve and repair 6 existing facilities and .36 miles of trail as identified in the Land Use Component.	# Facilities/Miles of Trail/Miles of Road	LT	$6,675,000
Objective	Expand maintenance activities as existing facilities are improved and new facilities are developed.	Facilities maintained	C	$34,000

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

Table 7
John Pennekamp Coral Reef State Park
Ten-Year Implementation Schedule and Cost Estimates

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

Summary of Estimated Costs

Management Categories		Total Estimated Manpower and Expense Cost* (10-years)
Resource Management		**$14,953,700**
Administration and Support		**$1,241,000**
Capital Improvements		**$13,534,000**
Recreation Visitor Services		**$3,496,000**
Law Enforcement Activities	Note: Law enforcement activities in Florida State Parks are conducted by the FWC Division of Law Enforcement and by local law enforcement agencies.	

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

Addendum 1—Acquisition History

LAND ACQUISITION HISTORY REPORT	
Park Name	John Pennkeamp Coral Reef State Park
Date Updated	9/28/2015
County	Monroe
Trustees Lease Number	3627 (original lease, Lease No. 2324)
Current Park Size	63839.67 acres
Purpose of Acquisition	To protect the area from impending commercial exploitation and to preserve it for the benefit and enjoyment of the people.

Acquisition History

Parcel Name or Parcel DM-ID	Date Acquired	Initial Seller	Initial Purchaser	Size in acres	Instrument Type
MDID 345010	5/22/1963	Trustee of the El Radabob Liquidation Trust	the use and benefit of the Florida Board of Parks and Historic Memorials	2067.23	Limited Warranty Deed
MDID 4461	3/17/1982	Ocean Reef Club, Inc.	The Boad of Trustees of the Internal Improvement Trust Fund of the State of Florida (Trustees)	718.914	Special Warranty Deed
MDID 11955	6/9/1988	Ocean Reef Club, Inc.	Trustees	715.79	Corrective Deed
MDID 11889	6/16/1988	Federal Deposit Insurance Corporation	Trustees	418.537	Special Warranty Deed
MDID 311408	9/20/2001	Monroe County	Trustees	344.961	County Deed
MDID 4459	3/21/1985	Riley-Field Company	Trustees	250.333	Warranty Deed
MDID 4458	5/1/1986	Investment Properties, Inc.	Trustees	151.97	Indenture
MDID 355517	3/21/1961	Trustee of the El Radabob Liquidation Trust	FBPHM	70.622	Warranty Deed
MDID 4455	2/28/1979	Early Shaw individually and as Trustees joined by his wife, Rita P. Shaw, Herbert J. Shaw, JR. individually and as Trustee joined by his wife Frances D. Shaw; and Herbert J. Shaw, SR. and Donna Shaw, his wife.	Trustees	56.019	Warranty Deed
MDID355519	5/22/1963	J.G. McKay, Jr. individually and as Trustee, joined by his wife, Betty Jean W. MacKay	FBPHM	30.371	Limited Warranty Deed
MDID 15363	4/20/1998	Dawn Rigby Laws, et al.	Trustees	30.254	Order of Taking
MDID 312800	5/4/1999	Alton R. Wells	Trustees	13.592	Warranty Deed
MDID 359939	2/13/1997	Dr. Howard F. Wallach, indivually and as Trustee (10243 Century Woods)	Trustees	11.029	Warranty Deed

Management Lease

Parcel Name or Lease Number	Date Leased	Initial Lessor	Initial Lessee	Current Term	Expiration Date
Lease Number 3627 (Original lease, Lease No. 2324)	1/23/1968	Improvement Trust Fund of the State of Florida	FBPHM	99 years	1/22/2067

Outstanding Issue	Type of Instrument	Brief Description of the Outstanding Issue	Term of the Outstanding Issue
acquisition of this park properties between 1961 and 2006 identifies variours restrictions. Detailed information about specific restriction is available from the Office of Park Planning.			

Addendum 2—Advisory Group Members and Report

Dagny Johnson Key Largo Hammock Botanical State Park
And
John Pennekamp Coral Reef State Park

Advisory Group Members and Report

List

Dagny Johnson Key Largo Hammock Botanical State Park
And
John Pennekamp Coral Reef State Park

Advisory Group Members and Report

Report

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Addendum 4—Soil Descriptions

(2) Pennekamp gravelly muck - 0 to 2 percent slopes, extremely stony – The Pennekamp series consists of well drained soils that are shallow to rippable coral limestone bedrock. The depth to bedrock is 4 to 16 inches. These soils formed in material weathered from the coral limestone bedrock. They generally have a thin overburden of sapric material. They are on uplands. Slopes range from 0 to 2 percent. The taxonomic class is loamy-skeletal, carbonatic, isohyperthermic Lithic Rendolls.

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

The Pennekamp soil is dominant in this map unit. Soils in areas on the keys between Upper Matecumbe Key and Big Pine Key are more sandy than the Pennekamp soil; however, uses and interpretations are the same as those of the Pennekamp soil. Areas that have different uses and interpretations are rare and generally are adjacent to the boundaries of the map unit.

Soils that are associated with the Pennekamp soil are the moderately well drained, organic Matecumbe soils in the slightly lower position on the landscape and the poorly drained, marly Cudjoe, Lignumvitae, and Key West soils and very portly drained, organic Islamorada, Key Largo, and Tavernier soils in the significantly lower positions on the landscape.

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 tropical hammock species. Some areas have been developed for residential, urban or recreation use. Characteristic vegetation for the soils in the survey area include; poisonwood, wild tamarind, gumbo limbo, strangler fig and wild coffee.

Depth to bedrock and the flooding are severe limitations affecting most uses of this soil, including most kinds of building site and recreational development and salinity facilities.

(3) Matecumbe muck - occasionally flooded - The Matecumbe series consists of moderately well drained soils that are very shallow to rippable coral or oolitic limestone bedrock. The depth to limestone or coral limestone bedrock is 2 to 9 inches. These soils formed in organic material in varying stages o decomposition. Slopes are 0 to 1 percent. The taxonomic class is Euic, isohyperthemric Lithic Tropofolists.

This soil is 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, according to National Geodetic

Vertical Datum of 1929. The mean temperature ranges from 74 to 78 degrees F, and the mean annual precipitation ranges from 50 to 65 inches.

The Matecumbe soil is dominant in this map unit. Areas that have different uses and interpretations are rare and generally are adjacent to the boundaries of the map unit.

Soils that are associated with the Matecumbe soil are the well-drained, mineral Key Vaca and Pennekamp soils in the higher positions on the landscape; the somewhat poorly drained, marly Saddlebunch soils in the landscape positions similar to those of the Matecumbe soil; and the poorly drained, marly Cudjoe, Key West, and Lignumvitae soils and very poorly drained, organic Islamorada, Key Largo, and Tavernier soils in the lower positions on the landscape.

The Matecumbe 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 support native vegetation and are used as habitat for woodland wildlife. Some areas have been developed for residential, urban, or recreational use. Characteristic vegetation for the soils in the survey area include; poisonwood, wild tamarind, mahogany, tree cactus, crabwood, thatch palms, satinleaf, paradise tree, and stopper.

Depth to bedrock, the flooding, and an excessive amount of humus are severe limitation affecting most uses of this soil, including most kinds of building site and recreational development and sanitary facilities.

(4) Rock outcrop – Tavernier complex, tidal – The Tavernier series consists of very poorly drained soils that are shallow to rippable coral limestone bedrock. The depth to bedrock is dominantly 3 to 16 inches but ranges to 20 inches. These soils formed in sapric material. The taxonomic class is Euic, isohyperthermic, shallow Lithic Troposaprists

This map unit is in mangrove swamps throughout the keys. Individual areas are subject to daily flooding by tides. Elevations are less than 2 feet above sea level, according to National Geodetic Vertical Datum of 1929. The mean annual temperature is about 75 degrees F, and the mean annual precipitation is about 55 inches.

Approximately 60 percent of this map unit consists of areas of exposed bedrock. These areas are dominantly 1 to 4 inches above the surface of the surrounding soils and range from approximately 2 feet to more than 200 feet in diameter. The Tavernier soil is dominant in about 35 percent of this map unit. Areas that have different uses and interpretations are rare and generally are adjacent to the boundaries of this map unit.

Soils that are associated with the Tavernier soil are the very poorly drained, organic Islamorada and Key Largo soils in landscape positions similar to those of the

Tavernier soil; the poorly drained, marly Cudjoe, Lignumvitae, and Key West soils in the slightly higher positions on the landscape; and the moderately well drained, organic Matecumbe soils and somewhat poorly drained, marly Saddlebunch soils in the significantly higher positions on the landscape.

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 for wetland wildlife. Some areas have been developed for residential, urban, or recreational use. Characteristic vegetation for the soils in the survey area include; red mangrove, black mangrove, and saltwort.

The flooding, the depth to bedrock and the wetness are severe limitation affecting most uses of this map unit, including most kinds of building site and recreational development.

(5) Islamorada muck - tidal – The Islamorada series consists of very poorly drained soils that are moderately deep to rippable coral or oolitic limestone bedrock. The depth to bedrock is 20 to 50 inches. These soils formed in sapic material. Slopes are less than 1 percent. Taxonomic class is Euic, isohyperthermic Lithic Troposaprists.

This soil is dominantly on the upper keys in mangrove swamps. Individual areas are subject to daily flooding by tides. Elevations are dominantly at or below sea level, according to National Geodetic Vertical Datum of 1929. The mean annual temperature is about 75 degrees F, and the mean annual precipitation is about 50 inches.

The Islamorada soil is dominant in this map unit. Areas of the Tavernier soils are also included. These soils have bedrock within a depth of 20 inches. Other areas that have different uses and interpretations are rare and generally are adjacent to the boundaries of the map unit.

Soils that are associated with the Islamorada soils are the very poorly drained, organic Key Largo and Tavernier soils in landscape positions similar to those of the Islamorada soil; the poorly drained, marly Cudjoe, Lignumvitae, and Key West soils in the slightly higher position on the landscape; and the moderately drained, organic Matecumbe soils and somewhat poorly drained, marly Saddlebunch soils in the significantly higher positions on the landscape.

The Islamorada 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 soil support native vegetation and are used as habitat for wetland wildlife. Some areas have been developed for residential or recreation use. Characteristic vegetation for the soils in the survey area include; red and black mangrove.

The wetness, the flooding, and depth to bedrock are severe limitations affecting most uses of this soil, including most kinds of building site and recreational development.

(6) Key Largo muck - tidal – The Key Largo series consists of very poorly drained soils that are deep to rippable coral or oolitic limestone bedrock. The depth to bedrock is 50 to 90 inches. These soils formed in sapric material. Slopes are less than 1 percent. The taxonomic class is Euic, isohyperthermic Typic Troposaprists.

This soil is dominantly on the upper keys but can occur throughout the keys. It is in mangrove swamps. Individual areas are subject to daily flooding by tides. Elevations are dominantly at or below sea level, according to National Geodetic Vertical Datum of 1929. The mean annual temperature is about 75 degrees F, and the mean annual precipitation is about 50 inches.

The Key Largo soil is dominant in the map unit. Areas that have different uses and interpretations are rare and generally are adjacent to the boundaries of the map unit.

Soils that are associated with the Key Largo soils are the very poorly drained, organic Islamorada and Tavernier soils in the landscape positions similar to those of the Key Largo soil; the poorly drained, marly Cudjoe, Lignumvitae and Key West soils in the slightly higher position on the landscape; and the moderately well drained, organic Matecumbe soils and somewhat poorly drained, marly Saddlebunch soils in the significantly higher positions on the landscape.

The Key Largo 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 soil support native vegetation and are used as habitat for wetland wildlife. A few areas have been developed for residential or recreation use. Characteristic vegetation for the soils in the survey areas include; red and black mangrove.

The wetness, an excessive amount of humus, and the flooding are severe limitations affecting most uses of this soil, including most kinds of building site and recreational development.

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

The Udorthents dominantly consist of crushed oolitic limestone or coral bedrock that has been spread over the original soil material. They commonly are about 32 inches of extremely gravelly sand underlain by about 40 inches of marl. The marl is underlain by coral bedrock. Other areas of soils are underlain by muck and other soil material. Houses and other urban structures cover up to 40 percent of most

areas of the Udorthents; however, the soils can still be observed. Soils that are associated in this map unit are all of the other soils that are in the Keys.

The Udorthents are moderately well drained. They have a seasonal high-water table at a depth of 2 to 4 feet during wet periods of most years. Permeability is variable.

This map unit generally supports no vegetation. The stones and droughtiness are severe limitations affecting any kind of landscaping activity. The Udorthents were developed for urban use, and many areas are being used for this purpose.

The stones, seepage, and the wetness are moderate or severe limitations affecting most uses of this map unit, including most kinds of building site and recreational development.

(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 temperatures range from 75 to 78 degrees F, and the mean annual precipitation ranges from 40 to 50 inches.

The Lignumvitae soil is dominant in this map unit. Areas that have different uses and interpretations are rare and generally are adjacent tot eh boundaries of the map unit.

Soils that are associated with the Lignumvitae soil are the well-drained, mineral Key Vaca and Pennekamp soils, moderately well drained, organic Matecumbe soils, and somewhat poorly drained, marly Saddlebunch soils in the higher position on the landscape; the poorly drained, marly Cudjoe and Key West soils in landscape positions similar to those of the Lignumvitae soil; and the very poorly drained, organic Islamorada, Key Largo, and Tavernier soils in the lower positions on the landscape.

The Lignumvitae soil is poorly drained. The seasonal high-water table is within a depth of 6 inches during the wet periods of most years. Permeability is moderate or moderately rapid.

Most areas of this soil support native vegetation and are used as habitat for wetland wildlife. Some areas have been developed for residential, urban, or recreational use. Characteristic vegetation for the soils are black, red and white mangrove, buttonwood, glasswort and wild tamarind. Because the species listed generally are more easily established and require less maintenance than other species, they should be selected for planting during beautification and landscaping.

Threatened or endangered plants and animals in the areas of this soil include the following;
Birds: Bald eagle, white-crowned pigeon, wood stork
Reptiles: American crocodile, striped mud turtle

Depth to bedrock, the flooding, and the wetness are severe limitations affecting most uses of this soil, including most kinds of building site and recreational development and sanitary facilities.

Addendum 5—Plant and Animal List

John Pennekamp Coral Reef State Park Plants

Common Name	Scientific Name	Primary Habitat Codes (for imperiled species)
PTERIDOPHYTES		
Giant leather fern	*Acrostichum danaeifolium*	
Fishtail fern	*Nephrolepis flacata f. furcans* *	
Resurrection fern	*Pleopeltis polypodioides var. michauxiana*	
Whisk fern	*Psilotum nudum*	
Brake fern	*Pteris vittata* *	
Shield fern	*Thelyptris kunthii*	
ANGIOSPERMS		
MONOCOTS		
Christmas palm	*Adonidia merillii* *	
False sisal	*Agave decipiens*	
Sisal hemp	*Agave sisalana* *	
Bushy bluestem	*Andropogon glomeratus var. pumilus*	
Bluestem	*Andropogon longiberbis*	
Asparagus fern	*Asparagus aethiopicus* *	
Arrowfeather	*Aristida purpurascens*	
Foolproof plant	*Billbergia pyramidalis**	
Pitted bluestem	*Bothriochloa pertusa* *	
Payaya	*Carica papaya*	
Basket plant	*Callisia fragrans* *	
Southern sandbur	*Cenchrus echinatus*	
Coconut palm	*Cocos nucifera* *	
Fern palm	*Cycas circinalis* *	
King sago palm	*Cycas revoluta* *	
Bermuda grass	*Cynodon dactylon* *	
Yellow nutgrass	*Cyperus esculentus* *	
False saw grass	*Cyperus ligularis*	
Umbrella sedge	*Cyperus planifolius*	
Cowhorn orchid	*Cyrtopodium punctatum*	
Egyptian grass	*Dactyloctenium aegyptium* *	
Dracaena	*Dracaena fragrans* *	
Red-edged Dracaena	*Dracaena marginata* *	
Cane palm	*Dypsis lutescens* *	
Goosegrass	*Eleusine indica* *	
Butterfly orchid	*Encyclia tampensis*	
Pothos	*Epipremnum pinnatum* *	
Gophertail lovegrass	*Eragrostis ciliaris* *	
Lovegrass	*Eragrostis elliottii*	
Centipede grass	*Eremochloa ophiuroides* *	
Ground orchid	*Eulophia graminea* *	
Finger grass	*Eustachys petraea*	
Hurricane grass	*Fimbristylis cymosa* *	
Central American sisal	*Furcraea cabuya* *	

* Non-native Species

John Pennekamp Coral Reef State Park Plants

Common Name	Scientific Name	Primary Habitat Codes (for imperiled species)
Night-blooming cereus	*Hylocereus undatus* *	
Spider lily	*Hymenocallis latifolia*	
Wild bamboo	Lasiacis divaricate	
Green sprangle top	*Leptochloa dubia*	
Key grass	*Monanthochloe littoralis*	
Banana	*Musa x paradisiaca* *	
Burma reed	*Neyraudia reynaudiana* *	
Ground orchid	*Oeceolclades maculata**	
Guinea grass	*Panicum maximum* *	
Tufted Paspalum	*Paspalum blodgetii*	
Blue Paspalum	*Paspalum caespitosum*	
Salt joint grass	*Paspalum setaceum*	
Salt joing grass	*Paspalum vaginatum*	
Phoenix hybrid	*Phoenix x hybrid* *	
Dollar orchid	*Prosthechea boothiana*	RH
Solitaire palm	*Ptychosperma elegans* *	
Cabbage palm	*Sabal palmetto*	
Bowstring hemp	*Sansevieria hyacinthoides* *	
Bowstring hemp	*Sansevieria trifasciata* *	
Wire bluestem	*Schizachyrium gracile*	
Bluestem	*Schizachyrium sanguineum*	
Florida Keys nutrush	*Scleria lithosperma*	
Foxtail grass	*Setaria parviflora*	
Grain sorghum	*Sorgum bicolor* *	
Prickly cordgrass	*Spartina spartinae*	
Coral dropseed grass	*Sporobolus domingensis*	
Dropseed	*Sporobolus indicus var. indicus* *	
West Indian dropseed	*Sporobolus indicus var. pyramidalis* *	
Whorled dropseed	*Sporobolus pyramidatus*	
Coastal dropseed	*Sporobolus virginicus*	
St. Augustine grass	*Stenotaphrum secundatum* *	
Arrowhead vine	*Syngonium podophyllum* *	
Key thatch palm	*Leucothrinax morrisii*	RH
Florida thatch palm	*Thrinax radiata*	CB, KTRB, RH
Reflexed wild pine	*Tillandsia balbisiana*	
Stiff leaved wild pine	*Tillandsia fasciculata var. densispica*	
Twisted air plant	*Tillandsia flexousa*	
Silvery wild pine	*Tillandsia paucifolia*	
Ball moss	*Tillandsia recurvata*	
Southern needleleaf	*Tillandsia setacea*	
Spanish moss	*Tillandsia usneoides*	
Giant wild pine	*Tillandsia utriculata*	
Wild pine	*Tillandsia variabilis*	
Purple queen	*Tradescantia pallida* *	
Oyster plant	*Tradescantia spathacea* *	
Wandering Jew	*Tradescantia zebrina* *	

* Non-native Species

Common Name	Scientific Name	Primary Habitat Codes (for imperiled species)
Dominican panicum	*Urochloa adspersa*	
Signal grass	*Urochloa subquadripara* *	
Spanish bayonet	*Yucca aloifolia*	
Spineless yucca	*Yucca guatemalensis* *	
Turf grass	*Zoysia tenuifolia**	
	DICOTS	
Indian mallow	*Abutilon permolle*	
Barbed wire cactus	*Acanthocereus tetragonus*	
Red sandalwood	*Adenanthera pavonina* *	
False foxglove	*Agalinis maritima*	
Chaff flower	*Alternanthera flavescens*	
Alice-clover	*Alysicarpus vaginalis* *	
Notch-leaved amaranth	*Amaranthus blitum* *	
Spiny amaranth	*Amaranthus spinosus* *	
Torchwood	*Amyris elemifera*	
Sugar apple	*Annona squamosa* *	
Coral vine	*Antigonon leptopus* *	
New Caldonia tree	*Araucaria columnaris* *	
Norfolk Island pine	*Araucaria heterophylla* *	
Marlberry	*Ardisia escallonioides*	
Sand atriplex	*Atriplex cristata*	
Black mangrove	*Avicennia germinans*	
Groundsel tree	*Baccharis glomeruliflora*	
Salt bush	*Baccharis halimifolia*	
Water hyssop	*Bacopa monnieri*	
Crested Phillipine violet	*Barleria cristata* *	
Saltwort	*Batis maritima*	
Spanish needle	*Bidens alba* var. *radiata*	
Green shrimp plant	*Blechum pyramidatum* *	
Samphire	*Blutaparon vermiculare*	
Red spiderling	*Boerhavia diffusa*	
Sea ox-eye daisy	*Borrichia arborescens*	
Sea oxeye	*Borrichia frutescens*	
Bougainvillea	*Bougainvillea glabra* *	
Bahama strongbark	*Bourreria succulent*	
Blueheart	*Buchnera americana*	
Black olive	*Bucida bucera* *	
Gumbo limbo	*Bursera simaruba*	
Locustberry (cultivated)	*Byrsonima lucida*	DV
Gray nickerbean	*Caesalpinia bonduc*	
Yellow nickerbean	*Caesalpinia major*	
Dwarf Poinciana	*Caesalpinia pulcherrima* *	
Southern sea rocket	*Cakile lanceolata*	

* Non-native Species

John Pennekamp Coral Reef State Park Plants

Common Name	Scientific Name	Primary Habitat Codes (for imperiled species)
Beautyberry	*Callicarpa americana*	
Mastwood	*Calophyllum antillanum* *	
Sea daisy	*Calyptocarpus vialis* *	
Spicewood	*Calyptranthes pallens*	
Bay-bean	*Canavalia rosea*	
Cinnamon bark	*Canella winterana*	RH
Goatweed	*Capraria biflora*	
Bird pepper	*Capsicum annuum var. glabriusculum*	
Balloon vine	*Cardiospermum corundum*	
Australian pine	*Casuarina equisetifolia* *	
Madagascar periwinkle	*Catharanthus roseus* *	
West Indian cock's comb	*Celosia nitida*	
Blodgett's spurge	*Euphorbia blodgettii*	
Hairy spurge	*Euphorbia hirta*	
Graceful sandmat	*Euphorbia hypericifolia*	
Mendez's sandmat	*Euphorbia mendezii* *	
Seaside spurge	*Euphorbia mesembryanthemifolia*	
Florida hammock sandmat	*Euphorbia ophthalmica*	
Blackweed	*Euphorbia prostrata* *	
Snowberry	*Chiococca alba*	
Pineland snowberry	*Chiococca parvifolia*	
Jack-in-the-bush	*Chromolaena odorata*	
Cocoplum (cultivated)	*Chrysobalanus icaco*	
Satinleaf	*Chrysophyllum oliviforme*	
Sorrel vine	*Cissus trifoliata*	
Fiddlewood	*Citharexylum spinosum*	
Key lime	*Citrus aurantiifolia* *	
Grapefruit	*Citrus paradisa* *	
Pitch apple	*Clusia rosea* *	
Pigeon plum	*Coccoloba diversifolia*	
Seagrape	*Coccoloba uvifera*	
Croton	*Codiaeum variegatum* *	
Coffee colubrina	*Colubrina arborescens*	
Latherleaf	*Colubrina asiatica* *	
Soldierwood	*Colubrina elliptica*	
Day flower	*Commelina diffusa* *	
Buttonwood	*Conocarpus erecta*	
Semaphore cactus (cultivated)	*Consolea corallicola*	DV
Jute	*Corchorus siliquosus*	
Geiger tree	*Cordia sebestena*	
Rhacoma	*Crossopetalum rhacoma*	KTRB, RH
Rattlebox	*Crotalaria pumila*	
Ironweed	*Cyanthilium cinereum* *	
Fine-leaved marsh parsley	*Cyclospermum leptophyllum* *	

* Non-native Species

John Pennekamp Coral Reef State Park Plants

Common Name	Scientific Name	Primary Habitat Codes (for imperiled species)
Limber caper	*Cynophalla flexuosa*	
Coin vine	*Dalbergia brownii*	
Royal poinciana	*Delonix regia* *	
Virgate mimosa	*Desmanthus virgatus*	
Beggerweed	*Desmodium incanum*	
Florida begger weed	*Desmodium tortuosum* *	
Threeflower ticktrefoil	*Desmodium triflorum* *	
Ponyfoot	*Dichondra carolinensis*	
False-mint	*Dicliptera sexangularis*	
Woodrose	*Distimake dissecta*	
Varnish leaf (cultivated)	*Dodonaea viscosa*	
Milkbark	*Drypetes diversifolia*	RH
Guiana plum	*Dyrpetes laterfilora*	
Devil's potato	*Echites umbellate*	
Black torch	*Erithalis fruticosa*	
White stopper	*Eugenia axillaris*	
Redberry stopper	*Eugenia confusa*	RH
Spanish stopper	*Eugenia foetida*	
Red stopper	*Eugenia rhombea*	RH
Surinam cherry	*Eugenia uniflora* *	
Dog fennel	*Eupatorium capillifolium*	
Wild poinsettia	*Euphorbia cyathophora*	
Blodgett's spurge	*Euphorbia blodgettii*	
Grassleaf spurge	*Euphorbia graminea* *	
Hairy spurge	*Euphorbia hirta*	
Graceful sandmat	*Euphorbia hypericifolia*	
Crown of thorns	*Euphorbia lactea* *	
Mendez's sandmat	*Euphorbia mendezii* *	
Seaside spurge	*Euphorbia mesembryanthemifolia*	
Florida hammock sandmat	*Euphorbia ophthalmica*	
Blackweed	*Euphorbia prostrata* *	
Seaside gentian	*Eustoma exaltatum*	
Princewood	*Exostema caribaeum*	RH
Inkwood	*Exothea paniculata*	
False banyan	*Ficus altissima* *	
Strangler fig	*Ficus aurea*	
Weeping fig	*Ficus benjamina* *	
Shortleaf fig	*Ficus citrifolia*	
Laurel fig	*Ficus microcarpa* *	
Governor's plum	*Flacourtia indica* *	
Yellow top	*Flaveria linearis*	
Stalkless yellow top	*Flaveria trinervia*	
Segregata	*Foresteria segregata*	
Milkweed vine	*Funastrum clausum*	
Blanket flower	*Gaillardia pulchella* *	

* Non-native Species

Common Name	Scientific Name	Primary Habitat Codes (for imperiled species)
Milk pea	*Galactia striata*	
Southern gaura	*Gaura angustifolia*	
Seven year apple	*Genipa clusiifolia*	
Madre de Cacao	*Gliricidia sepium* *	
Wild cotton	*Gossypium hirsutum*	KTRB
Chewstick	*Gouania lupuloides*	
Lignum vitae	*Guajacum officinale* *	
Lignum vitae	*Guajacum sanctum*	RH
Blolly	*Guapira discolor*	
Everglades velvetseed	*Guettarda elliptica*	
Rough velvetseed	*Guettarda scabra*	
Crabwood	*Gymanthes lucida*	
Scarlet bush	*Hamelia patens*	
Prickly apple cactus	*Harrisia simpsonii* var. *patens*	RH
Scorpion tail	*Heliotropium angiospermum*	
Seaside heliotrope	*Helioptropium curassavicum*	
Bladder mallow	*Herissantia crispa*	
Wild hibiscus	*Hibiscus poeppigii*	
Hibiscus	*Hibiscus rosa-sinensis var. rosa-sinensis* *	
Manchineel (cultivated)	*Hippomane mancinella*	RH
Jaragua	*Hyparrhenia rufa* *	
White ironwood	*Hypelate trifoliata*	RH
Florida Keys indigo	*Indigofera mucronata var. keyensis*	CL
Wild indigo	*Indigofera spicata* *	
Moon flower	*Ipomoea alba*	
Scarlet morning glory	*Ipomoea hederifolia*	
Morning glory	*Ipomoea imperati*	
Morning glory	*Ipomoea indica var. acuminate*	
Railroad vine	*Ipomoea pes-caprae subsp. brasiliensis*	
Glades morning glory	*Ipomoea sagittata*	
Moonvine	*Ipomoea violaceae*	
Ixora	*Ixora coccinea* *	
Sky blue morning glory	*Jacquemontia pentanthos*	KTRB
Bracelet-wood	*Jacquinia arborea* *	
Joewood	*Jacquinia keyensis*	KTRB
Jasminum	*Jasminum fluminense* *	
Arabian jasmine	*Jasminum sambac* *	
Devil's backbone	*Kalanchoe daigremontiana* *	
Life plant	*Kalanchoe pinnata* *	
Chandelier plant	*Kalanchoe tubiflora* *	
Black ironwood	*Krugiodendron ferreum*	
White mangrove	*Languncularia racemosa*	
Lantana	*Lantana camara* *	
Wild lantana	*Lantana involucrata*	
Wild lettuce	*Launaea intybacea* *	

* Non-native Species

Common Name	Scientific Name	Primary Habitat Codes (for imperiled species)
Peppergrass	*Lepidium virginicum*	
Lead tree	*Leucaena leucocephala* *	
Sea lavender	*Limonium carolinianum*	
Christmas berry	*Lycium carolinianum*	
Wild tamarind	*Lysiloma latisiliquum*	
False mallow	*Malvastrum corchorifolium*	
Mango	*Mangifera indica* *	
Wild dilly	*Manilkara jaimiqui subsp. emarginata*	KTRB
Sapodilla	*Manilkara zapota* *	
Mayten	*Maytenus phyllanthoides*	
Marsh elder	*Melanthera nivea*	
Spanish lime	*Melicoccus bijugatus* *	
White sweet clover	*Melilotus alba* *	
Natal grass	*Melinis repens* *	
Poisonwood	*Metopium toxiferum*	
Four-o-clock	*Mirabilis jalapa* *	
Cheeseweed	*Morinda royoc*	
Twinberry stopper (cultivated)	*Myrcianthes fragrans*	
Soldier bush	*Myriopus volubilis*	
Jamaican weed	*Nama jamaicense*	
Lancewood	*Nectandra coriacea*	
Sensitive plant	*Neptunia pubescens*	
Southern Gaura	*Oenothera simulans*	
Cochineal cactus	*Opuntia cochenfllifera* *	
Prickly-pear cactus	*Opuntia stricta*	
Leafless cynanchum	*Orthosai scoperia*	
Lady's sorrel	*Oxalis corniculata*	
Pellitory	*Parietaria floridana*	
Virginia creeper	*Parthenocissus quinquefolia*	
Passionflower	*Passiflora multiflora*	RH
Corky stemmed passionflower	*Passiflora suberosa*	
Tea-blinkums	*Pectis glaucescens*	
Spreading cinchweed	*Pectis prostrata*	
Devil's backbone	*Pedilanthus tithymaloides* *	
Wild allamanda	*Pentalinon luteum*	
Pentas	*Pentas lanceolata* *	
Avocado	*Persea americana* *	
Mahogany mistletoe	*Phoradendron rubrum*	RH
Creeping Charlie	*Phyla nodiflora*	
Gale of wind	*Phyllanthus amarus* *	
Rock Carolina leaf flower	*Phyllanthus caroliniensis var. saxicola*	
Mascarene island leafflower	*Phyllanthus tenellus* *	
Ground cherry	*Physalis angulata*	
Artillery plant	*Pilea microphylla*	
Keys tree cactus	*Pilosocereus polyganus*	RH

* Non-native Species

Common Name	Scientific Name	Primary Habitat Codes (for imperiled species)
Jamaica dogwood	*Piscidia piscipula*	
Cockspur	*Pisonia aculeata*	
Blackbead	*Pithecellobium keyense*	
Cat's claw	*Pithecellobium unguis-cati*	
English plantain	*Plantago lanceolata* *	
Plantain	*Plantago major* *	
Dwarf coleus	*Plectranthus scutellarioides* *	
Bushy fleabane	*Pluchea carolinensis* *	
Marsh fleabane	*Pluchea odorata*	
Blue plumbago	*Plumbago auriculata* *	
Wild plumbago	*Plumbago zeylanica*	
Frangipani	*Plumeria rubra* *	
Miklwort	*Polygala grandiflora*	
Rustweed	*Polypremum procumbens*	
Purslane	*Portulaca oleracea*	
Purslane	*Portulaca rubricaulis*	
Eggfruit	*Pouteria campechiana* *	
Velvet burr	*Priva lappulacea*	
Mexican flame vine	*Pseudogynoxys chenopodioides* *	
Guava	*Psidium guajava* *	
Wild coffee	*Psychotria nervosa*	
Jamaica caper	*Quadrella cynophallophora*	
White indigo berry	*Randia aculeata*	
Darling plum	*Reynosia septentrionalis*	
Mangrove rubber vine	*Rhabdadenia biflora*	
Red mangrove	*Rhizophora mangle*	
Least snoutbean	*Rhynchosia minima*	
Swartz's snoutbean	*Rhynchosia swartzii*	CL
Rougeberry	*Rivina humilis*	
Annual glasswort	*Salicornia bigelovii*	
Woody glasswort	*Sacocornia perennis*	
Spanish sage	*Salvia hispanica**	
Soapberry	*Sapindus saponaria* var. *saponaria*	
Maidenbush (cultivated)	*Savia bahamensis*	DV
Beach naupaka	*Scaevola taccada* *	
Florida boxwood	*Schaefferia fruitescens*	RH
Umbrella tree	*Schefflera actinophylla* *	
Brazilian pepper	*Schinus terinthifolius* *	
Snake cactus	*Selenicereus pteranthus* *	
Sea purslane	*Sesuvium portulacastrum*	
Milkweed	*Seutera angustifolium*	
Broomweed	*Sida acuta*	
Fringed fanpetals	*Sida ciliaris*	
Saffron plum	*Sideroxylon celastrinum*	
Mastic	*Sideroxylon foetidissimum*	

* Non-native Species

Common Name	Scientific Name	Primary Habitat Codes (for imperiled species)
Willow bustic	*Sideroxylon salicifolium*	
Paradise tree	*Simarouba glauca*	
Greenbriar	*Smilax havanensis*	
Bahama nightshade	*Solanum bahamense*	
Mullein nightshade	*Solanum donianum*	
Potato tree	*Solanum erianthum*	
Necklace pod	*Sophora tomentosa var. occidentalis* *	
Necklace pod	*Sophora tomentosa var. truncata*	
Large leaf buttonweed	*Spermacoce remota*	
Buttonweed	*Spermacoce verticillata* *	
Wedelia	*Sphagneticola trilobata* *	
West Indian pinkroot	*Spigelia anthelmia*	
Blue porterweed	*Stachytarpheta jamaicensis*	
Pencil flower	*Stylosanthes hamata*	
Sea blite	*Suada linearis*	
Bay cedar	*Suriana maritima*	
West Indian mahogany	*Swietenia mahagoni*	RH
Tabebuia	*Tabebuia heterophylla* *	
Mahoe	*Taliparitiliaceum* *	
Tamarind	*Tamarindus indicus* *	
Yellow elder	*Tecoma stans* *	
Tropical almond	*Terminalia catappa* *	
Portia	*Thespesia populnea* *	
Luckynut	*Thevetia peruviana* *	
West Indian trema	*Trema lamarckianum*	RH
Florida trema	*Trema micranthum*	
Mexican daisy	*Tridax procumbens* *	
Yellow alder	*Turnera ulmifolia* *	
Cinnecord	*Vachellia choriophylla*	
Sweet acacia (cultivated)	*Vachellia farnesiana*	
Pearlberry	*Vallesia antillana*	RH
Cordia	*Varronia bullata* subsp. *humilis*	
Cow-pea	*Vigna luteola*	
Simpleleaf chastetree	*Vitex trifolia* *	
Muscadene grape	*Vitis rotundifolia*	
Waltheria	*Waltheria indica*	
Hog plum	*Ximenia americana*	
Japanese youngia	*Youngia japonica* *	
Wild lime	*Zanthoxylum fagara*	

MARINE PLANTS

Red algae	*Acanthophora spicifera*	
Mermaid's wine glass	*Acetablularia calyculus*	
Mermaid's wine glass	*Acetablularia crenulata*	

* Non-native Species

Common Name	Scientific Name	Primary Habitat Codes (for imperiled species)
Twig algae	*Amphiroa* sp.	
Blue green algae	*Anacystis* sp.	
Papyrus print algae	*Anadyomene stellata*	
Fan algae	*Avrainvillea asarifolia*	
Fan algae	*Avrainvillea nigricans*	
Fan algae	*Avrainvillea longicaulis*	
Green algae	*Batophora oerstedii*	
Red algae	*Bostrychia* sp.	
Fern algae	*Caulerpa cupressoides*	
Fern algae	*Caulerpa mexicana*	
Fern algae	*Caulerpa paspaloides*	
Fern algae	*Caulerpa prolifera*	
Fern algae	*Caulerpa sertularioides*	
Fern algae	*Caulerpa taxifolia*	
Fern algae	*Caulerpa verticillata*	
Red algae	*Ceramium* sp.	
Green algae	*Cladocephalus luteofuscus*	
Green algae	*Cladophora prolifera*	
Blue green algae	*Coccochloris sp.*	
Dead man's fingers	*Codium isthmocladum*	
Dead man's fingers	*Codium repens*	
Green algae	*Cymopolia barbata*	
Red algae	*Dasya sp.*	
Fuzzy finger algae	*Dasycladus vermicularis*	
Green bubble weed	*Dictyosphaeria cavernosa*	
Bubble algae	*Dictyoshpaeria ocellata*	
Strap algae	*Dictyota* spp.	
Green algae	*Enteromorpha flexuosa*	
Blue green algae	*Entophysalis sp.*	
Red algae	*Gracilaria* spp.	
Oatmeal algae	*Halimeda incrassata*	
Oatmeal algae	*Halimeda monile*	
Oatmeal algae	*Halimeda opuntia*	
Oatmeal algae	*Halimda tuna*	
Shoal grass	*Halodule wrightii*	
Red algae	*Heterosyphonia* sp.	
Pink segmented algae	*Jania* sp.	
Red algae	*Laurencia* sp.	
Red algae	*Lithothamnium* sp.	
Blue green algae	*Microcoleus* sp.	
Red calcareous algae	*Neogoniolithon spectabile*	
Red calcareous algae	*Neogoniolithon strictum*	
Fuzzy tip algae	*Neomeris annulata*	
Brown algae	*Padina gymnospora*	
Brown algae	*Padina sanctae-crucis*	
Shaving brush algae	*Penicillus capitatus*	

* Non-native Species

John Pennekamp Coral Reef State Park Plants

Common Name	Scientific Name	Primary Habitat Codes (for imperiled species)
Shaving brush algae	*Penicillus dumetosus*	
Shaving brush algae	*Penicillus pyriformis*	
Black band disease	*Phormidium corallyticum*	
Red algae	*Polysiphonia* sp.	
Red algae	*Porphyra* sp.	
Pinecone algae	*Rhipocephalus phoenix*	
Sargassum weed	*Sargassum fluitans*	
Sargassum weed	*Sargassum natans*	
Blue green algae	*Spirulina* sp.	
Manatee grass	*Syringodium filiforme*	
Turtle grass	*Thalassia tetudinum*	
Saucer leaf algae	*Turbinaria* sp	
Stiff fan algae	*Udotea cyathiformis*	
Stiff fan algae	*Udotea flabellum*	
Lettuce algae	*Ulva fasciata*	
Bubble alage	*Valonia* sp	
Bubble algae	*Ventricaria ventricosa*	

* Non-native Species

John Pennekamp Coral Reef State Park Animals

Common Name	Scientific Name	Primary Habitat Codes (for imperiled species)
SPONGES		
Tube sponge	*Callyspongia vaginalis*	MCPS,MCNS,MCR,MSGB
Chickenliver sponge	*Chondrilla nucula*	MCPS,MCNS,MCR,MSGB
Red boring sponge	*Cliona delitrix*	MCPS,MCNS,MCR,MSGB
White sponge	*Geodia gibberosa*	MCPS,MCNS,MCR,MSGB
Red sponge	*Haliclona rubens*	MCPS,MCNS,MCR,MSGB
Green sponge	*Haliclona viridis*	MCPS,MCNS,MCR,MSGB
Vase sponge	*Ircinia campana.*	MCPS,MCNS,MCR,MSGB
Stinker sponge	*Ircinia fasciculata*	MCPS,MCNS,MCR,MSGB
Cake sponge	*Ircinia strobilina*	MCPS,MCNS,MCR,MSGB
Do-not-touch-me sponge	*Neofibularia nolitangere*	MCPS,MCNS,MCR,MSGB
Loggerhead sponge	*Spheciospongia vesparium.*	MCPS,MCNS,MCR,MSGB
Grass sponge	*Spongia graminea*	MCPS,MCNS,MCR,MSGB
Reef sponge	*Spongia obliquia*	MCPS,MCNS,MCR,MSGB
Fire sponge	*Tedania ignis*	MCPS,MCNS,MCR,MSGB
Candle sponge	*Verongia fistularis*	MCPS,MCNS,MCR,MSGB
HYDROZOANS		
Branching fire coral	*Millepora alcicornis*	MCR
Blade fire coral	*Millepora complanata*	MCR
Portuguese man-of-war	*Physalia physalis*	MTC
By-the-wind sailor	*Velella velella*	MTC
JELLYFISH		
Moon jellyfish	*Aurelia aurita*	MTC
Upside-down jellyfish	*Cassiopeia xamachana*	MSGB
CNIDARIANS		
Ringed anemone	*Bartholomea annulata*	MCNS,MCR
Warty sea anemone	*Bunodosoma cavernata*	MCNS,MCR
Pinked tipped anemone	*Condylactis gigantea*	MCNS,MCR
Speckled anemone	*Epicystes crucifera*	MCNS,MCR
White encrusting zoanthid	*Palythoa caribaeorum*	MCR
Knobby zoanthid	*Palythoa mammilosa*	MCNS,MCR
Sun anemone	Stichodactyla helianthus	MCR
CORALS		
	Octocorals	
Corky sea finger	*Briareum asbestinum*	MCR
Warty sea rod	*Eunicea calyculata*	MCNS,MCR
Shelf-knob sea rod	*Eunicea succinea*	MCNS,MCR
Common sea fan	*Gorgonia ventalina*	MCR
Spiny sea fan	*Muricea muricata*	MCR

* Non-native Species

Common Name	Scientific Name	Primary Habitat Codes (for imperiled species)
Bent sea rod	*Plexaura flexuosa*	MCR
Black sea rod	*Plexaura homomalla*	MCR
Giant slit-pore sea rod	*Plexaurella nutans*	MCR
Porous false plexaura	*Pseudoplexaura porosa*	MCNS,MCR
Purple sea plume	*Pseduopterogorgia acerosa*	MCNS,MCR
Slimy sea plume	*Pseudophterogorgia americana*	MCNS,MCR
Sea feather	*Pseudopterogorgia bipinnata*	MCNS,MCR
Angular sea whip	*Pterogorgoia anceps*	MCNS,MCR
Yellow sea whip	*Pterogorgia citrina*	MCNS,MCR
	Stony Corals	
Staghorn coral	*Acropora cervicornis*	MCR
Elhorn coral	*Acropora palmata*	MCR
Fused staghorn	*Acropora prolifera*	MCR
Dwarf cup coral	*Astrangia solitaria*	MCR
Ivory tube coral	*Cladocora arbuscula*	MCR
Boulder brain coral	*Colpophyllia natans*	MCNS,MCR
Elliptical star coral	*Dichocoenia stokesii*	MCR
Grooved brain coral	*Diploria labyrinthiformis*	MCR
Smooth flower coral	*Eusmilia fastigata*	MCR
Golfball coral	*Favia fragum*	MCNS,MCR,MSGB
Cactus coral	*Isophyllia sinuosa*	MCR
Eight-ray finger coral	*Madracis auretenra*	MCR
Ten-ray star coral	*Madracis decactis*	MCR
Common rose coral	*Manicina areolata*	MCNS,MCR,MSGB
Butterprint brain coral	*Meandrina meandrites*	MCR
Giant star coral	*Montastraea cavernosa*	MCR
Spiny flower coral	*Mussa angulosa*	MCR
Knobby cactus coral	*Mycetophyllia aliciae*	MCR
Ivory bush coral	*Oculina diffusa*	MCNS,MCR
Boulder star coral	*Orbicella annularis*	MCR
Boulder star coral	*Orbicella faveolata*	MCR
Boulder star coral	*Orbicella franksi*	MCR
Mustard hill coral	*Porites astreoides*	MCNS,MCR
Finger coral	*Porites divercata*	MCNS,MCPS,MCR,MSGB
Finger coral	*Porites porites*	MCNS,MCPS,MCR,MSGB
Small finger coral	*Porites furcata*	MCNS,MCPS,MCR,MSGB
Knobby brain coral	*Pseudodiploria clivosa*	MCNS,MCR
Symmetrical brain coral	*Pseudodiploria strigosa*	MCR
Disk coral	*Scolymia* sp.	MCR
Massive starlet coral	*Siderastrea siderea*	MCNS,MCR,MSGB
Lesser starlet coral	*Siderastrea radians*	MCNS,MCR,MSGB
Smooth star coral	*Solenastrea bournoni*	MCNS, MCR
Knobby star coral	*Solenastrea hyades*	MCR,MSGB
Blushing star coral	*Stephanocoenia intersepta*	MCR
Leaf coral	*Undaria agaricites*	MCR

* Non-native Species

John Pennekamp Coral Reef State Park Animals

Common Name	Scientific Name	Primary Habitat Codes (for imperiled species)
CHITONS		
West Indian fuzzy chiton	*Acanthopleura granulata*	KTRB,MCNS
GASTROPODS		
Faust telling	*Acrophagia fausta*	MCPS,MCNS,MCR,MSGB,MUS
Spotted sea hare	*Aplysia dactylomela*	MCPS,MCNS,MCR,MSGB,MUS
Black horn snail	*Batillaria minima*	MCPS,MCNS,MCR,MSGB,MUS
Land planarian	*Bipalium keivense*	CL,RH
Striate bubble	*Bulla striata*	MCPS,MCR,MS
Peanut snail	*Cerion incanum*	KTRB
Stocky cerith	*Cerithium litteratum*	MTC
Cross-barred chione	*Chione cancellata*	MCPS,MCNS,MCR,MSGB,MUS
Great white lucine	*Codakia orbicularis*	MCPS,MCNS,MCR,MSGB,MUS
Flamingo tongue	*Cyphoma gibbosum*	MCR
Measled cowry	*Cypraea zebra*	MCPS,MCNS,MCR,MSGB,MUS
Multilined tree snail	*Drymaeus multilineatus*	RH
Broned-lined elysia	*Elysia subornata*	MCR,MS
Rosy predator snail	*Euglandina rosea*	RH
Tulip snail	*Fasciolaria tulipa*	MCPS,MCNS,MCR,MSGB,MUS
Two-toned gulella	*Huttonella bicolor*	DV
Florida tree snail	*Liguus fasciatus*	RH
Rough file shell	*Lima scabra scabra*	MCPS,MCNS,MCR,MSGB,MUS
Glowing marginella	*Marginella pruniosum*	MCPS,MCNS,MCR,MSGB,MUS
Coffeebean snail	*Melampus coffeus*	MS
Bleedingtooth nerite	*Nerita peloronta*	MS
Checkered nerite	*Nerita tesselata*	MS
Common reef octopus	*Octopus briareus*	MCPS,MCNS,MCR,MSGB,MUS
Common octopus	*Octopus vulgaris*	MCPS,MCNS,MCR,MSGB,MS,MUS
Banded tree snail	Orthalicus floridadensis	RH
Stock Island tree snail (cultivated)	*Orthalicus reses reses*	RH
Florida horse conch	*Pleuroploca gigantean*	MCR,MSGB
Sargassum nudibranch	*Scyllea pelagica*	MCPS,MCNS,MCR,MSGB,MUS
Caribbean reef squid	*Sepioteuthis sepioidea*	MCPS,MCNS,MCR,MSGB,MUS
Florida fighting conch	*Strombus alatus*	MCR,NSGB
Milk conch	*Strombus costatus*	MCR,MSGB
Queen conch	*Strombus gigas*	MCR,MSGB
Hawkwing conch	*Strombus raninus*	MCR,MSGB
Knobby periwinkle	*Tectarius muricatus*	MCPS,MCNS,MCR,MSGB,MUS
Common lettuce slug	*Tridachia crispata*	MCPS,MCNS,MCR,MSGB,MUS
Cuban garden snail	*Zachrysia provisoria**	MTC
BIVALVES		
Tree-oyster	*Isognomon alatus*	MS

* Non-native Species

Common Name	Scientific Name	Primary Habitat Codes (for imperiled species)
Purse-oyster	*Isognomon radiatus.*	MS
Spiny fileclam	*Lima lima*	MSGB,MS
Rough fileclam	*Lima scabra*	MCPS,MCNS,MCR,MSGB,MUS
Pearl oyster	*Pinctada radiata*	MCPS,MCNS,MCR,MSGB
Pen shell	*Pinna carnea*	MCPS,MCNS,MCR,MSGB,MUS
Sunrise telling	*Tellina radiata*	MCPS,MCNS,MCR,MSGB,MUS
SEGMENTED WORMS		
Southern lugworm	*Arenicola cristata*	MUS
Black-spotted feather duster	*Branchiomma nigromaculata*	MCR
Bearded fireworm	*Hermodice carunculata*	MCR,MSGB
Medusa worm	*Loimia medusa*	MSGB,MUS
Star feather worm	*Pomatostegus stellatus*	MCR
Banded feather duster	*Sabella melanostigma*	MCR
Magnificent feather duster	*Sabellastarte magnifica*	MCR
Christmas tree worm	*Spirobranchus giganteus*	MCR
Blushing star coral	*Vermiliopsis* sp.	MCR
ARTHROPODS		
Yellow banded millipede	*Anadenobolus monilicornis*	CL,DV
Palmetto bug	*Eurycotis floridana*	CL,DV,RH,CB
American cockroach	*Periplaneta americana*	CL,DV,RH,CB
CRUSTACEANS		
Red snapping shrimp	*Alpheus armatus*	MCPS,MCNS,MCR,MSGB
Mangrove crab	*Aratus pisonii*	MS
Ivory barnacle	*Balanus eburneus*	MCPS,MCNS,MCR,MSGB,MUS
Orangeclaw hermit	*Calcinus tibicen*	MCR
Common blue crab	*Callinectes sapidus*	MCPS,MCNS,MCR,MSMSGB
Great land crab	*Cardisoma guanhumi*	CB,RH,MS
Fragile barnacle	*Chthamalus fragilis*	MCPS,MCNS,MCR,MSGB,MUS
Common land hermit crab	*Coenobita clypeatus*	CB,RH,MS
Mangrove crab	Goniopsis cruentata	MS
Goose-neck barnacles	*Lepas anatifera*	MCPS,MCNS,MCR,MS,MSGB,MUS
Sea roach	*Ligia exotica*	MS,MUS
Horseshoe crab	*Limulus polyphemus*	MSGB,MUS
Reef mantis	*Lysiosquilla glabriuscula*	MCPS,MCR,MSGB
Stone crab	*Menippe mercenaria*	MCPS,MCNS,MCR,MSGB,MUS
Decorator crab	*Microphrys bicornuta*	MCR,MS
Banded clinging crab	*Mithrax cinctimanus*	MCR,MSGB
Red reef hermit	*Paguristes cadenati*	MCR
Spiny lobster	*Panulirus argus*	MCPS,MCNS,MCR,MS,MSGB,MUS
Spotted lobster	*Panulirus guttatus*	MCPS,MCNS,MCR,MSGB,MUS
Pink shrimp	*Penaens duorarum*	MCPS,MSGB,MCR

* Non-native Species

Common Name	Scientific Name	Primary Habitat Codes (for imperiled species)
Red-striped hermit	*Phimochirus holthuisi*	MCR
Sargassum swimming crab	*Portunus sayi*	MTC
Spanish lobster	Scyllarides aequinoctialis	MCR
Mangrove gribble	*Sphaeroma tenebrans*	MS
Banded coral shrimp	*Stenopus hispidus*	MCR
Yellowline arrow crab	*Stenorhynchus seticornis*	MCR
Fiddler crab	*Uca pugilator*	MS
DRAGONFLIES		
Common green darner	*Anax junius*	MTC
Four-spotted pennant	*Brachymesia gravida*	MTC
STICK INSECTS		
Two-striped walkingstick	*Anisomorpha buprestoides*	CL,RH
TRUE BUGS, CICADAS, HOPPERS AND KIN		
Seaside cicada	*Diceroprocta viridifascia*	MTC
Thorn bug	*Umbonia crassicornis*	MTC
BEETLES		
	Anelaphus inermis	MTC
	Euburia stigma	MTC
	Euburia stroheckeri	MTC
	Elaphidion cryptum	MTC
	Elaphidion irroratum	MTC
	Elateropsis scabrosus	MTC
Click beetle	*Lanelator sallei*	MTC
	Linsleyonides albomaculatum	MTC
	Psyrassa pertenuis	MTC
BUTTERFLIES AND MOTHS		
Butterflies and skippers		
Gulf fritillary	*Agraulis vanillae*	MTC
Great southern white	*Ascia monuste*	MTC
Orange barred sulphur	*Colias eurytheme*	MTC
Miami blue	Cyclargus thomasi berthunebakeri	MTC
Julia heliconian	*Dryas iulia largo*	MTC
Barred yellow	*Eurema daira*	MTC
Zebra heliconian	Heliconius charitonius	MTC
Fiery skipper	*Hylephila phyleus*	MTC
Cassius blue	*Leptotes cassius*	MTC
Giant swallowtail	*Papilio cresphontes*	MTC
Mangrove skipper	*Phocides pigmalion*	MTC

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Common Name	Scientific Name	Primary Habitat Codes (for imperiled species)
Cloudless sulphur	*Phoebis sennae*	MTC
Orange-barred sulphur	*Phoebis philea*	MTC
Large orange sulphur	*Phoebis agarithe*	MTC
Hammock skipper	*Polygonus leo*	MTC
Buckeye butterfly	*Precis coenia*	MTC
Long-tailed skipper	*Urbanus proteus*	MTC
Poey's swallowtail	*Papillio caiguanabus*	MTC
	Moths	
	Acalyptris gilvafascia	MTC
Dyar's lichen moth	*Afrida ydatodes*	MTC
	Antiblemma rufinans	MTC
	Antispila eugeniella	MTC
Black witch moth	*Ascalapha odorata*	MTC
Ailanthus webworm moth	*Atteva aurea*	MTC
Florida io moth	*Automeris io lilith*	MTC
Wavy lined mallow moth	*Bagisara repanda*	MTC
	Bedellia minor	MTC
Soybean webworm moth	*Brachyacma palpigera*	MTC
	Bucculatrix n. sp.	MTC
	Caloptilia n. sp.	MTC
Grote's sphinx moth	*Cautethia grotei*	MTC
	Chilocampyla dyeriella	MTC
	Chloropteryx paularia	MTC
Faithful beauty	*Composia fidelissima*	MTC
	Conchylodes diphteralis	MTC
Mobile groundling moth	*Condica mobilis*	MTC
	Coptodisca n. sp.	MTC
	Cremastobombyci sp.	MTC
	Crocidomera imitate	MTC
	Cydia fahlbergiana	MTC
Melonworm moth	*Diaphania hyalinata*	MTC
Caper-leaf webworm moth	*Dichogama redtenbacheri*	MTC
Julia's dicymolomia moth	*Dicymolomia julianalis*	MTC
	Dicymolomia metalophota	MYC
	Epimencis fraternaria	MTC
	Epimencis detexta	MTC
	Episimus kimballi	MTC
Ello sphinx moth	*Erinnyis ello*	MTC
	Ethmia confusella	MTC
	Eublemma cinnamomea	MTC
	Eutelia pyrastis	MTC
Anna carpenterworm moth	*Givira anna*	MTC
Kemp's hellula moth	*Hellula kempae*	MTC
Diva hemerophila moth	*Hemerophila diva*	MTC
Variable tropic moth	*Hermeroplanis scopulepes*	MTC

* Non-native Species

Common Name	Scientific Name	Primary Habitat Codes (for imperiled species)
	Heterocampa cubana	MTC
	Heterocampa zayasi	MTC
Seagrape borer moth	*Hexeris enhydris*	MTC
Long-horned owlet moth	*Hypenula cacuminalis*	MTC
	Leucochroma corope	MTC
	Leucoptera guettardella	MTC
Double-lined prominent moth	*Lochmaeus bilineata*	MTC
	Lypotigris fusalis	MTC
Edward's wasp moth	*Lymire edwardsii*	MTC
Mahogany webworm moth	*Macalla thyrisisalis*	MTC
	Marilopteryx lutina	MTC
Puss moth	*Megalopyge opercularis*	MTC
	Metriochroa n. sp.	MTC
Gold-striped grass-veneer moth	*Microcrambus biguttellus*	MTC
	Microcausta flavipunctalis	MTC
	Mimophobetron pyropsalis	MTC
	Nematocampa filamentaria	MTC
	Nystalea eutalanta	MTC
Southern hayworm moth	*Ocrasa nostralis*	MTC
Wine-tinted oenobotys moth	*Oenobotys vinotinctalis*	MTC
	Omiodes stigmosalis	MTC
	Opostega kempella	MTC
	Parectopa n sp.	MTC
Yellow-winged pareuchaetes moth	*Pareuchaetes insulate*	MTC
	Pebops ipomoeae	MTC
Black penestola moth	*Penestola bufalis*	MTC
	Phaedropsis stictigramma	MTC
Coffee-loving pyrausta moth	*Pyrausta tyralis*	MTC
	Rupela tinctella	MTC
	Salobrena rubiginea	MTC
Assembly moth	*Samea ecclesialis*	MTC
Pale-edged Selenisa moth	*Selenisa sueroides*	MTC
	Sphacelodes vulneraria	MTC
Dolichos armyworm moth	*Spodoptera dolichos*	MTC
	Stilbosis sp.	MTC
	Stigmella gossypii	MTC
	Stigmella n. sp.	MTC
	Synchlora cupedinaria	MTC
	Synchlora xysteraria	MTC
Watson's tallula moth	*Tallula watsoni*	MTC
	Tischeria sp.	MTC
	Tortyra iocyaneus	MTC
Slosson's metalmark moth	*Tortyra slossonia*	MTC
	Tripudia grapholithoides	MTC
	Tripudia rectangular	MTC
	Tyrissa multilinea	MTC

* Non-native Species

Common Name	Scientific Name	Primary Habitat Codes (for imperiled species)
ANTS, BEES AND WASPS		
Ant	*Aphaenogaster carolinensis*	CB,CL,RH
Ant	*Brachymyrmex depilis*	CB,CL,RH
Ant	*Brachymyrmex obscurior*	CB,CL,RH
Carpenter ant	*Camponotus floridanus*	CB,CL,RH
Florida carpenter ant	*Camponotus planatus*	CB,CL,RH
Ant	*Conomyrma bureni*	CB,CL,RH
Ant	*Crematogaster ashmeadi*	CB,CL,RH
Ant	*Cyphomyrmex minutus*	CB,CL,RH
Ant	*Hypoponera inexorata*	CB,CL,RH
Ant	*Leptothorax allardycei*	CB,CL,RH
Ant	*Leptothorax torrei*	CB,CL,RH
Ant	*Monomorium floricola*	CB,CL,RH
Ant	*Odotomachus ruginodis*	CB,CL,RH
Ant	*Paratrechina bourbonica*	CB,CL,RH
Ant	*Paratrechina guatemalensis*	CB,CL,RH
Ant	*Paratrechina longicornis*	CB,CL,RH
Ant	*Pheidole dentigula*	CB,CL,RH
Ant	*Pseudomyrmex elongates*	CB,CL,RH
Ant	*Pseudomyrmex mexicanus*	CB,CL,RH
Fire ant	*Solenopsis geminata*	CB,CL,RH
Fire ant	*Solenopsis invicta**	CB,CL,RH
Fire ant	*Solenopsis tennesseensis*	CB,CL,RH
Fire ant	*Solenopsis sp., near texana*	CB,CL,RH
Ant	*Strumigenys eggersi*	CB,CL,RH
Ant	*Strumigenys gundalachi*	CB,CL,RH
Ant	*Trachymyrmes jamaicensis*	CB,CL,RH
Ant	*Wasmannia auropunctata*	CB,CL,RH
	Mosquitos	
Mosquito	*Aedes sollicitans*	MTC
Black saltmarsh mosquito	*Aedes taeniorhychus*	MTC
SPIDERS		
Silver argiope	*Argiope argentata*	RH
Spiny orb-weaver	*Gasteracantha cancriformis*	RH
Golden silk orbweaver	*Nephila clavipes*	RH
SEA URCHINS, SAND DOLLARS		
Common arbacia	*Arbacia punctulata*	MCPS,MCNS,MCR,MSGB,MUS
Say's astropecten	*Astropecten articulatus*	MCPS,MCNS,MCR,MSGB,MUS
Basket starfish	*Astrophyton muricatu*	MCPS,MCNS,MCR,MSGB,MUS
Long-spined urchin	*Diadema antillarum*	MCPS,MCNS,MCR,MSGB,MUS

* Non-native Species

Common Name	Scientific Name	Primary Habitat Codes (for imperiled species)
Rock-boring urchin	*Echinometra lucunter*	MCPS,MCNS,MCR,MSGB,MUS
Thorny starfish	*Echinaster sentus*	MCPS,MCNS,MCR,MSGB,MUS
Orange-ridged sea star	*Echinaster spinulosus*	MCPS,MCNS,MCR,MSGB,MUS
Pencil urchin	*Eucidaris tribuloides*	MCR,MSGB
Florida sea cucumber	*Holothuria floridana*	MCPS,MCNS,MCR,MSGB,MUS
Donkey dung sea cucumber	*Holothuria mexicana*	MCPS,MCNS,MCR,MSGB,MUS
Common comet star	*Linckia guildingii*	MCPS,MCNS,MCR,MSGB,MUS
Variegated urchin	*Lytechinus variegatus*	MCPS,MCNS,MCR,MSGB,MUS
Key-hole urchin	*Mellita quinquiesperforata*	MCPS,MCNS,MCR,MSGB,MUS
Red heart urchin	*Meoma ventricosa*	MCR,MSGB
Seagrass brittle star	*Ophiactis quinqueradia*	MCPS,MCNS,MCR,MSGB,MUS
Brittle star	*Ophiocoma echinata*	MCPS,MCR
Slimy brittle star	*Ophiomyxa flaccida*	MCPS,MCNS,MCR,MSGB,MUS
Cushion sea star	*Oreaster reticulata*	MCR
West Indian sea egg	*Tripneustes ventricosus*	MCR,MSGB,
TUNICATES		
Black tunicate	*Ascidia nigra*	MCPS,MCNS,MCR,MSGB,MUS
Flat tunicate	*Botrylloides nigrum*	MSGB
Mangrove tunicate	*Ecteinascidia trubinata*	MS
SHARKS, RAYS		
Spotted eagle ray	*Aetobatus narinari*	MCPS,MCNS,MCR,MSGB,MUS
Bull shark	*Carcharhinus leucas*	MCPS,MCNS,MCR,MSGB,MUS
Reef shark	*Carcharhinus perezi*	MCPS,MCNS,MCR,MSGB,MUS
Southern stingray	*Dasyatis americana*	MCPS,MCNS,MCR,MSGB,MUS
Tiger shark	*Galeocerdo cuvier*	MCPS,MCNS,MCR,MSGB,MUS
Nurse shark	*Ginglymostoma cirratum*	MCPS,MCNS,MCR,MSGB,MUS
Lemon shark	*Negaprion brevirostris*	MCPS,MCNS,MCR,MSGB,MUS
Hammerhead shark	*Sphyrna lewini*	MCPS,MCNS,MCR,MSGB,MUS
Bonnethead shark	*Sphyrna tiburo*	MCPS,MCNS,MCR,MSGB,MUS
Yellow stingray	*Urolophus jamaicensis*	MCPS,MCNS,MCR,MSGB,MUS
BONY FISHES		
Sergeant major	*Abudefduf saxatilis*	MCPS,MCNS,MCR,MSGB,MUS
Ocean surgeonfish	*Acanthurus bahianus*	MCPS,MCNS,MCR,MSGB,MUS
Doctorfish	*Acanthurus chirurgus*	MCPS,MCNS,MCR,MSGB,MUS
Blue tang	*Acanthurus coeruleus*	MCPS,MCNS,MCR,MSGB,MUS
Bonefish	*Albula vulpes*	MCNS,MSGB,MUS
Orange filefish	*Aluterus schoepfi*	MCPS,MCNS,MCR,MSGB,MUS
Scrawled filefish	*Aluterus scriptus*	MCPS,MCNS,MCR,MSGB,MUS

* Non-native Species

Common Name	Scientific Name	Primary Habitat Codes (for imperiled species)
Black margate	*Anisotremus surinamensis*	MCPS,MCNS,MCR,MSGB,MUS
Porkfish	*Anisotremus virginicus*	MCPS,MCNS,MCR,MSGB,MUS
Sea bream	*Archosargus rhomboidalis*	MCPS,MCNS,MCR,MSGB,MUS
Conch fish	*Astrapogon stellatus*	MCPS,MCNS,MCR,MSGB
Trumpetfish	*Aulostomus maculatus*	MCPS,MCNS,MCR,MUS
Queen triggerfish	*Balistes vetula*	MCR,MSGB
Spotfin hogfish	*Bodianus pulchellus*	MCPS,MCNS,MCR,MSGB,MUS
Spanish hogfish	*Bodianus rufus*	MCPS,MCNS,MCR,MUS
Peacock flounder	*Bothus lunatus*	MCPS,MCNS,MCR,MSGB,MUS
Saucereye porgy	*Calamus calamus*	MCPS,MCNS,MCR,MSGB,MUS
Ocean triggerfish	*Canthidemis sufflamen*	MCR
Sharpnose puffer	*Canthigaster rostrata*	MCPS,MCNS,MCR,MSGB,MUS
Yellow jack	*Caranx bartholomaei*	MCPS,MCNS,MCR,MSGB,MUS
Blue runner	*Caranx crysos*	MCPS,MCNS,MCR,MSGB,MUS
Bar jack	*Caranx ruber*	MCPS,MCNS,MCR,MSGB,MUS
Common snook	*Centropomus undecimalis*	MCPS,MCNS,MCR,MSGB,MUS
Graysby	*Cephalopholis cruentata*	MCPS,MCNS,MCR,MSGB,MUS
Atlantic spadefish	*Chaetodipterus faber*	MCPS,MCNS,MCR,MSGB,MUS
Foureye butterflyfish	*Chaetodon capistratus*	MCPS,MCNS,MCR,MSGB,MUS
Spotfin butterflyfish	*Chaetodon ocellatus*	MCPS,MCNS,MCR,MSGB,MUS
Reef butterflyfish	*Chaetodon sedentarius*	MCPS,MCNS,MCR,MSGB,MUS
Banded butterflyfish	*Chaetodon striatus*	MCPS,MCNS,MCR,MSGB,MUS
Colon goby	*Coryphopterus dicrus*	MCPS,MCNS,MCR,MSGB,MUS
Bridled goby	*Coryphopterus glaucofraenum*	MCPS,MCNS,MCR,MSGB,MUS
Masked goby	*Coryphopterus personatus*	MCPS,MCNS,MCR,MSGB,MUS
Shortfin pipefish	*Cosmocampus elucens*	MCPS,MCNS,MCR,MSGB,MUS
Bluelip parrotfish	*Cryptotomus roseus*	MCPS,MCNS,MCR,MSGB,MUS
Sea trout	*Cynoscion nebulosus*	MCPS,MCNS,MCR,MSGB,MUS
Balloonfish	*Diodon holocanthus*	MCPS,MCNS,MCR,MSGB,MUS
Porcupinefish	*Diodon hystrix*	MCPS,MCNS,MCR,MSGB,MUS
Sand perch	*Diplectrum formosum*	MCPS,MCNS,MCR,MSGB,MUS
Spottail pinfish	*Diplodus holbrooki*	MCPS,MCNS,MCR,MSGB,MUS
Sharksucker	*Echeneis naucrates*	MCPS,MCNS,MCR,MSGB,MUS
Sailfin blenny	*Emblemaria pandionis*	MCPS,MCNS,MCR,MSGB,MUS
Rock hind	*Epinephelus adscensionis*	MCPS,MCNS,MCR,MSGB,MUS
Goliath grouper	*Epinephelus itajara*	MCR
Red grouper	*Epinephelus morio*	MCPS,MCNS,MCR,MSGB,MUS

* Non-native Species

Common Name	Scientific Name	Primary Habitat Codes (for imperiled species)
Nassau grouper	*Epinephelus striatus*	MCPS,MCNS,MCR,MSGB,MUS
High-hat	*Equetus acuminatus*	MCPS,MCNS,MCR,MSGB,MUS
Spotted drum	*Equetus punctatus*	MCPS,MCNS,MCR,MSGB,MUS
Mosquitofish	*Gambusia affinis*	MCPS,MCNS,MCR,MSGB,MUS
Mangrove gambusia	*Gambusia rhizophorae*	MSGB,MS
Yellowfin mojarra	*Gerres cinereus*	MCPS,MCNS,MCR,MSGB,MUS
Goldspot goby	*Gnatholepis thompsoni*	MCPS,MCNS,MCR,MSGB,MUS
Neon goby	*Gobiosoma oceanops*	MCPS,MCNS,MCR,MSGB,MUS
Green moray	*Gymnothorax funebris*	MCPS,MCNS,MCR,MSGB,MUS
Spotted moray	*Gymnothorax moringa*	MCPS,MCNS,MCR,MSGB,MUS
Tomtate	*Haemulon aurolineatum*	MCPS,MCNS,MCR,MSGB,MUS
Caesar grunt	*Haemulon carbonarium*	MCPS,MCNS,MCR,MSGB,MUS
Smallmouth grunt	*Haemulon chrysargyreum*	MCPS,MCNS,MCR,MSGB,MUS
French grunt	*Haemulon flavolineatu*m	MCPS,MCNS,MCR,MSGB,MUS
Spanish grunt	*Haemulon macrostomum*	MCPS,MCNS,MCR,MSGB,MUS
Cottonwick	*Haemulon melanurum*	MCPS,MCNS,MCR,MSGB,MUS
Sailor's choice	*Haemulon parrai*	MCPS,MCNS,MCR,MSGB,MUS
White grunt	*Haemulon plumier*i	MCPS,MCNS,MCR,MSGB,MUS
Bluestriped grunt	*Haemulon sciurus*	MCPS,MCNS,MCR,MSGB,MUS
Slippery dick	*Halichoeres bivittatus*	MCPS,MCNS,MCR,MSGB,MUS
Yellowhead wrasse	*Halichoeres garnoti*	MCPS,MCNS,MCR,MSGB,MUS
Clown wrasse	*Halichoeres maculipinna*	MCPS,MCNS,MCR,MSGB,MUS
Puddingwife	*Halichoeres radiatus*	MCPS,MCNS,MCR,MSGB,MUS
Ballyhoo	*Hemiramphus brasiliensis*	MCPS,MCNS,MCR,MSGB,MUS
Lined seahorse	*Hippocampus erectus*	MCPS,MCNS,MCR,MSGB,MUS
Sargassumfish	*Histrio histrio*	MSGB, MCR
Blue angelfish	*Holacanthus bermudensis*	MCPS,MCNS,MCR,MSGB,MUS
Queen angelfish	*Holacanthus ciliaris*	MCPS,MCNS,MCR,MSGB,MUS
Black hamlet	*Hypoplecturs nigricans*	MCPS,MCNS,MCR,MSGB,MUS
Barred hamlet	*Hypoplectrus puella*	MCPS,MCNS,MCR,MSGB,MUS
Butter hamlet	*Hypoplectrus unicolor.*	MCPS,MCNS,MCR,MSGB,MUS
Bermuda chub	*Kyphosus sectartrix*	MCPS,MCNS,MCR,MSGB,MUS
Hogfish	*Lachnolaimus maximus*	MCPS,MCNS,MCR,MSGB,MUS
Spotted trunkfish	*Lactophrys bilaudalis*	MCPS,MCNS,MCR,MSGB,MUS
Honeycomb cowfish	*Lactophrys polygonia*	MCPS,MCNS,MCR,MSGB,MUS
Scrawled cowfish	*Lactophrys quadricornis*	

* Non-native Species

Common Name	Scientific Name	Primary Habitat Codes (for imperiled species)
.....	.....	MCPS,MCNS,MCR,MSGB,MUS
Trunkfish	*Lactophrys triqueter*...	MCPS,MCNS,MCR,MSGB,MUS
Pinfish	*Lagodon rhomboids* ...	MCPS,MCNS,MCR,MSGB,MUS
Tripletail	*Lobotes surinamensis*.	MCPS,MCNS,MCR,MSGB,MUS
Mutton snapper	*Lutjanus analis*.....	MCPS,MCNS,MCR,MSGB,MUS
Schoolmaster	*Lutjanus apodus*.....	MCPS,MCNS,MCR,MSGB,MUS
Blackfin snapper	*Lutjanus buccanella* ...	MCPS,MCNS,MCR,MSGB,MUS
Cubera snapper	*Lutjanus cyanopterus*.	MCPS,MCNS,MCR,MSGB,MUS
Mangrove snapper	*Lutjanus griseus*.....	MCPS,MCNS,MCR,MSGB,MUS
Dog snapper.....	*Lutjanus joco*	MCPS,MCNS,MCR,MSGB,MUS
Mahogany snapper.....	*Lutjanus mahogoni*	MCPS,MCNS,MCR,MSGB,MUS
Lane snapper.....	*Lutjanus synagris*	MCPS,MCNS,MCR,MSGB,MUS
Rosy blenny	*Malacoctenus macropus*.....	
.....	.....	MCPS,MCNS,MCR,MSGB,MUS
Tarpon	*Megalops atlanticus* ...	MCPS,MCNS,MCR,MSGB,MUS
Yellowtail damselfish	*Microspathodon chrysurus*	MCR, MSGB
Black mullet	*Mugil cephalus*	MCPS,MCNS,MCR,MSGB,MUS
Yellow goatfish	Mulloidichthys martinicus.....	MCR
Black grouper	*Mycteroperca bonaci* ..	MCPS,MCNS,MCR,MSGB,MUS
Gag.....	*Mycteroperca microlepis*	
.....	.....	MCPS,MCNS,MCR,MSGB,MUS
Scamp.....	*Mycteroperca phenax* .	MCPS,MCNS,MCR,MSGB,MUS
Yellowtail snapper	*Ocyurus chrysurus*.....	MCPS,MCNS,MCR,MSGB,MUS
Reef croaker.....	*Odontoscion dentex* ...	MCPS,MCNS,MCR,MSGB,MUS
Shortnose batfish.....	*Ogcocephalus nasutus*	MCPS,MCNS,MCR,MSGB,MUS
Redlip blenny	*Ophioblennius atlanticus*.....	
.....	.....	MCPS,MCNS,MCR,MSGB,MUS
Yellowhead jawfish.....	*Opistognathus aurifrons*	MCR
Gray angelfish	*Pomacanthus arcuatus*	MCPS,MCNS,MCR,MSGB,MUS
French angelfish	*Pomacanthus paru*.....	MCPS,MCNS,MCR,MSGB,MUS
Spotted goatfish	*Pseudupeneus maculatus*.....	
.....	.....	MCPS,MCNS,MCR,MSGB,MUS
Lionfish.....	*Pterois volitans**	MCPS,MCNS,MCR,MSGB,MUS
Midnight parrotfish.....	*Scarus coelestinus*	MCPS,MCNS,MCR,MSGB,MUS
Blue parrotfish	*Scarus coeruleus*	MCPS,MCNS,MCR,MSGB,MUS
Rainbow parrotfish	*Scarus guacamaia*	MCPS,MCNS,MCR,MSGB,MUS
Striped parrotfish.....	*Scarus iserti*.....	MCPS,MCNS,MCR,MSGB,MUS
Princess parrotfish	*Scarus taeniopterus*...	MCPS,MCNS,MCR,MSGB,MUS
Queen parrotfish.....	*Scarus vetula*.....	MCPS,MCNS,MCR,MSGB,MUS
Spotted scorpionfish.....	*Scorpaena plumieri*	MCPS,MCNS,MCR,MSGB,MUS
Greenblotch parrotfish	*Sparisoma atomarium*	MCPS,MCNS,MCR,MSGB,MUS
Redband parrotfish.....	*Sparisoma aurofrenatum*	
.....	.....	MCPS,MCNS,MCR,MSGB,MUS
Redtail parrotfish	*Sparisoma chrysopterum*.....	
.....	.....	MCPS,MCNS,MCR,MSGB,MUS
Bucktooth parrotfish.....	*Sparisoma radians*.....	MCPS,MCNS,MCR,MSGB,MUS

* Non-native Species

Common Name	Scientific Name	Primary Habitat Codes (for imperiled species)
Yellowtail parrotfish	*Sparisoma rubripinne*	MCPS,MCNS,MCR,MSGB,MUS
Stoplight parrotfish	*Sparisoma viride*	MCPS,MCNS,MCR,MSGB,MUS
Bandtail puffer	*Sphoeroides spengleri*	MCPS,MCNS,MCR,MSGB,MUS
Great barrucuda	*Sphyraena barracuda*	MCPS,MCNS,MCR,MSGB,MUS
Dusky damselfish	*Stegastes fuscus*	MCPS,MCNS,MCR,MSGB,MUS
Beaugregory	*Stegastes leucostictus*	MCPS,MCNS,MCR,MSGB,MUS
Bicolor damselfish	*Stegastes partitus*	MCPS,MCNS,MCR,MSGB,MUS
Three spot damselfish	*Stegastes planifrons*	MCPS,MCNS,MCR,MSGB,MUS
Cocoa damselfish	*Stegastes variabilis*	MCPS,MCNS,MCR,MSGB,MUS
Atlantic needlefish	*Strongylura marina*	MCPS,MCNS,MCR,MSGB,MUS
Redfin needlefish	*Strongylura notata*	MCPS,MCNS,MCR,MSGB,MUS
Sand diver	*Synodus intermedius*	MCPS,MCNS,MCR,MSGB,MUS
Bluehead	*Thalassoma bifasciatum*	MCPS,MCNS,MCR,MSGB,MUS
Permit	*Trachinotus falcatus*	MCPS,MCNS,MCR,MSGB,MUS
Houndfish	*Tylosurus crocodilus*	MCPS,MCNS,MCR,MSGB,MUS
Rosy razorfish	*Xyrichtys martinicensis*	MCPS,MCNS,MCR,MSGB,MUS
Stippled clingfish	Gobiesox punctalatus	MCPS,MCNS,MCR,MSGB,MUS

AMPHIBIANS

Frogs and Toads

Greenhouse frog	*Eleutherodactylus p. planirostris**	CL,DV
Eastern narrowmout toad	*Gastrophryne carolinensis carolinensis*	RH
Green tree frog	*Hyla cinero*	RH
Cuban treefrog	*Osteopilus septentrionalis**	CL,RH, DV

REPTILES

American crocodile	*Crocodyluc acutus*	MSGB,MS
Loggerhead turtle	*Caretta caretta*	MCPS,MCNS,MCR,MSGB,MUS
Green turtle	*Chelonia mydas*	MCPS,MCNS,MCR,MSGB,MUS
Atlantic leatherback turtle	*Dermochelys coriacea*	MCPS,MCNS,MCR,MSGB,MUS
Atlantic hawksbill turtle	*Eretmochelys imbricata*	MCPS,MCNS,MCR,MSGB,MUS
Atlantic ridley	*Lepidochelys kempii*	MCPS,MCNS,MCR,MSGB,MUS
Florida box turtle	*Terrapene carolina bauri*	RH, MS
Green anole	*Anolis carolinensis*	CL,DV,RH
Knight anole	*Anolis equestis**	CL,DV
Brown anole	*Anolis sagrei**	CL,DV,RH
Brown basilisk	Basiliscus vittatus*	DV
Six-lined racerunner	*Cnemidophorus sexlineatus*	CB, RH
Southeastern five-lined skink	*Eumeces inexpectatus*	RH
Tokay gecko	*Gecko gecko* *	CL,DV
Indo-Pacific gecko	*Hemidactylus garnotii**	CL,DV
Mediterranean gecko	*Hemidactylus turcicus**	CB,CL,DV

* Non-native Species

Common Name	Scientific Name	Primary Habitat Codes (for imperiled species)
Great green iguana	*Iguana iguana**	MTC
Northern curly tailed lizard	*Leiocephalus carinatus armouri**	CL,DV
Florida Keys mole skink	*Plestiodon egregius egregius*	CB, CL,RH
Ashy gecko	*Spaerodactylus cinereus*	CL,RH
Florida reef gecko	*Sphaerodactylus notatus*	CL,RH
Southern black racer	*Coluber constrictor priapus*	RH
Eastern diamondback snake	*Crotalus adamanteus*	RH
Southern ringneck snake	*Diadophis punctatus*	RH
Eastern indigo snake	*Drymarchon corais couperi*	RH
Corn snake	*Elaphe guttata guttata*	CL,RH
Eastern coral snake	*Micrurus fulvius fulvius*	RH
Mangrove saltmarsh snake	*Nerodia clarkia compressicauda*	MS
Brahminy blind snake	*Ramphotyphlops braminus*	DV
Rim rock crowned snake	*Tantilla oolitica*	RH
Red-headed agama	*Agama Agama*	RH

BIRDS

Common loon	*Gavia immer*	MTC
Horned grebe	*Podiceps auritus*	MTC
Pied-billed grebe	*Podilymbus podiceps*	MTC
Double-crested cormorant	*Phalacrocorax auritus*	MTC
Mallard	*Anas platyrhynchos*	MTC
Northern shoveler	*Anas clypeata*	MTC
Blue-winged teal	*Anas dicors*	MTC
Muscovy	*Cairina moschata*	CL
Ruddy duck	*Oxyura jamaicensis*	MTC
Hooded merganser	*Lophodytes cucullatus*	MTC
Common merganser	*Mergus merganser*	MTC
Red-breasted merganser	*Mergus serrator*	OF
Brown pelican	*Pelecanus occidentalis*	MTC
Magnificent frigatebird	*Fregata magnificens*	OF
Northern gannet	*Morus bassanus*	OF
Masked booby	*Sula dactylatra*	OF
Brown booby	*Sula leucogaster*	OF
Herring gull	*Larus argentatus*	MTC
Ring-billed gull	*Larus delawarensis*	MTC
Laughing gull	*Leucophaeus atricilla*	MTC
Caspian tern	*Hydroprogne caspia*	MTC
Sooty tern	*Onychoprion fuscatus*	MTC
Roseate tern	*Sterna dougallii*	MTC
Forster's tern	*Sterna forsteri*	MTC
Common tern	*Sterna hirundo*	MTC
Least tern	*Sternulla antillarum*	MTC
Royal tern	*Thalasseus maxima*	MTC
Sandwich tern	*Thalasseus sandvicensis*	MTC

* Non-native Species

John Pennekamp Coral Reef State Park Animals

Common Name	Scientific Name	Primary Habitat Codes (for imperiled species)
Black skimmer	*Rynchops niger*	OF
Great egret	*Ardea albus*	CL,MSGB,MS,MUS
Great blue heron	*Ardea herodias*	MSGB,MS,MUS
Great white heron	*Ardea herodias occidentalis*	MSGB,MS,MUS
Wudermann's heron	*Ardea herodias herodias*	MSGB,MS,MUS
American bittern	*Botaurus lentiginosus*	MS
Cattle egret	*Bubulcus ibis*	CL,MSGB,MS,MUS
Green heron	*Butorides striatus*	MSGB,MS,MUS
Little blue heron	*Egretta caerulea*	MSGB,MS,MUS
Reddish egret	*Egretta rufescens*	MSGB,MS,MUS
Snowy egret	*Egretta thula*	MSGB,MS,MUS
Tricolored heron	*Egretta tricolor*	MSGB,MS,MUS
Black-crowned night heron	*Nycticorax nycticorax*	MSGB, MS
Yellow-crowned night-heron	*Nyctanassa violacea*	MSGB,MS
Limpkin	*Aramus guarauna*	CL
White ibis	*Eudocimus albus*	CL,DV,MSGB,MS,MUS
Roseate Spoonbill	*Platalea ajaja*	MSGB,MS,MUS
Glossy ibis	*Plegadis flacinellus*	MSGB, MS, MUS
Wood stork	*Mycteria americana*	MSGB,MS,MUS
Turkey vulture	*Cathartes aura*	OF
Black vulture	*Coragyps atratus*	OF
Bald eagle	*Haliaeetus leucocephalus*	OF
Osprey	*Pandion haliaetus*	MTC
Cooper's hawk	*Accipiter cooperii*	OF
Sharp-shinned hawk	*Accipiter striatus*	OF
Short-tailed hawk	*Buteo brachyurus*	OF
Red-tailed hawk	*Buteo jamaicensis*	OF
Red-shouldered hawk	*Buteo lineatus*	OF
Broad-winged hawk	*Buteo platypterus*	OF
Swainson's hawk	*Buteo swainsoni*	OF
Northern harrier	*Circus cyaneus*	OF
Swallow-tailed kite	*Elanoides forficatus*	OF
Merlin	*Falco columbarius*	OF
Peregrine falcon	*Falco peregrinus*	OF
American kestrel	*Falco sparverius*	OF
American coot	*Fulica americana*	OF
Purple gallinule	*Porphyrula martinica*	MS
Sora rail	*Porzana caroilna*	MS
Clapper rail	*Rallus creptians*	MS
Piping plover	*Charadrius melodus*	MUS
Semipalmated plover	*Charadrius semipalmatus*	MUS
Killdeer	*Charadrius vociferus*	CL
Wilson's plover	*Charadrius wilsonia*	CL
Black-bellied plover	*Pluvialis squatarola*	CL
Black-necked stilt	*Himantopus mexicanus*	MUS
Avocet	*Recurvirostra americana*	MUS

* Non-native Species

Common Name	Scientific Name	Primary Habitat Codes (for imperiled species)
Spotted sandpiper	*Actitis macularius*	CL,MUS
Ruddy turnstone	*Arenaria interpres*	CL,DV
Sanderling	*Calidris alba*	CL,MUS
Western sandpiper	*Calidris mauri*	CL,MUS
Least sandpiper	*Calidris minutilla*	CL,MUS
Semipalmated sandpiper	*Calidris pusilla*	CL,MUS
Short-billed dowitcher	*Limnodromus griseus*	CL,MUS
Willet	*Tringa semipalmatus*	CL,MUS
Solitary sandpiper	*Tringa solitaria*	CL,MUS
Rock dove	*Columba livia**	CL,DV
Common ground-dove	*Columbina passerina*	CL,RH
White-winged dove	*Zenaida asiatica*	CL
White-crowned pigeon	*Patagioenas leucocephala*	RH
Eurasian collared dove	*Streptopelia decaocto**	MTC
Mourning dove	*Zenaida macroura*	CL,RH
Yellow-billed cuckoo	*Coccyzus americanus*	RH,MS
Mangrove cuckoo	*Coccyzus minor*	RH,MS
Short-eared owl	*Asio flammeus*	OF
Antillean short-eared owl	*Asio flammeus flammeus*	OF
Burrowing owl	*Athene cunicularia*	CL
Great horned owl	*Bubo virginianus*	OF
Eastern screech-owl	*Megascops asio*	RH
Barred owl	*Strix varia*	CL
Barn owl	*Tyto alba*	RH
Black masked parrot	*Agipornis personata**	CL
Red mitred conure	*Aratinga mitrata**	CL
Monk parakeet	*Myiopsitta monachus**	CL
Chuck-will's-widow	*Caprimulgus carolinensis*	RH
Common nighthawk	*Chordeiles minor*	OF
Chimney swift	*Chaetura pelagica*	OF
Ruby-throated hummingbird	*Archilochus colubris*	CL,RH
Belted kingfisher	*Megaceryle alcyon*	MS
Flicker	Colapes auratus	RH
Pileated woodpecker	*Dryocopus pileatus*	MS
Red-bellied woodpecker	*Melanerpes carolinus*	RH
Yellow-bellied sapsucker	*Sphyrapicus varius*	RH
Eastern wood pewee	*Contopus virens*	RH
Scissor-tailed flycatcher	*Muscivora forficate*	CL
Great-crested flycatcher	*Myiarchus crinitus*	CL,RH
Eastern phoebe	*Sayornis phoebe*	RH
Gray kingbird	*Tyrannus dominicensis*	CL,RH
Eastern kingbird	*Tyrannus tyrannus*	CL,RH
Western kingbird	*Tyrannus verticalis*	CL
Black-whiskered vireo	*Vireo altiloquus*	RH
White-eyed vireo	*Vireo griseus*	RH
Fish crow	*Corvus ossifragus*	CL,DV

* Non-native Species

John Pennekamp Coral Reef State Park Animals

Common Name	Scientific Name	Primary Habitat Codes (for imperiled species)
Blue jay	*Cyanocitta cristata*	CL,RH
Carolina wren	*Thryothorus ludovicianus*	RH
Barn swallow	*Hirundo rustica*	OF
Tree swallow	*Tachycineta bicolor*	OF
Chimney swift	*Chaetura pelagica*	OF
Blue-gray gnatcatcher	*Polioptila caerulea*	RH
Gray catbird	*Dumetella carolinensis*	CL,RH
Northern mockingbird	*Mimus polyglottos*	CL,DV,RH
Brown thrasher	*Toxostoma rufum*	CL,DV.RH
Swainson's thrush	*Catharus ustulatus*	RH
Loggerhead shrike	*Lanius ludovicianus*	CL
Common yellowthroat	*Geothlypis trichas*	KTRB,CB,RH,MS
Worm-eating warbler	*Helmitheros vermivorous*	KTRB,CB,RH,MS
Black-and-white warbler	*Mniotilta varia*	KTRB,CB,RH,MS
Connecticut warbler	*Oporonis agilis*	KTRB,CB,RH,MS
Louisiana waterthrush	*Parkesia motacilla*	KTRB,CB,RH,MS
Northern waterthrush	*Parkesia noveboracensis*	KTRB,CB,RH,MS
Prothonotary warbler	*Protonotaria citrea*	KTRB,CB,RH,MS
Ovenbird	*Seiurus aurocapilla*	KTRB,CB,RH,MS
Northern parula	*Setophaga americana*	KTRB,CB,RH,MS
Black-throated blue warbler	*Setophaga caerulescens*	KTRB,CB,RH,MS
Hooded warbler	*Setophaga citrina*	KTRB,CB,RH,MS
Yellow-rumped warbler	*Setophaga coronata*	KTRB,CB,RH,MS
Prairie warbler	*Setophaga discolor*	KTRB,CB,RH,MS
Yellow-throated warbler	*Setophaga dominica*	KTRB,CB,RH,MS
Kirtland's warbler	*Setophaga kirtlandii*	KTRB,CB,RH,MS
Magnolia warbler	*Setophaga magnolia*	KTRB,CB,RH,MS
Palm warbler	*Setophaga palmarum*	KTRB,CB,RH,MS
Yellow warbler	*Setophaga petechia*	KTRB,CB,RH,MS
Pine warbler	*Setophaga pinus*	KTRB,CB,RH,MS
American redstart	*Setophaga ruticilla*	KTRB,CB,RH,MS
Blackpoll warbler	*Setophaga striata*	KTRB,CB,RH,MS
Cape May warbler	*Setophaga tigrina*	KTRB,CB,RH,MS
Black-throated green warbler	*Setophaga virens*	KTRB,CB,RH,MS
Northern cardinal	*Cardinalis cardinalis*	KTRB,CB,RH,MS
American goldfinch	*Carduelis tristis*	CB,KTRB,RH
Painted bunting	*Passerina ciris*	CL
Indigo bunting	*Passerina cyanea*	CB,KTRB
Red-winged blackbird	*Agelaius phoeniceus*	CL,MS
Common grackle	*Quiscalus quiscula*	CL,RH
European starling	*Sturnus vularis**	CL,DV
House sparrow	*Passer domesticus**	CL,RH
Common mynah	Acridotheres tristis*	CL

* Non-native Species

John Pennekamp Coral Reef State Park Animals

Common Name	Scientific Name	Primary Habitat Codes (for imperiled species)
MAMMALS		
Virginia opossum	*Didelphis virginiana*	CL,RH
Norway rat	*Rattus norvegicus* *	MTC
Black rat	*Rattus rattus**	MTC
Eastern gray squirrel	*Sciurus carolinensis*	MTC
Domestic cat	*Felis domesticus* *	MTC
Raccoon	*Procyon lotor*	MTC
Florida manatee	*Trichechus manatus latirostris*	MCPS,MCNS,MCR,MSGB,MUS
Bottle-nosed dolphin	*Tursiops truncatus*	MCPS,MCNS,MCR,MSGB,MUS

* Non-native Species

Addendum 6—Imperiled Species Ranking Definitions

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

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

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

FNAI GLOBAL RANK DEFINITIONS

G1 ..... Critically imperiled globally because of extreme rarity (5 or fewer occurrences or less than 1000 individuals) or because of extreme vulnerability to extinction due to some natural or fabricated factor.

G2 ..... Imperiled globally because of rarity (6 to 20 occurrences or less than 3000 individuals) or because of vulnerability to extinction due to some natural or man-made factor.

G3 ..... Either very rare or local throughout its range (21-100 occurrences or less than 10,000 individuals) or found locally in a restricted range or vulnerable to extinction of other factors.

G4 ..... apparently secure globally (may be rare in parts of range)

G5 ..... demonstrably secure globally

GH ..... of historical occurrence throughout its range may be rediscovered (e.g., ivory-billed woodpecker)

GX ..... believed to be extinct throughout range

GXC ..... extirpated from the wild but still known from captivity or cultivation

G#? ..... Tentative rank (e.g.,G2?)

G#G# ..... range of rank; insufficient data to assign specific global rank (e.g., G2G3)

G#T# ..... rank of a taxonomic subgroup such as a subspecies or variety; the G portion of the rank refers to the entire species and the T portion refers to the specific subgroup; numbers have same definition as above (e.g., G3T1)

G#Q..... rank of questionable species - ranked as species but questionable whether it is species or subspecies; numbers have same definition as above (e.g., G2Q)
G#T#Q..... same as above, but validity as subspecies or variety is questioned.
GU ..... due to lack of information, no rank or range can be assigned (e.g., GUT2).
G?..... Not yet ranked (temporary)
S1..... Critically imperiled in Florida because of extreme rarity (5 or fewer occurrences or less than 1000 individuals) or because of extreme vulnerability to extinction due to some natural or man-made factor.
S2..... Imperiled in Florida because of rarity (6 to 20 occurrences or less than 3000 individuals) or because of vulnerability to extinction due to some natural or man-made factor.
S3..... Either very rare or local throughout its range (21-100 occurrences or less than 10,000 individuals) or found locally in a restricted range or vulnerable to extinction of other factors.
S4..... apparently secure in Florida (may be rare in parts of range)
S5..... demonstrably secure in Florida
SH ..... of historical occurrence throughout its range, may be rediscovered (e.g., ivory-billed woodpecker)
SX..... believed to be extinct throughout range
SA..... accidental in Florida, i.e., not part of the established biota
SE..... an exotic species established in Florida may be native elsewhere in North America
SN ..... regularly occurring but widely and unreliably distributed; sites for conservation hard to determine
SU ..... due to lack of information, no rank or range can be assigned (e.g., SUT2).
S?..... Not yet ranked (temporary)
N ..... Not currently listed, nor currently being considered for listing, by state or federal agencies.

LEGAL STATUS

FEDERAL

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

LE ..... Listed as Endangered Species in the List of Endangered and Threatened Wildlife and Plants under the provisions of the Endangered Species Act. Defined as any species that is in danger of extinction throughout all or a significant portion of its range.
PE ..... Proposed for addition to the List of Endangered and Threatened Wildlife and Plants as Endangered Species.
LT ..... Listed as Threatened Species. Defined as any species that is likely to become an endangered species within the near future throughout all or a significant portion of its range.

PT ..... Proposed for listing as Threatened Species.
C ..... Candidate Species for addition to the list of Endangered and Threatened Wildlife and Plants. Defined as those species for which the USFWS currently has on file sufficient information on biological vulnerability and threats to support proposing to list the species as endangered or threatened.
E(S/A) ..... Endangered due to similarity of appearance.
T(S/A) ..... Threatened due to similarity of appearance.
EXPE, XE..... Experimental essential population. A species listed as experimental and essential.
EXPN, XN .... Experimental non-essential population. A species listed as experimental and non-essential. Experimental, nonessential populations of endangered species are treated as threatened species on public land, for consultation purposes.

STATE

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

FE ..... Federally-designated Endangered

FT ..... Federally-designated Threatened

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

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

ST..... Listed as Threatened Species by the FWC. Defined as a species, subspecies, or isolated population, which is acutely vulnerable to environmental alteration, declining in number at a rapid rate, or whose range or habitat, is decreasing in area at a rapid rate and therefore is destined or very likely to become an endangered species within the near future.
SSC..... Listed as Species of Special Concern by the FWC. Defined as a population which warrants special protection, recognition or consideration because it has an inherent significant vulnerability to habitat modification, environmental alteration, human disturbance or substantial human exploitation that, in the near future, may result in its becoming a threatened species.

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

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

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

Addendum 7—Cultural Information

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

A. General Discussion

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

B. Agency Responsibilities

Per State Policy relative to historic properties, state agencies of the executive branch must allow the Division of Historical Resources (Division) the opportunity to comment on any undertakings, whether these undertakings directly involve the state agency, i.e., land management responsibilities, or the state agency has indirect jurisdiction, i.e. permitting authority, grants, etc. No state funds should be expended on the undertaking until the Division has the opportunity to review and comment on the project, permit, grant, etc.

State agencies shall preserve the historic resources which are owned or controlled by the agency.

Regarding proposed demolition or substantial alterations of historic properties, consultation with the Division must occur, and alternatives to demolition must be considered.

State agencies must consult with Division to establish a program to location, inventory and evaluate all historic properties under ownership or controlled by the agency.

C. Statutory Authority

Statutory Authority and more in depth information can be found at:
http://www.flheritage.com/preservation/compliance/guidelines.cfm

D. Management Implementation

Even though the Division sits on the Acquisition and Restoration Council and approves land management plans, these plans are conceptual. Specific information regarding individual projects must be submitted to the Division for review and recommendations.

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

Projects such as additions, exterior alteration, or related new construction regarding historic structures must also be submitted to the Division of Historical Resources for review and comment by the Division's architects. Projects involving structures fifty years of age or older, must be submitted to this agency for a significance determination. In rare cases, structures under fifty years of age may be deemed historically significant. These must be evaluated on a case by case basis.

Adverse impacts to significant sites, either archaeological sites or historic buildings, must be avoided. Furthermore, managers of state property should make preparations for locating and evaluating historic resources, both archaeological sites and historic structures.

E. Minimum Review Documentation Requirements

In order to have a proposed project reviewed by the Division, certain information must be submitted for comments and recommendations. The minimum review documentation requirements can be found at: http://www.flheritage.com/preservation/compliance/docs/minimum_review_documentation_requirements.pdf .

* * *

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

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

Phone: (850) 245-6425

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

The criteria to be used for evaluating eligibility for listing in the National Register of Historic Places are as follows:

1) Districts, sites, buildings, structures, and objects may be considered to have significance in American history, architecture, archaeology, engineering, and/or culture if they possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:

- **a)** are associated with events that have made a significant contribution to the broad patterns of our history; and/or
- **b)** are associated with the lives of persons significant in our past; and/or
- **c)** embody the distinctive characteristics of type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; and/or
- **d)** have yielded, or may be likely to yield, information important in prehistory or history.

2) Ordinarily cemeteries, birthplaces, or graves of historical figures; properties owned by religious institutions or used for religious purposes; structures that have been moved from their original locations; reconstructed historic buildings; properties primarily commemorative in nature; and properties that have achieved significance within the past 50 years shall not be considered eligible for the *National Register*. However, such properties will qualify if they are integral parts of districts that do meet the criteria or if they fall within the following categories:

- **a)** a religious property deriving its primary significance from architectural or artistic distinction or historical importance; or
- **b)** a building or structure removed from its original location but which is significant primarily for architectural value, or which is the surviving structure most importantly associated with a historic person or event; or
- **c)** a birthplace or grave of an historical figure of outstanding importance if there is no appropriate site or building directly associated with his productive life; or
- **d)** a cemetery which derives its primary significance from graves of persons of transcendent importance, from age, distinctive design features, or association with historic events; or

e) a reconstructed building, when it is accurately executed in a suitable environment and presented in a dignified manner as part of a restoration master plan, and no other building or structure with the same association has survived; or a property primarily commemorative in intent, if design, age, tradition, or symbolic value has invested it with its own exceptional significance; or

f) a property achieving significance within the past 50 years, if it is of exceptional importance.

Restoration is defined as the act or process of accurately depicting the form, features, and character of a property as it appeared at a particular period of time by means of the removal of features from other periods in its history and reconstruction of missing features from the restoration period. The limited and sensitive upgrading of mechanical, electrical and plumbing systems and other code-required work to make properties functional is appropriate within a restoration project.

Rehabilitation is defined as the act or process of making possible a compatible use for a property through repair, alterations and additions while preserving those portions or features that convey its historical, cultural or architectural values.

Stabilization is defined as the act or process of applying measures designed to reestablish a weather resistant enclosure and the structural stability of an unsafe or deteriorated property while maintaining the essential form as it exists at present.

Preservation is defined as the act or process of applying measures necessary to sustain the existing form, integrity and materials of an historic property. Work, including preliminary measures to protect and stabilize the property, generally focuses upon the ongoing maintenance and repair of historic materials and features rather than extensive replacement and new construction. New exterior additions are not within the scope of this treatment; however, the limited and sensitive upgrading of mechanical, electrical and plumbing systems and other code-required work to make properties functional is appropriate within a preservation project.

Addendum 8 —Land Management Review

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

Management Review Team Members

Agency Represented	Team member Appointed	Team member in attendance
DEP/DRP	Ms. Renate Skinner	Ms. Renate Skinner
DEP South District	Mr. R.J. Helbling	Ms. Jennifer Ricks
DACS/DOF	Mr. Bill Korn	Mr. Bill Korn
FWCC	Mr. Robert Guerra	Mr. Robert Guerra
Soil and Water Conservation		
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

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

Is the land being managed for the purpose for which it was acquired?

After completing the checklist, team members were asked to answer "yes" or "no" to this question. All team members agreed that the John Pennekamp Coral Reef State Park is being managed for the purpose for which it was acquired.

Are actual management practices, including public access, in compliance with the management plan?

After completing the checklist, team members were asked to answer "yes" or "no" to this question. 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

1. 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. (Vote: 7+, 0-)

Exceptional Management Actions

The following items received high scores on the review team checklist (see Attachment 1), which indicates that management actions exceeded expectations.

- Fish Management – Fishing Quality
- Control of non-native invasive & problem species plants
- Surface water quality monitoring
- Recreational Opportunities
- 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. (Vote: 7+, 0-)

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. (Vote: 7+, 0-)

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. (Vote: 6+, 0-)

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. (Vote: 6+, 0-)

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. (Vote: 7+, 0-)

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. (Vote: 6+, 0-)

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.
(Vote: 7+, 0-)

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. (Vote: 7+, 0-)

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 (see Attachment 1), 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.

ATTACHMENT I

The management review checklist was analyzed as follows: The checklist consisted of two parts: a plan review section that answered whether or not the management plan sufficiently addressed protection/ restoration/ management needs for a series of items; and a field review section that scored to what extent sufficient management actions were being taken for a series of items. For each item in each section the scores for all team members were averaged. Some items received high scores (≥ 4.0) in the field review, which indicates that exceptional management actions are being taken. Some items received low scores (≤ 0.5 for plan review; ≤ 2.0 for field review), which indicates that they were not sufficiently addressed in the plan, or that management practices did not meet expectations. These items must be addressed in the management plan update.

PLAN REVIEW									**AVERAGE**
Coastal Berm	I.A.1	1	1	1	1	1	1	1	1
Coastal Rock Barren	I.A.2	1	1	1	1	1	1	1	1
Rockland Hammock	I.A.3	1	1	1	1	1	1	1	1
Maritime Composite Substrate	I.A.4	1	1	1	1	1	1	1	1
Marine Consolidated Substrate	I.A.5	1	1	1	1	1	1	1	1
Marine Coral Reef	I.A.6	1	1	1	1	1	1	1	1
Marine Grass Bed	I.A.7	1	1	1	1	1	1	1	1
Marine Tidal Swamp	I.A.8	1	1	1	1	1	1	1	1
Marine Unconsolidated Substrate	I.A.9	1	1	1	1	1	1	1	1
Animals	I.B.1	1	1	1	1	1	1	1	1
Plants	I.B.2	1	1	1	1	1	1	1	1
Survey	II.A	0	1	1	1	1	1	1	0.8
Protection and Preservation	II.B	1	1	1	1	1	1	1	1
Rockland Hammock	III.B.1	1	0	1	1	1	1	1	0.8
Marine Tidal Swamp	III.B.2	1	0	1	1	1	1	1	0.8
Coral Reef	III.B.3		0	1	1		1	1	0.8
Fish Management-Fishing Quality	III.C.2	1	1	1		1	1	1	1
Animals	III.D.1	1	1	1	1	1	1	1	1
Plants	III.D.2	1	1	1	1	1	1	1	1
Dredged Channels	III.E.1A	1	0	1	1	1	1	1	0.8
Filled Wetlands	III.E.1B	1	0	1	1	1	1	1	0.8
Marinas	III.E.1C	0	0	1	1	1	1	1	0.7
Ground Water Quality	III.E.2A	0	0	0	0	0	1	1	0.3
Surface Water Quality	III.E.3A	1	1		1	1	1	1	1
Boundary Survey	III.F.1	1	0	0	1	1	1	1	0.7
Gates & Fencing	III.F.2	1	0	0	1	1	1	1	0.7
Signage	III.F.3	1	0	0	1	1	1	1	0.7
Law Enforcement Presence	III.F.4	1	1	1	1	1	1	1	1
Poaching	III.F.5		0	1	1		0		0.5
Navigational Aids	III.F.6		1						1
Commercial Development	III.G.1A		0	1	1	1	1	1	0.8
Residential Development	III.G.1B		0	1	1	1	1	1	0.8
Permit Review	III.G.1C		0					1	0.5
Inholdings/Additions	III.G.2		1	1	1		1	1	1
Roads	IV.1.A	1	1	1	1	1	1	1	1
Parking	IV.1.B	1	1	1	1	1	1	1	1
Water Access	IV.1.C	1	0	1	1	1	1	1	0.8
Recreational Opportunities	IV.2	1	1	1	1	1	1	1	1
Interpretive Facilities and Signs	IV.3	1	1	1	1	1	1	1	1

Environmental Education/Outreach	IV.4	1	1	1	1	1	1	1	1
Snorkeling	VI.A.1	1	1	1	1	1	1	1	1
Scuba Diving	VI.A.2	1	1	1	1	1	1	1	1
Hiking	VI.A.3	1	1	1	1	1	1	1	1
Camping	VI.A.4	1	1	1	1	1	1	1	1
Canoeing/Kayaking	VI.A.5	1	1	1	1	1	1	1	1
Glass Bottom Boat Tours	VI.A.6	1	1	1	1	1	1	1	1
Fishing	VI.A.7	0		0	1	1	0	1	0.5
Swimming	VI.A.8	1	1	1	1	1	1	1	1
Commercial Lobstering	VI.A.9		0		1				0.5
Recreational Fishing	VI.A.10	0	1	1	1		1		0.8
Ecology Camp	VI.B.1	0	0	1	1	1		1	0.7
Camping/Resting Areas (canoes/Kayaks)	VI.B.2	1	0	1	1	1	1	1	0.8
New Sewer Treatment Plant	VI.B.3	1	1	1	1	1	1	1	1
FIELD REVIEW									
Coastal Berm	I.A.1	2	3	3	3	2	4	3	2.8
Coastal Rock Barren	I.A.2	3	3	4	3	3	3	3	3.1
Rockland Hammock	I.A.3	3	4	4	3	4	4	3	3.6
Maritime Composite Substrate	I.A.4	3	3	3	3	3	4	3	3.1
Marine Consolidated Substrate	I.A.5	3	3	3	3	3	4	3	3.1
Marine Coral Reef	I.B.1	3	3	3	4	2	3	4	3.1
Marine Grass Bed	I.B.2	1	3	3	2	2	3	4	2.6
Marine Tidal Swamp	II.A	3	3	3	3	3	4	4	3.3
Marine Unconsolidated Substrate	II.B	3	3	3	3	3	4	3	3.1
Animals	II.C	1	3	3	3	4	4	4	3.1
Plants	III.B.1	4	3	4	3	4	4	4	3.7
Survey	III.B.2	1	2	2	3	3	3	2	2.3
Protection and Preservation	III.B.3	2	3	3	3	3	3	2	2.7
Rockland Hammock	III.D.1	4	3	3	4	3	4	3	3.4
Marine Tidal Swamp	III.D.2	4	3	3	4	3	4	3	3.4
Coral Reef	III.E.1A	4	3	4	4	2	2	4	3.3
Fish Management-Fishing Quality	III.E.1B	5	4	4	4	4	4		4.2
Animals	III.E.1C	1	3	3	3	4	4	3	3
Plants	III.E.1D	4	4	4	4	4	4	4	4
Dredged Channels	III.E.1E	4	3	3	3	4	2	4	3.3
Filled Wetlands	III.E.2A	3	3	3	3	4	2	4	3.1
Marinas	III.E.2B	3	3		3	4	3	4	3.3
Ground Water Quality	III.E.3A	4	3	3	3	2	3	4	3.1
Surface Water Quality	III.E.3B	5	4	3	3	4	5	4	4
Boundary Survey	III.F.1	3	3	3	3	5	3	3	3.3
Gates & Fencing	III.F.2	3	3	3	3	5	3	3	3.3
Signage	III.F.3	4	3	4	3	3	3	3	3.3
Law Enforcement Presence	III.F.4	1	2	3	2	2	2	2	2
Poaching	III.F.5	1	3	3	3	2	2		2.3
Navigational Aids	III.F.6	1	4	4	3	4	4		3.3
Commercial Development	III.G.1A	3	3	3	3	3	4	4	3.3
Residential Development	III.G.1B	3	3	3	3	3	4	4	3.3

Permit Review	III.G.1C	4	3	3	3	5		5	3.8
Inholdings/Additions	III.G.2	1	3	2	2	1	5	3	2.4
Roads	IV.1.A	4	4	3	3	5	4	4	3.8
Parking	IV.1.B	4	4	3	3	5	4	4	3.8
Water Access	IV.1.C	4	3	3	4	5	4	4	3.8
Recreational Opportunities	IV.2	4	4	4	4	5	4	4	4.1
Interpretive Facilities and Signs	IV.3	4	4	4	3	5	5	4	4.1
Environmental Education/Outreach	IV.4	4	4	4	3	5	3	4	3.8
Waste Disposal	V.1.A	4	4	4	3	5	3	3	3.7
Sanitary Facilities	V.1.B	3	3	4	3	5	3	3	3.4
Buildings	V.2.A	4	4	3	3	5	3	3	3.5
Equipment	V.2.B	3	2	3	3	2	3	3	2.7
Staff	V.3	1	2	2	2	2	2	2	1.8
Funding	V.4	3	3	3	3	3	3	3	3